As discussed previously, different types of radiation produce ionizations at different rates as they pass through tissue. The alpha particle travels only a short distance, causing intense, closely spaced ionization along its path. The beta particle travels much farther, causing much less ionization in each portion of its path. Therefore, the alpha particle is more damaging to internal tissue than the beta particle for the same number of ionizations because the damage to cells in the tissue is more localized.

Besides the rad, the other commonly used radiation dose unit is the "rem" (acronym for roentgen equivalent in man). The rem quantifies the relative biological response to radiation rather than the amount of energy delivered to the tissue.

The biological damage done by an alpha particle is greater than that by a beta particle for the same total amount (rads) of energy deposited, and this difference is accounted for by the use of "quality factors" (1 for X- or gamma radiations and most beta particles, and 10 to 20 for alpha particles). Thus, 1 rad of energy from gamma rays would result in 1 rem of dose, while 1 rad from alpha particles would result in 10 to 20 rems of dose.

Because the relative degree of damage from each type of radiation is known, the rem can be used to estimate the approximate biological effect. The rem permits evaluation of potential effects without regard to the type of radiation or its source. One rem of exposure from natural cosmic radiation results in the same biological consequences as 1 rem of medical X-rays or 1 rem delivered by radiation produced by either natural or man-made radioactive decay.

A frequent error in the use of radiation units is their application to a standard weight of tissue rather than all of the tissue irradiated. A person can receive one rad or one rem of radiation from any of the following: (1) an X-ray of the teeth, where little tissue is irradiated; (2) a chest X-ray, where a moderate amount of tissue is irradiated; or (3) whole-body radiation, where all tissue in the body is irradiated. Although all these sources give 1 rem of radiation, the effects are different depending upon the organs involved. Thus, one must always keep in mind the portion of the body or organs involved and make comparisons only for corresponding exposures. For example, whole-body doses must be compared only to other whole-body doses or to whole-body dose standards.

In some cases, radiation measurements are expressed as a "dose rate," or the amount of radiation received in a unit of time. For example, some instrument measurements of background are reported in "microrem(s) per hour" (μrem/h). To calculate total dose, the rate is multiplied by the time of exposure. This is conceptually similar to multiplying speed (rate of travel--e.g., in miles per hour) by time to get total distance travelled. Dose may be expressed using rads or rems, depending on whether the emphasis is on the energy deposited or the biological effect.

Because many of the radiation doses discussed in this EIS are small, the metric prefixes "milli" for one-thousandth (1/1000 or 0.001,

04000205

symbolized as "m") or "micro" for one-millionth (1/1,000,000, or 0.000001, symbolized as ("μ") are often used; 1,000,000 microrem (μrem) = 1,000 millirem (mrem) = 1 rem.

What Is Known About the Health Effects of Radiation

If molecules vital to the function of a cell are ionized by radiation, the cell may be destroyed; if enough cells are destroyed, an organ may be damaged. However, organ damage is usually associated with large doses and is generally referred to as a "short-term" effect of radiation.

People who receive high radiation doses also increase their risk of developing cancer and producing genetic damage to their progeny; these are "long-term" effects. The risk is proportional to the dose. How low-level exposure to radiation results in cancer is not fully understood, and the relationship between the amount of exposure and the probability that cancer will develop cannot be accurately predicted.

Radiation levels around uranium minesites are not generally considered to be high enough to cause short-term effects. They may, however, be sufficient to raise the risks of long-term effects, depending on conditions and length of exposure.

In spite of the uncertainties in the risk estimates, more is known about radiation and its health effects than is known about certain chemical hazards. Radiation has been studied extensively since the 1920's. Also, it is possible to detect the various types of radiation easily, making it possible to avoid areas of potential risk.

An important distinction exists between external and internal radiation sources and their impacts. When external radiation interacts with a person's body, it is quickly dissipated as ionization and eventually heat. However, radioactive materials can enter a person's body and remain there for some period of time, emitting radiation. Thus it is incorrect to say that "radiation is in a person's body." It is correct to say that the person has radioactive materials in his/her body and that radiation is emitted from these radioactive materials.

Background Radiation

"Background" is the term used to represent the natural levels of radiation (radioactivity) that are typical for an area. Naturally occurring radioactive elements are present in air, water and soil.

Background radiation results from cosmic and terrestrial sources. Cosmic radiation originates in the cosmos and enters the earth's atmosphere, while terrestrial radiation originates from the naturally occurring radionuclides in the soil. The level of background radiation in any particular area depends on such factors as altitude, local geology and meteorological conditions.

Radioactivity in the human body originates from the intake of naturally occurring radioactive elements in the food and water consumed,

04000206

and in the air inhaled by each person. Human exposure to background radiation depends on personal lifestyle, diet and type of residence.

The annual background radiation dose rate in the area around the minesite as compared to U.S. averages is indicated in Table B-2. The local rates are higher than U.S. averages because the minesite is at a fairly high elevation (6,000 feet above mean sea level) and because of the elevated concentration of uranium throughout the Grants mineral belt.

TABLE B-2

ESTIMATED AVERAGE ANNUAL BACKGROUND WHOLE-BODY DOSE RATES (1970)
(millirems per year)

Source	U.S. Average Dose Rate	Colorado	Jackpile-Paguate Minesite
Environmental			
1. Natural			
Cosmic Radiation	44	90	70
Terrestrial Sources [a]	40	46	90
Internal Sources [b]	18	18	18
Subtotals	102	154	178
2. Global Fallout	4	4	4
3. Nuclear Power	0.003	0.003	0.003
Medical	73	73	73
Occupational	0.8	0.8	0.8
Miscellaneous	2	2	2
TOTALS (rounded)	182	234	258

Sources: Iowa Energy Policy Council 1975 (for U.S. average and Colorado figures); Momeni, et al. 1983 (for minesite).

Notes: [a] Crustal and building materials.
[b] Principally potassium-40.

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Appendix C

Author Comments on ANL/ES-131

04000208

AUTHOR COMMENTS ON ANL/ ES-131

"Radiological Impacts of Jackpile-Paguate Uranium Mines:
An Analysis of Alternatives of Decommissioning"
by M.H. Momeni, Principal Author [a]
May 1986

Objectives

The ANL/ES-131 report was intended to be a support document for the Environmental Impact Statement prepared by the U.S. Department of the Interior on Anaconda Minerals Company's proposal to reclaim the Jackpile-Paguate uranium mine. The regional radiological analysis was limited to an area beyond the mine site and up to a distance of 50 miles. The analysis did not include the potential pathways of exposure for the mine site and the regions beyond the 50-mile radius.

Selected sections of the ANL/ES-131 report are modified by Dr. M. Momeni, principal author, to correct errors detected since preparation of the report.

Sources of site specific data were obtained from the following documents:

-Anaconda Company. 1980. "Reclamation Plan, Jackpile-Paguate Mine". Report to the U. S. Geological Survey, Conservation Division.

-Anaconda Company. 1982. "Revised Reclamation Plan, Jackpile-Paguate Uranium Mine, Anaconda Mineral Company, New Mexico, Operation".

-Anaconda Minerals Company, letter dated June 16, 1982. The enclosures to this letter provided the following information (copy enclosed as Appendix 1):

-Characteristics of Surface Materials, Jackpile-Paguate Mine, Material Classification (Table 1).

-Characteristics of Surface Materials at the Jackpile-Paguate Mine, Radiological Analysis (Table 2).

-Stockpile Inventory, February 28, 1982, providing volume and quality of the ore and protore present at the mines (marked confidential by the Anaconda Company--is not enclosed).

Except for the concentration of radionuclides in water obtained from four wells on the Laguna Indian Reservation (Table 2.5 ANL/ES-131), all the other data were provided by Anaconda or were obtained from published literature.

[a]/Dr. M. Momeni prepared these amendments independantly; these amendments are neither endorsed by, nor represent the views of Argonne National Laboratory.

04000209

Changes to Chapter 3, ANL/ES-131
by Dr. M. Momeni, Principal Author

ANALYSIS OF PATHWAYS OF EXPOSURE

Page 3-1, last sentence is modified to:

Grazing of livestock on the site would not be permitted under the no-action case. Under this alternative of decommissioning ground deposition of airborne material on grazing lands beyond the boundaries would steadily expand and increase. Quality of surface water at Paguate Reservoir and in Rio Puerco will be affected by surface run-off from the contaminated watersheds. Under the no-action alternative the process of fugitive dusting and surface run-off of radioactive materials would not be controlled.

Table 3.1

A specific flux of 0.5 picoCuries of Rn-222 per meter squared per second (0.5pCi Rn-222/m^2·sec) per picoCurie of Ra-226 per gram (pCi Ra-226/g) of soil was used in calculation of the annual releases from the mine site. The area of the releases was limited to the mine site alone; it did not include the contribution from contaminated material surface creep into the adjacent lands. The release rate was calculated as 5587.8 Ci/yr.

A justification for the assumed value of the specific flux is as follows: Thomas, Nielson and Mauch (1982) reported an arithmetic mean specific radon flux from several locations within a mine site.

Area	pCi Rn/m^2-sec/%U_3O_8	pCi Rn/m^2-sec/pCi Ra/g*
Mine pit floor	3,200	1.4
Ore in Mine	3,200	1.4
Ore piles at mine	6,200	2.2
Lower grade ore piles	5,400	1.9

*These values were not reported by Thomas et al. A conversion from %U_3O_8 to pCi Ra/g was calculated assuming:

- secular radioactive equilibrium
- 2812.5 pCi/g Ra-226 for 1% U_3O_8

For the analysis of the model mill, the U.S. NRC (1980) used a specific flux of 1.0 pCi Rn-222/m^2.sec per pCi Ra-226/g.

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Thus it seems that the reported release rate of 5587.8 Ci/yr Rn-222 from the mine site (ANL/ES-131) may be underestimated by a factor of two. However, in our opinion an adjustment of the radon release rate to 11175 Ci/yr is not warranted.

Radon flux is a function of soil porosity and equilibrium moisture content. The aging process of a disturbed soil would decrease the soil porosity by natural compaction. In addition, U.S. NRC ((1980), Volume III, Appendix O) states:

> "...the correlation between radon flux and radium concentration adheres on the average to approximately 0.6 $pCi/m^2.sec$ per pCi/gm of radium".

This statement was based on data collected by several researchers between the years 1966 through 1979. The annual release rate of 5587.8 Ci Rn-222/yr does not include the contribution from fugitive dust which has already deposited on the adjacent grazing land. The suggested 0.6 value for the specific flux would increase the radon source term by 20%.

Under the no-action decommissioning alternative, the contribution of radon from the deposited activities on the adjacent land from the mine site would increase due to increase in the area of contamination and amount of deposition. This contribution was not calculated.

Table 3.4 and 3.5

The coordinates for the town of Paguate have been corrected to X=-3.0 km and Y=1.0 km. This change, however, does not alter the reported airborne and ground deposited concentrations (see figure 3.6a).

Figure 3.9, Page 3.17

The caption to this figure is corrected to:

> "concentration of ground deposited Ra-226 at various distances and directions from the mine site (calculated using UDAD code)."

The figure was intended to provide radon concentration as a function of distance; but inadvertently the figure was substituted with a figure depicting the ground deposited Ra-226 concentrations.

Page 3.36

In the analysis of ingestion pathway for ANL/ES-131, consumption of contaminated water (see figure 3.22 in ANL/ES-131) by livestock was not determined.

Soluble concentration (C) of each radionuclide in any impounded water from rain runoff may be estimated from:

$$C = (A \times W \times f \times s / V)$$

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where

A = area of a watershed
W = ground deposited activity per unit area per unit time
f = surface runoff fraction
S = solubility fraction
V = volume of the impounded water

Values for (W), deposition of U-238, is given in Table 3.6. Because of the secular radioactive equilibrium in the ore, the same values would also apply to U-234, Th-230, Ra-226, Pb-210 and Po-210. Ingrowth of Pb-210 and Po-210 from decay of radon could be ignored for the regional analysis. For the impounded water, such as that at Rio Moquino Valley, north of the mine site, assuming a volume of $V=10^4$ m^3, surface runoff of f=0.9, and a watershed surface of $A=10^6$ m^2, the total concentration for Ra-226 would be:

$$(10^6 m^2) \times (100\ pCi/m^2.yr) \times (0.9)/10^4$$

$$= 9 \times 10^3\ pCi/m^3 = 9\ pCi/liter/year$$

Only a fraction of the total activity would be in solution and would be ingested by livestock. The remaining activity would deposit as sediment. The contamination level within the impounded water could increase with time. Because of the great uncertainty in the above type of estimation and seasonal nature of the process, under no-action alternative the radioactivity of the impounded water may have to be monitored.

Table 3.9:

The average ingestion dose to individuals from ingestion of locally raised meat does not include any contribution from surface creep and consumption of contaminated water by cattle.

Table 3.13

Table 3.13 provides annual population dose commitment. Annual dose commitment is defined as: the time-integrated dose from the body burden acquired during any single year; the dose rate from the body burden is integrated over the subsequent 70 year period.

Under Alternative A, the population dose commitment was only calculated for selected pathways and organs. For example, absence of tabulated dose to breast does not indicate that the dose is zero. The column designated as "total" is only a total for those pathways indicated.

Table 3.14

Table 3.14 provides 100-year environmental dose commitments under Alternative A. The column designated as "total" is only a total for those pathways shown in the Table 3.14. Absence of a value for a given pathway or organ does not indicate that the dose is zero.

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Section 3.5 Dose Commitment

Contribution of radon-222 released from Jackpile-Paguate mine to the residents of the United States was not included in the tabulated values (Table 3.13 and 3.14). Travis et al. (1979) calculated dose commitment to the U.S. population (excluding the regional population) from a release rate of 1 kCi/year of radon-222 in New Mexico. They evaluated dose commitment from inhalation of Rn-222, its short-lived daughters, Pb-210 and Po-210. The analyses included primary and resuspended Pb-210 and Po-210 for a 100 year period following the release of radon and ingestion of deposited radionuclides.

An annual population dose commitment can be calculated from the published values by Travis et al. (1979) assuming a release rate of 5587.8 Ci Rn-222/yr (5.6 k Ci Rn-222/yr). U.S. annual dose commitments (man-rem) from a release of 1 k Ci Rn-222 during 1978, in Grants, New Mexico and those from Jackpile- Paguate mines are:

Table A: Annual Dose Commitment (man-rem) to U.S. Population from a release of 1000 Ci Rn-222/yr in Grants, New Mexico and from the Jackpile-Paguate mine.

Pathway	Whole Body	Lung	Bone	Kidney	Liver
Inhalation	1.6	1.5	23.2	0.4	0.5
	(9.0)*	8.4	130.0	2.2	2.8
Ingestion	3.1		42.1	0.4	0.6
	(17.4)		(235.8)	(2.2)	(3.4)
Total	(26.4)	(8.4)	(365.8)	(4.4)	(6.2)

*The values in parentheses are estimated annual dose commitments from the Jackpile-Paguate mine

The above doses are based on a release of radon during the year 1978. But the atmospheric residence of the Pb-210 and Po-210 by resuspension of the ground deposited Pb-210 were calculated to the year 2078. The cumulative impact from the no-action alternative would be from integration of annual dose commitments over a 70-year life span (about 70 times larger than the annual population dose commitments).

04000213

Changes to Chapter 4, ANL/ES-131
by Dr. M. Momeni, Principal Author

HEALTH EFFECTS

In this chapter, potential radiation-induced somatic effects (diseases inflicting an individual) and genetic effects were discussed. The uncertainty in the risk coefficients is surmised to be not less than a factor of 5 ($\pm$ 2.5 times).

The above uncertainty is an optimistic value for projection of radiological risks from the Jackpile Mine. Realistically---it may not be less than a factor of 10. These estimates are equally probable to be underestimated as well as overestimated projections. National Research Council (BEIR 1980) states:

> "It is not yet possible to estimate precisely the risk of cancer induction by low-dose radiation, because the degree of risk is so low that it can not be observed directly and there is great uncertainty as to the dose-response function most appropriate for extrapolating in the low-dose region."

Thus, in matter of life, a prudent application of the ALARA principle is dictated.

Method of Risk Analysis

The risks were calculated using "Potential Radiation-Induced Biological Effects in Man" (PRIM) computer code. Somatic risk analysis in the PRIM code are based on the following assumptions and procedures:

-Risk to an individual was calculated using either (A) an absolute risk model or (B) relative risk model.

A - Absolute Risk Model

With the absolute risk model, probability of death from a radiation-induced somatic effect is proportional to the radiation dose to the inflicted organ. The proportionality constant is dependent on: the individual age at the exposure time (BEIR 1980, Figure V-5), type of a disease, sex,and racial origin.

B - Relative Risk Model

The risk of radiation-induced somatic effect using the relative risk model is proportional to both the radiation dose to the inflicted organ and the natural incidence of the disease. Natural incidence of a disease is dependent on age, sex, racial origin (BEIR 1980, Figure V-2). Also, other factors such as smoking and industrial polutants may influence the observed incidences. We surmise that the observed time dependence (not age dependence) of the incidences may be due to the other factors. The proportionality constant (risk coefficient) for relative risk model is also dependent on sex, age, and racial origin.

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The risk of radiation-induced mortality (m) from a single disease throughout the residual life, from a single dose D(a,t) or doses received within a single year, at an age (a) and time (t) was assumed to be independent of any other doses received at any other times. The residual life was defined as time of natural death minus age at irradiation. The dose rates at exposure time and age were calculated from all previously acquired body burdens and external exposures during that year.

The total radiation-induced risk of mortality (M) from all diseases was assumed to be the sum of the risks (m) from a single dose acquired at age a and time t..

The following additional conditions were imposed on both models:

1. The radiation-induced risk from a single dose is zero during the latency period and after the expression period. Table B lists default values for the latency and expression periods in PRIM code.

Latency is the period from the beginning of irradiation of a homogenous population (i.e. identical in sex, age, racial origin) to the onset of radiation-induced mortality. The expression period is the duration of observed mortality in the exposed population from the induced disease.

2. The radiation-induced risk coefficients (incidences) during the expression period were assumed to be dependent on the age and sex of the exposed individuals. Tables C and D list the values for selected risk coefficients.

3. Radiation-induced mortality from a continuous exposure is dependent on time and age because of the changes in the intensity of radiation exposure and the other forces of mortality. Thus, induced mortality is both age and time dependent.

4. The number of individuals inflicted with a single radiation-induced disease is reduced by competitive causes of mortality from natural deaths, accidents, etc. and all the other radiation-induced diseases.

Radiation Doses

An average radiation dose rate (mrem/yr) to each organ was calculated using UDAD code for the following conditions:

-six radial distances*: 0.1, 1.0, 5.0, 10.0, 50, 80 kilometers

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*The PRIM code version II specified 16 directions. Reduction of the number of the directions to 4 directions was done to reduce computer matrix size and running time. However, the doses were extrapolated between angles and directions. Version IV under development will replace radial distances and angles with town coordinates.

04000215

-four directions: north, east, south, and west

-twenty time intervals: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100 years

-four pathways: inhalation, ingestion, external exposure from airborne and ground deposited radionuclides.

The total dose to each organ at the center of each location for any 5-year period, specified by a distance and angle, was calculated from the average dose rate at age (a) and time (t) within the period and from each pathway of exposure. The risk to an individual from this total dose (i.e. dose within a 5 year period) was computed for selected causes, 20 age intervals, and both sexes. The total risk to an individual from a single cause was assumed to be a cumulative of all risks from the previous exposures.

Population Projection

The size and composition of a population in a region was assumed to change continuously with time. Population projections were calculated using the cohort-component method. In this method the population within a town was grouped into 19 age groups (cohorts), each group in a 5-year age interval. Thus, all those up to 5 years of age were included in the first age group. Those in between 5 and up to 10 years of age were included in the second group. The last age group included all those older than 95 years of age. Each cohort was further subdivided by sex and race. For these analysis, a single racial group (American) representing the population of the United States was used. Migration both into a town or away from a town was not considered.

The population structure was assumed to be dependent on age and sex, death rates (Table 4-2) and birth rates. Birth rate within any time period was calculated from age-specific fertility rates (table 4.2). The age-specific birth rate, fertility rate and death rate was assumed to be equivalent to the average rates for the United States during 1970.

Thus, the PRIM code is a cause-specific risk model, applying the life-table method to each population age-cohort at each time. Radiation-induced mortality for the cohort is assumed to be porportional to the organ doses accumulated during each 5-year time period. The cause-specific mortality for each cohort at each time is a superposition of the risks from all previous doses imposed on the population at that time. At each time, the total risk for all ages is a summation of the mortalities imposed on all age-cohorts. Since the population is replenished by new births, the size of each age-cohort is time dependent. The mortality matrix contains information on:

- 20 time periods
- 19 age groups
- 2 sexes
- 10 causes (Radiation)
- 10 causes (Spontaneous)
- 20 all the other causes.

04000216

PRIM code calculates and stores the information for each matrix cell.

Example:

Table 4.3 provides the following projection:

-age distribution of the regional population for the period 2032 to 2037.

-death distribution due to natural incidence of cancers and the other causes. CA-8 also includes cancer of kidney.

Table 4.5 provides the following projections:

-age specific mortality rate for the five-year period 2032-2037 from radiation-induced neoplasms among 0.45 million regional population. CA-8 includes cancer of urinary, kidney, and sex organs.

Table E provides a revised projected mortality from selected causes. The total risks calculated using the relative risk model can not be determined; the mortalities from leukemia, bone and all the other causes (CA-10) were not calculated. BEIR (1980) does not suggest the relative risk model for leukemia and bone cancer.

BEIR (1980) states: "Review of the current data has led the present subcommittee to conclude that the relative-risk model does not apply generally, but is applicable to the effect of age on cancer-incidence for many sites at which cancer is induced by irradiation".

The relative risk model was used for completeness - not as endorsement of the risk model.

Table B: Default Latency and Expression periods in PRIM code (version III)

Cause	Latency (Years)	Expression (Years)
Leukemia		
Ages less than 5	1.7	25
Ages more than 5	2	25
Bone		
Ages less than 15	2	30
Ages more than 15	10	30
All the other causes*	10	100

*Age dependency is suggested for solid tumors, however, data is not at this time available.

04000217

Table C: Risk coefficients (cases per mrem per year) (absolute risk model) are incorporated into the PRIM Code and used for ANL/ES-131 and for this amendment. The parameters A and B are linear and quadratic coefficients of the response equation (sex dependent values, except for breast cancer, were not used).

	ANL/ES-131		REVISED [a]	
	A (Linear)	B (Quadratic)	A (Linear)	B (Quadratic)
Leukemia				
in utero	5×10^{-9}	9×10^{-12}	0	0
0 - 15	5×10^{-9}	9×10^{-12}	6.0×10^{-10}	5.4×10^{-12}
15 - 25	2×10^{-9}	9×10^{-12}	6.0×10^{-10}	5.0×10^{-12}
25 - older	1×10^{-9}	9×10^{-12}	7.0×10^{-10}	6.3×10^{-12}
Lung				
in utero	0	0	0	
0 - 9	0	0	0	
10 - 19	2×10^{-9}	0	2×10^{-9}	0
20 - 34	3×10^{-9}	0	2×10^{9}	0
35 - 49	2×10^{-9}	0	2×10^{-9}	0
50 - older	2×10^{-9}	0	2×10^{-9}	0
Stomach [b]				
in utero	0	0	0	
0 - 9	4×10^{-10}	0	1×10^{-10}	9.0×10^{-13}
10 - 19	4×10^{-10}	0	5×10^{-11}	4.5×10^{-13}
20 - 34	7.7×10^{-10}	0	1.6×10^{-10}	1.4×10^{-12}
35 - 49	1.3×10^{-9}	0	2.3×10^{-10}	2.1×10^{-12}
50 - older	3.4×10^{-9}	0	5.7×10^{-10}	5.1×10^{-12}
Intestine [b]				
in utero	0	0	0	0
0 - 9	2.6×10^{-10}	0	4.7×10^{-11}	4.3×10^{-13}
10 - 19	2.6×10^{-10}	0	2.3×10^{-11}	2.0×10^{-13}
20 - 34	5.2×10^{-10}	0	7.5×10^{-11}	6.8×10^{-13}
35 - 49	5.2×10^{-10}	0	1.1×10^{-10}	1.0×10^{-13}
50 - older	8.4×10^{-10}	0	2.6×10^{-10}	2.6×10^{-10}

[a] Based on data in Tables V-14 (BEIR 1980).
[b] Based on data in Tables V-14 and V-15. The coefficients are normalized.

04000218

	ANL/ES-131		REVISED	
	A (Linear)	B (Quadratic)	A (Linear)	B (Quadratic)
Breast (Female) [b]				
in utero	0	0	0	0
0 - 9	0	0	0	0
10 - 19	0	0	3.5×10^{-10}	3.2×10^{-12}
20 - 34	7.3×10^{-9}	0	6.4×10^{-10}	5.8×10^{-12}
35 - 49	6.6×10^{-9}	0	6.0×10^{-10}	5.4×10^{-12}
50 - older	6.6×10^{-9}	0	6.0×10^{-10}	5.4×10^{-12}
Bone				
in utero	2.8×10^{-10}	2.8×10^{-13}	0	0
0 - 9	2.0×10^{-10}	2.0×10^{-13}	1.4×10^{-11}	1.3×10^{-13}
10 - 19	1.0×10^{-10}	1.0×10^{-13}	1.4×10^{-11}	1.3×10^{-13}
20 - 34	5.0×10^{-11}	5.0×10^{-14}	2.0×10^{-11}	1.8×10^{-13}
35 - 49	5.0×10^{-11}	5.0×10^{-14}	1.6×10^{-11}	1.4×10^{-13}
50 - older	5.0×10^{-11}	5.0×10^{-14}	3.6×10^{-11}	3.2×10^{-13}
Liver [b]				
in utero	7.0×10^{-10}	0	0	0
0 - 9	7.0×10^{-10}	0	3.9×10^{-10}	3.5×10^{-12}
10 - 19	7.0×10^{-10}	0	1.1×10^{-10}	1.0×10^{-12}
20 - 34	7.0×10^{-10}	0	1.9×10^{-10}	1.7×10^{-12}
35 - 49	7.0×10^{-10}	0	1.6×10^{-10}	1.4×10^{-12}
50 - older	7.0×10^{-10}	0	1.5×10^{-10}	1.4×10^{-12}
Kidney				
in utero	6.2×10^{-10}	0	6.2×10^{-10}	0
0 - 9	6.2×10^{-10}	0	6.2×10^{-10}	0
10 - 19	6.2×10^{-10}	0	6.2×10^{-10}	0
20 - 34	3.8×10^{-10}	0	3.8×20^{-10}	0
35 - 49	1.1×10^{-10}	0	1.1×10^{-9}	0
50 - older	1.5×10^{-10}	0	1.5×10^{-9}	0
Lymphoma	2.7×10^{-10}	0	2.7×20^{-10}	0
Urinary & Sex Ogans 0		5×10^{-9}	0	5×10^{-9}

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Table D: Risk Coefficients (relative risk model) incorporated into PRIM code and used to generate the risks reported in ANL/ES-131.

Cause	Sex	Risk Coefficients	
		ANL/ES-131	Revised
Leukemia	M	2.8×10^{-6}	-
	F	2.3×10^{-6}	-
Lung	M	1.0×10^{-5}	3.0×10^{-6}
	F	1.0×10^{-5}	1.5×10^{-6}
Stomach	M	4.0×10^{-6}	2.0×10^{-6}
	F	4.0×10^{-6}	1.0×10^{-6}
Breast	M	-	-
	F	4.2×10^{-6}	4.2×10^{-7}
Bone	M	2.8×10^{-6}	-
	F	2.3×10^{-6}	-
Liver Plus Pancreas	M	1.2×10^{-6}	2.5×10^{-6}
	F	1.2×10^{-6}	2.5×10^{-6}
Kidney, Urinary Passages and Sex Organs	M	2.8×10^{-6}	2.8×10^{-6}
	F	2.4×10^{-6}	2.4×10^{-6}
Lymphoma	M	7.7×10^{-7}	7.7×10^{-7}
	F	7.7×10^{-7}	7.7×10^{-7}
Intestine	M	4.0×10^{-6}	4.0×10^{-7}
	F	4.0×10^{-6}	4.0×10^{-7}

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Table E: Total Cumulative Radiation-Induced Cancer Mortality* in 85 years based on Revised Risk Coefficients
No Action Alternative

	Absolute Model	Relative Model
Leukemia	10.3	
Lung	0.3	10.0
Stomach	1.2	9.0
Intestine	0.2	2.0
Breast	0.3	0.9
Bone	0.1	
Liver plus Pancreatic	0.1	1.6
Kidney, Urinary & Sex Organs	0.7	1.3
Lymphoma	0.1	0.6
All the Other Cancers	1.6	

*The estimated uncertainty in each one of these risks is not less a factor of 7, $\pm$ 3.5 times the indicated values.

04000221

Appendix D

Occupational Dose Analysis

OCCUPATIONAL DOSE ANALYSIS
RADIOLOGICAL IMPACTS TO WORKERS
INVOLVED IN RECLAMATION

NOTE: Due to time constraints, it was not possible to include an occupational dose analysis for Anaconda's 1985 Multiple Land Use Reclamation Plan and the revised Laguna Proposal. However, DOI feels that the occupational dose impacts of Anaconda's 1985 Plan would fall between the No Action Alternative and the Green Book Proposal. The impact of the revised Laguna Proposal would essentially be the same as the original Laguna Proposal analyzed in the DEIS. Since the predicted impacts are so small and within a narrow range, DOI feels that additional study is unwarranted.

Introduction

The construction/reclamation worker would be potentially exposed to five sources of radiation during a typical work day. These sources of radiation exposure are:

1. Direct radiation from gamma emitting nuclides in soil.
2. Submersion in particulates.
3. Exposure due to ground deposited radionuclides.
4. Inhalation of some particulates containing U-238 and its daughter products.
5. Inhalation of Rn-222 and some of the Rn-222 daughter products.

Of these five sources, the dose contribution to the total dose due to submersion in particulates and ground deposited material was found to be insignificant in comparison with inhalation of Rn-222, inhalation of particulates and direct radiation from gamma emitters in soil. Although submersion in particulates and exposure due to ground deposited radionuclides are treated in this analysis, the results are not included in the total dose because their contribution was negligible.

Assumptions

A number of general assumptions were made in estimation of potential doses to workers involved in the reclamation operations. They are:

1. There would be secular radioactive equilibrium of the radionuclides in the soil and ore; therefore, the average specific activity of U-238 at each site is considered equivalent to the specific activity of U-234, Th-230, Ra-226, Pb-210, and Pb-210.

2. All the relevant source terms for the emission and dispersal of radioactive material are either directly taken from when available or recalculated from the data when not available from the data presented in Momeni et al. (1983).

3. The dose conversion factors for external radiation to relevant organs are taken from Gilbert et al. (1983).

04000223

4. Although the reclamation workers would be shielded in part by the equipment they operate, no correction for such shielding is made. This makes the external dose estimates substantially conservative.

5. Dust emission factors due to the operation of the heavy equipment have been either taken or calculated from existing literature (see, for example, Oztunali et al. 1981) based upon the most conservative assumptions.

6. The number of workers, vehicles, and the number of hours of operation for all reclamation alternatives were taken from the manpower analysis provided by the Bureau of Land Management personnel (letter from Herrick Hanks, April 3, 1985).

In addition to these general assumptions, several specific assumptions have been made under each alternative for each pathway of exposure. They will be detailed at the appropriate places.

External Doses

No Action Alternative

Under the No Action alternative there would be two security guardposts manned for 24 hours by a total of 11 guards. Guardpost 1 is assumed to be south of the South Paguate Pit near the shop area. Guardpost 2 is assumed to be at the fence southwest of Y Dump (telephone conversation with J. Andrews of Bureau of Land Management, April 22, 1985). The average U-238 concentration at guardpost 1 is estimated to be 8.5 picocuries per gram (pCi/g) and the average U-238 concentration at guardpost 2 is estimated to be 3 pCi/g from the data presented in Momeni et al (1983).

Each guard has 210 shifts of 8 hours/day in one year. Of these, 140 shifts per guard will be of 6 hours/day at the post and 2 hours/day making rounds on the site. The remainder of 70 shifts per guard will be without making any rounds. This estimation was necessary since the external dose at the post and the external dose while making rounds are different. It was estimated that a typical guard would spend 40% of the rounds time on the protore and 60% of this time on waste. In addition, it was also assumed that the average U-238 concentration on protore is 70 pCi/g and the average U-238 concentration of the waste is 7 pCi/g, from Momeni et al (1983). The external doses to the whole body, lung, and bone are calculated using the dose conversion factors given in Gilbert et al (1983), and prorated appropriately for the times spent at the post and on the site while making rounds for each of the guards.

As has been mentioned earlier, the external dose to the whole body, lung, and bone to either of the guards due to submersion in particulates was found to be of the order of 0.1 millirem per year (mrem/yr) and was hence neglected in further calculations. External dose due to ground deposited radionuclides for the first several decades would be negligible, but after an accumulated period of deposition of 99 years

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(Momeni et al 1983) the contribution to the guard at guardpost 1 would be approximately 20.5 mrem/yr and to the guard at guardpost 2 would be approximately 28.0 mrem/yr.

Under this alternative, there will be no other personnel onsite except occasional the monitoring personnel. The time spent by the monitoring personnel at the site would be far less than the time spent by any typical guard. Hence, the doses to these personnel would be negligible.

The external doses to the guards under the No Action alternative are summarized in Table D-1.

TABLE D-1

EXTERNAL DOSES TO GUARDS
NO ACTION ALTERNATIVE
(millirem per year)

Location	Whole Body	Lung	Bone
Direct Radiation			
Guard Post 1	23.9	21.6	26.4
Guard Post 2	15.1	13.6	16.7
Average Exposure to a nominal guard	19.5	17.6	21.6
Ground Deposition		Negligible	
Guard Post 1	(0 - 20.5)		
Guard Post 2	(0 - 28.0)		
Average exposure to a nominal guard	(0 - 24.3)[a/]		
Submersion in Particulates		Negligible	

[a/] Over a period of 99 years of accumulation from Momeni et al. 1983.

Green Book, DOI (Both Options) and Laguna Proposals

Some general observations are made under all the above reclamation alternatives. For the purposes of estimating the doses, four major tasks are identified, with varied number of personnel for each task working on

04000225

the site with varied work hours. The tasks and personnel involved are as follows:

Task 1. Backfilling of open pits with protore and waste obtained from waste dump slope modifications,

Task 2. the waste dump slope modifications,

Task 3. Plugging of underground openings and

Task 4. Stabilization of high walls.

The major personnel involved in these operations are: (1) loader-operators, (1) truck drivers, (3) dozer operators, (4) scraper operators, (5) miners, (6) miner's helpers, (7) laborers, (8) LHD operators, (9) water truck operators, (10) crane operators, (11) drillers, and (12) driller-helpers.

The doses are adjusted to account for the times spent by each worker under each task. Under the Laguna option there is an additional correction due to the movement of additional protore from one pit to the other, and this was accounted for in the estimation of doses.

The following generalizations for parameter values were estimated from the manpower data supplied.

1. Backfilling of the open pits with protore would raise the level approximately 8 feet, with waste an additional 11 feet, and the overburden and topsoil filling on top of the waste would raise the level another 5 feet. Under all the reclamation proposals there would be little change in the values of these parameters. This fact is used to estimate the total external doses committed to workers during the duration of each of the operations.

2. It was assumed that 60% of the time the trucker is exposed at the same rate as that of the loader operator. The remaining 40% of the time, the trucker is inside the truck cab, hauling the material. Using data in Figure 8 of Veluri et al (1983), it was estimated that the dose rate reduction factor inside the truck cab is approximately one half, assuming nominal truck dimensions.

3. Because of the attenuation properties of soil for gamma radiation, about 10 inches of soil essentially represents an infinite thickness. So, one can assume that each of the dozer operator gets the same dose-rate as that of a loader operator, during protore operations. When the waste material is being spread on protore, there is an additional average dose due to protore and due to waste. When the topsoil is being spread, there is a small additional dose to each of the dozer operators. All these factors were taken into account in the computation of external doses.

4. External doses due to submersion in particulates that become airborne during all these operations were found to be negligible.

04000226

5. A water truck operator that waters the haul roads was assumed to be on the waste, for 3 work-years. External dose was computed based on this assumption. External dose to any guard would decrease during reclamation from an initial dose rate of 20 mrem/yr. to the whole body to 11 mrem/yr. It remains the same for subsequent years, if guard posts are maintained. Similarly, the lung dose rate would decrease from an initial value of 18 mrem/yr. to 10 mrem/yr. and the bone dose rate would decrease from an initial value of 22 mrem/yr. to 12 mrem/yr.

External doses per person and total whole body doses are presented for the Green Book's proposal in Table D-2, for the DOI Monitor option in Table D-3, for the DOI Drainage option proposal in Table D-4, and for the Laguna Proposal in Table D-5.

TABLE D-2

EXTERNAL DOSES
GREEN BOOK PROPOSAL

Task/Operator	Dose in Millirem			No. of Persons	Total Whole Body Dose in Man-Rem
	Whole Body	Lung	Bone		
TASK 1					
Loader	157	141	174	11	1.7
Trucker	126	114	140	33	4.2
Dozer	163	147	181	11	1.8
TASK 2					
Scraper	16	14	18	8	0.1
Dozer	27	24	30	4	0.1
TASK 3					
LHD	30	27	34	1	0.03
Miner	Negligible				
Miner's Helper					
Laborer	488	439	541	2	1.0
TASK 4					
Crane Operator	40	36	45	1	0.04
Driller	4	3	4	1	-
Helper	4	3	4	1	-
Driver	-	-	-	-	-
Water Trucker	40	36	45	2	0.08

04000227

TABLE D-3

EXTERNAL DOSES
DOI MONITOR OPTION

Task/Operator	Dose in Millirem			No. of Persons	Total Whole-Body Dose in Man-Rem
	Whole Body	Lung	Bone		
TASK 1					
Loader	159	143	177	11	1.7
Trucker	127	114	141	33	4.2
Dozer	164	148	182	11	1.8
TASK 2					
Scraper	25	23	28	10	0.3
Dozer	29	26	32	5	0.15
TASK 3					
LHD	30	27	33	1	0.03
Miner	Negligible				
Miner's Helper					
Laborer	483	435	536	2	1.0
TASK 4					
Crane Operator	40	36	44	1	0.04
Driller	27	24	30	1	0.03
Helper	27	24	30	1	0.03
Driver (Explosives Truck)	27	24	30	1	0.03
Water Trucker	40	36	45	2	0.08

04000228

TABLE D-4

EXTERNAL DOSES
DOI DRAINAGE OPTION

Task/Operator	Dose in Millirem			No. of Persons	Total Whole-Body Dose in Man-Rem
	Whole Body	Lung	Bone		
TASK 1					
Loader	160	144	178	11	1.8
Trucker	128	115	142	33	4.2
Dozer	165	149	183	11	1.8
TASK 2					
Scraper	25	23	28	10	0.25
Dozer	29	26	32	5	0.15
TASK 3					
LHD	30	27	33	1	0.03
Miner		Negligible			
Miner's Helper					
Laborer	485	437	538	2	1.0
TASK 4					
Crane Operator	40	36	44	1	0.04
Driller	25	23	28	2	0.05
Helper	25	23	28	2	0.05
Driver (Explosives Truck)	25	23	28	2	0.05
Water Trucker	40	36	45	2	0.08

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TABLE D-5

EXTERNAL DOSES
LAGUNA PROPOSAL

Task/Operator	Dose in Millirem			No. of Persons	Total Whole-Body Dose in Man-Rem
	Whole Body	Lung	Bone		
TASK 1					
Loader	181	163	201	11	2.0
Trucker	144	130	160	33	4.8
Dozer	186	167	206	11	2.0
TASK 2					
Scraper	25	23	28	10	0.25
Dozer	37	33	41	12	0.44
TASK 3					
LHD	29	26	32	1	0.03
Miner	Negligible				
Miner's Helper					
Laborer	472	425	524	2	0.9
TASK 4					
Crane Operator	-	-	-	-	-
Driller	27	24	30	1	0.03
Helper	27	24	30	1	0.03
Driver (Explosives Truck)	27	24	30	1	0.03
Water Trucker	40	36	45	2	0.08

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Inhalation Doses (Particulates)

No Action Alternative

From the dose rate commitment values for continuous inhalation of particulates and the tabulated particulates concentrations at various locations in Momeni et al (1983), the relevant dose rate conversion factors are estimated. These conversion factors are corrected for the actual time spent by the guard onsite and for the volume of air breathed during work. Incorporating these corrections, the dose rate to the whole, body, lung and bone were estimated to a nominal guard (Table D-6).

TABLE D-6

PARTICULATE INHALATION
DOSE RATES TO A NOMINAL GUARD
NO ACTION ALTERNATIVE
(millirem/year)

Organ	Dose Rate
Whole Body	0.2
Lung	3.1
Bone	4.0

The contribution to the dose rate from the particulate inhalation pathway was found to be very small in comparison to the external exposure.

Green Book, DOI (Both Options), and Laguna Proposals

Due to the operation of different equipment during reclamation activities, different rates of dust emissions into the atmosphere take place. These dust emission factors are vehicle-specific and site-specific. They are not available for the Jackpile-Paguate complex. The dust emission factors are needed to estimate the soil-to-air transfer factors. The generic values of soil-to-air transfer factors vary over a wide range. Conservative soil-to-air transfer factors were assumed for the site (Oztunali et al 1983). The same factors were used for all the reclamation alternatives. The dose for each operator under each task was estimated using the following expression:

concentrations in soil x soil-to-air transfer factor x dose conversion factor x time factor

The particulate inhalation for the four action reclamation alternative doses are tabulated in Tables D-7, D-8, D-9, and D-10.

04000231

TABLE D-7

PARTICULATE INHALATION DOSES
GREEN BOOK PROPOSAL

Task/Operator	Dose in Millirem			No. of Persons	Total WholeBody Dose in Man-Rem
	Whole Body	Lung	Bone		
TASK 1					
Loader	7	159	198	11	0.08
Trucker	1.4	35	44	33	0.05
Dozer	2	49	61	11	0.02
TASK 2					
Scraper	0.2	5	6	8	-
Dozer	0.3	9	11	4	-
TASK 3					
LHD	1	29	36	1	-
Miner	Negligible				
Miner's Helper					
Laborer	21	475	591	2	0.04
TASK 4					
Crane Operator	0.4	9	11	1	-
Driller	Negligible		0.8	1.0	1
Helper	Negligible		0.8	1.0	1
Driver	-	-	-	-	-
Water Trucker	0.1	2	2	2	-

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TABLE D-8

PARTICULATE INHALATION DOSES
DOI MONITOR OPTION

Task/Operator	Dose in Millirem			No. of Persons	Total Whole Body Dose in Man-Rem
	Whole Body	Lung	Bone		
TASK 1					
Loader	7	161	201	11	0.1
Trucker	2	35	44	33	0.1
Dozer	2	50	62	11	0.1
TASK 2					
Scraper	0.3	8	10	10	-
Dozer	0.3	10	12	5	-
TASK 3					
LHD	1	29	36	1	-
Miner	Negligible				
Miner's Helper					
Laborer	21	473	591	2	0.04
TASK 4					
Crane Operator	0.4	9	11	1	-
Driller	0.3	6	8	1	-
Helper	0.3	6	8	1	-
Driver (Explosive Truck)	0.3	6	8	1	-
Water Trucker	0.4	9	11	2	-

04000233

TABLE D-9

PARTICULATE INHALATION DOSES
DOI DRAINAGE OPTION

Task/Operator	Dose in Millirem			No. of Persons	Total Whole Body Dose in Man-Rem
	Whole Body	Lung	Bone		
TASK 1					
Loader	7	162	202	11	0.08
Trucker	2	36	44	33	0.07
Dozer	2	50	62	11	0.02
TASK 2					
Scraper	0.3	8	10	10	-
Dozer	0.3	10	12	15	-
TASK 3					
LHD	1	29	36	1	-
Miner	Negligible				
Miner's Helper					
Laborer	21	473	591	2	0.04
TASK 4					
Crane Operator	0.4	9	11	1	-
Driller	0.3	5	7	2	-
Helper	0.3	5	7	2	-
Driver	0.3	5	7	2	-
Water Trucker	0.4	9	11	2	-

04000234

TABLE D-10

PARTICULATE INHALATION DOSES
LAGUNA PROPOSAL

Task/Operator	Dose in Millirem			No. of Persons	Total Whole-Body Dose in Man-Rem
	Whole Body	Lung	Bone		
TASK 1					
Loader	7	182	228	11	0.08
Trucker	2	40	50	33	0.07
Dozer	2	56	71	11	0.02
TASK 2					
Scraper	0.3	7	8	10	-
Dozer	3	12	15	12	0.04
TASK 3					
LHD	1	29	36	1	-
Miner	Negligible				
Miner's Helper					
Laborer	21	471	591	2	0.04
TASK 4					
Crane Operator	-	-	-	-	-
Driller	0.3	6	8	1	-
Helper	0.3	6	8	1	-
Driver	0.3	6	8	1	-
Water Trucker	0.4	9	11	2	-

04000235

Radon

The phases during which radon may be released are as follows:

1. Prior to any reclamation action.
2. During the movement of the material.
3. After relocation of the material.
4. Before the cover material is placed.
5. After the cover material is placed.

Note: In the No Action alternative, only Phase I would apply.

To estimate the bronchial epitheuum dose due to radon inhalation, a number of specific assumptions were made with respect to the release of radon during several phases of reclamation operation:

1. Ra-226 and Ra-222 were assumed to be in secular equilibrium.
2. Radon inhalation dose conversion factor was assumed to be 0.625 millirem per year/picocurie per cubic meter (NRC 1982).
3. Total surface area of the protore piles was conservatively estimated assuming that all the protore was piled up can be represented by the shape of the frustrum of right circular cone.
4. Specific flux of radon was assumed to be 0.5 picoCurie per square meter-second/picoCurie per gram of Ra-226 (Momeni et al 1983).
5. The radon release rates for the individual pits were taken from Momeni et al (1983).
6. The radon emanation coefficient was assumed to be 0.2 from U.S. Nuclear Regulatory Commission (NUREG-0706, Vol. III, 1980).

7. By idealizing the entire disturbed area to be a square, the downwind concentration of radon was conservatively estimated, assuming an area weighted average flux of 15.5 picoCuries per square meter-second.

8. Exposure rate for workers due to radon was calculated for the actual duration spent on the site with the assumption that half of the total air breathed in a day was during the work hours.

No Action Alternative

Under this alternative, a nominal guard would be exposed to an average concentration of 1014 pCi/cm^3 of radon. The average dose rate was corrected for the actual time spent on site and the total air breathed during that time. The dose to a nominal guard is 184.0 mrem/year.

Green Book, DOI (Both Options) and Laguna Proposals

The total radon release rate from the site is approximately 5600 curies per year (Ci/yr.), of which 3830 Ci/yr. is released from the pits. It is estimated that 942 Ci/year is released from the protore. Hence, the release rate from the waste and the remaining material on site is 828 Ci/yr.

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As the backfilling operation progresses, there will be a continuing decrease of radon release, as the protore is moved and covered with waste which is subsequently covered with topsoil. The computed average radon release rates have been corrected accordingly.

During the first year of operation, the quantity of radon released is estimated to be 3940 Curies, during the second year it is 909 Ci, during the third year it is 870 Curies, and during the fourth, fifth, and subsequent years, it is 830 Ci/yr.

The radon dose to any worker who spends the first-work year on the site is estimated as follows:

The average flux during the first year is estimated to be 12.96 picoCuries per square meter-second (pCi/m^2-sec), from an estimated total area of approximately 2384 acres. In the No Action alternative, the average flux was estimated to be 15.5 pCi/m^2-sec, and the dose rate is calculated to be 184 millirem per year. Thus, the first year dose rate has been scaled down, in the ratio of fluxes. The first year dose is estimated to be 154 millirem. During the second year, the flux is estimated to be 2.99 pCi/m^2sec, and the dose rate is 35.5 mrem/year. Similarly, during the third year, the flux is 2.86 pCi/m^2-sec square meter-second and the estimated dose rate is 34.0 mrem/year. For the subsequent years, the dose rate due to radon inhalation is 32.4 mrem for one who spends a work year on the reclaimed site. Thus, any worker who spends three work years during the reclamation would have a total individual dose of 224 mrem to the bronchial epithelium. Thus, a nominal guard under any reclamation alternative will have 224.0 mrem and in the subsequent years, the dose rate would be 32.4 mrem/year per guard.

Under the DOI Drainage option, there is a 5% increase in the waste material volume handled and that does change the dose significantly. Under the Laguna proposal there is 16% increase in the volume of protore to be moved from one it to the other, and the doses are adjusted to take this change into consideration. The inhalation doses to bronchial epithelium due to radon for the four action reclamation alternatives are tabulated in Table D-11. These doses are prorated for the actual time spent on the site by each worker.

Ingestion Doses

There are no ingestion doses to workers since no food is grown onsite and consumed.

Total Dose Commitments

Total dose commitments to reclamation workers are tabulated for all reclamation alternatives for the case of whole body exposure due to gamma radiation (external exposure) and due to inhalation of radon (Table D-12). These are the two significant exposures that can relate to excess cancer deaths (Table D-13).

04000237

TABLE D-11

INHALATION DOSES TO BRONCHIAL EPITHELIUM DUE TO RADON

	Green Book			DOI-Monitor Option			DOI-Drainage Option			Laguna		
Task/Operator	Dose mrem	No. of People	Total Dose Man-Rem	Dose mrem	No. of People	Total Dose Man-rem	Dose mrem	No. of People	Total Dose Man-Rem	Dose mrem	No. of People	Total Dose Man-Rem
TASK 1:												
Loader	197	11	2.2	196	11	2.2	196	11	2.2	230	11	2.5
Trucker	197	33	6.5	196	33	6.5	196	33	6.5	230	33	7.6
Dozer	197	11	2.2	196	11	2.2	196	11	2.2	230	11	2.5
TASK 2:												
Scraper	215	8	1.7	223	10	2.2	223	10	2.2	247	10	2.5
Dozer	181	4	0.7	186	5	0.9	186	5	0.9	239	12	2.9
TASK 3:												
LHD	14	1	-	14	1	-	14	1	-	15	1	-
Miner					Negligible							
Miner's Helper												
Laborer	224	2	0.4	224	2	0.4	224	2	0.4	248	2	0.5
TASK 4:												
Crane Operator	224	1	0.2	224	1	0.2	224	1	0.2	-	-	-
Driller	20	1	-	152	1	0.2	138	2	0.3	169	1	0.2
Helper	20	1	-	152	1	0.2	138	2	0.3	169	1	0.2
Driver	-	-	-	152	1	0.2	138	2	0.3	169	1	0.2
Water Truck Operator	224	2	0.4	224	2	0.4	224	2	0.4	248	2	0.5
Guard	The guard dose would be 224.0 mrem for the first three years and 32.4 mrem/year during the subsequent years.											

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TABLE D-12

ESTIMATES OF THREE-YEAR EXCESS TOTAL DOSE
COMMITMENTS TO THE RECLAMATION WORKERS

Organ Alternative	Total Dose Commitment (Man-Rem) Green Book	DOI-Monitor Option	DOI-Drainage Option	Laguna
Whole Body [a]	9.3	9.8	9.9	11.0
Bronchial Epithelium[b]	16.8	18.1	18.5	22.1

[a] Includes 3-year total whole body dose to the guards at 33 mrem per each guard.

[b] Includes the guard dose of 224 mrem for each guard.

TABLE D-13

EXPECTED EXCESS CANCER DEATHS
CAUSED BY RECLAMATION ACTIVITIES

Effect	Reclamation Alternative Green Book	DOI-Monitor	DOI-Drainage	Laguna
Cancer from Whole Body Gamma Exposure	0.001	0.001	0.001	0.001
Lung Cancer	0.0003	0.0004	0.0004	0.0004
TOTAL	0.0013	0.0014	0.0014	0.0014

It should be emphasized that a wide range of risk factors are accepted by experts who attempt to relate cancer deaths due to radiation exposure. The risk factors used in these estimates are believed to overestimate the cancer deaths associated with a given level of dose commitment.

04000239

Health Effects to Workers Involved in Reclamation

The significant health effects that can be predicted for the reclamation workers are the estimation of excess cancer deaths for that population. Estimates of excess cancer deaths due to radiation exposure were made using the following risk factors:

1. 20 lung cancer deaths in the exposed population for each 1,000,000 man-rem of dose commitment for inhalation of radon-daughter products (National Academy of Sciences, 1980).

2. 120 cancer deaths in the exposed population for each 1,000,000 man-rems of dose commitment for exposure to gamma-rays (National Academy of Sciences, 1980).

04000240

Appendix E

Geomorphic Criteria for DOI Drainage Option

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GEOMORPHIC CRITERIA
FOR
DOI DRAINAGE OPTION

Introduction

The rationale behind a drainage option for the reclamation plan is discussed in the EIS and involves stability of the future regime of water and solids discharged from the site. The following discussion places emphasis on the Jackpile Pit drainage option, with a brief reference to the North and South Paguate Pits.

Previous, and Currently Existing Geomorphic Characterizations

The pre-existing and neighboring topography can be described as flat-topped mesas with steep slopes separated by broad to narrow, shallow gradient alluvial valleys. Relief varies from 100 to 400+ feet for the sandstone capped mesas within and adjacent to the mine lease area. Mesa side slopes vary in gradient from 0.033 (30 to 1) to 0.430 (2.3 to 1). Tributary drainages vary in gradient from 0.014 to 0.065. Trunk channels through the lease area (i.e., the Rios Paguate and Moquino) vary in gradient from 0.007 to 0.013. The Rio Paguate, although rechanneled from 2000 feet, can still be described as a straight channel (sinuosity = 1.05; Smith, 1981), and is incised 30 to 65 feet into the alluvium, which is capped, in places, by protore stockpiles (Draft EIS, 1985). The Rio Moquino, directly upstream of its confluence with the Rio Paguate, has been changed from a sinuosity of 1.9 to 1.1, and from a gradient of 0.007 to 0.010, due to encroachment by T, U and N dumps (Smith, 1981).

Smith's (1981) investigation of slope stability for past reclamation efforts indicates reclaimed slope gradients steeper than 3:1 have been deeply incised by rilling and gullying. Slopes with gradients less than 3:1 are not incised, partly a result of the gradient and partly due to a high degree of surface roughness (i.e., grain size ranges up to cobble size) which promotes revegetation. Three to one slopes have been accepted as the steepest gradient to be used in regrading spoil slopes.

Reestablishment of Drainage System

Jackpile Pit Catchment

The reclaimed Jackpile pit is expected to be approximately a square mile catchment. Using an area-discharge relationship developed by USGS (1982) for forecasting flood events in a square mile catchment with a 100 year recurrence interval (commonly used frequency of reccurrence for flood channel design) is expected to be 936 cfs. A channel in the backfilled pit area of the dimensions set out in Figure E-1 would pass 960 cfs. The channel cross section should be designed to occupy an engineered floodplain tapering from 50 feet wide at the head of the channel to 100 feet wide at the upstream side of the bedrock lip. The purpose of the floodplain is 2 fold:

1. to provide a decrease in hillslope gradient, at which point material transported down the hillslopes would be deposited; and

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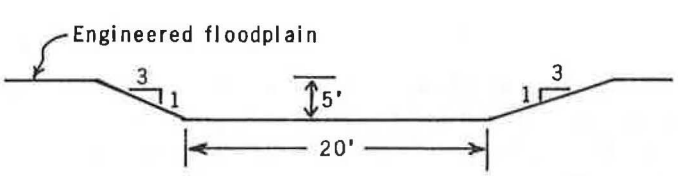
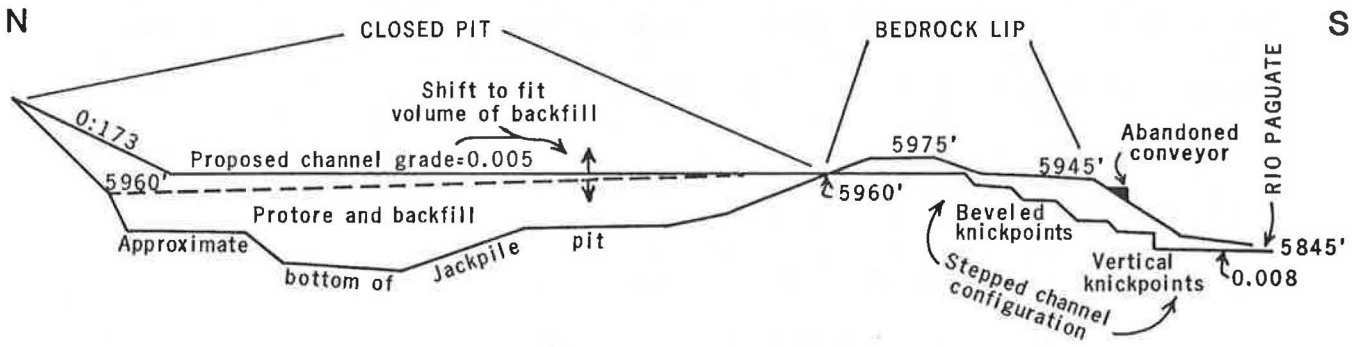


Slope=0.005

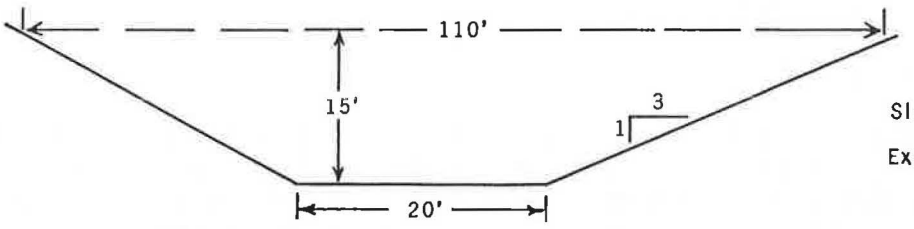
Velocity=5.5 ft/sec

Discharge=960 cfs

A. Channel cross-section to pass 100 year flood



B. Generalized North-South profile through the Jackpile pit



Slope=0.005

Excavation length=1100'

C. Maximum dimension of excavation in bedrock lip
(Assuming backfill level of 5960')

Not to scale

FIGURE E-1
Channel Cross-sections - DOI Drainage Option

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2. to provide a buffer zone between the toes of the reclaimed hillslopes and the erosive strength of overbank flood flows.

The geomorphic conditions to be imposed on hillslope reclamation procedures are as follows:

1. hillslope gradients should be 3:1 or less;

2. the reclaimed ground surface should have a high surface roughness (i.e. grain size ranges up to cobble size);

3. high infiltration capacity (i.e., low clay content);

4. hillslopes should be formed with subsidiary tributary drainages in such a way that overland flow lengths are reduced to the neighborhood of 200 feet.

Smith (1981) states that erosion of existing spoil piles on the lease site is inhibited on gentle (less than 3:1) and short (164 feet, S dump) slopes. The reclaimed slopes, particularly the interior draining Jackpile slopes, should not be straight from the divide to the engineered floodplain (slope lengths 1000 to 2500 feet) but should be formed during reclamation operations in such a way that overland flow lengths on 3:1 slopes are reduced to less than 300 feet. This slope formation would necessarily create poorly defined tributary drainage lines occupying the wide and open, concave contours. It is important to stress wide and open contours, necessary to avoid concentrating overland flow, and its erosive energy, too quickly into channelized flow. The tributary gradients would be dependent on the orientation and gradient of the intersecting hillslopes, but should be similar to existing waste dump piles could form the core of this reclaimed topography.

Wells (1982) found that flood peaks are reduced to non-existent for small (0.6 km) reclaimed catchments in the San Juan Basin coalfields. A principle factor for reducing flood peaks was determined to be the high infiltration capacity of the reclaimed hillslopes (average infiltration rate on reclaimed hillslopes + 40.3 cm/hr (1.3 ft/hr); (Jercinovic, 1984). In addition, a high degree of surface roughness dissipates the energy of overland flow, which promotes infiltration. A high degree of surface roughness also promotes revegetation by providing surface relief for seedling protection (Smith, 1981). Surface roughness is achieved by including cobble sized material in the top dressing; high infiltration capacity is achieved by utilizing top dressing borrow with generally less than 20 percent clay sized material.

Jackpile Pit Exit Channel

Depending on the final backfill volume, some portion of the bedrock lip will be excavated to provide drainage of surface water runoff from the Jackpile pit. Assuming 5960 to be the final level of backfill at the entry point of the bedrock lip, approximately 22,000 cu. yd. of sandstone would have to be excavated for the drainage channel, based upon the cross sectional view in Figure E-1.

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If the backfill elevation should be 10 feet lower, the excavation volume would be approximately doubled; if the backfill should be 10 feet higher, the excavation volume would be approximately one-third of the base case. The gradient of the excavated channel would be the same as upstream, 0.005. Field inspections indicate that the excavation would likely be entirely in sandstone and would fit within the existing ramp grade and alignment (Figure E-2).

The greatest problem with reintegrating the Jackpile pit catchment into the Rio Paguate drainage system is the elevation difference from the existing closed basin lip to the Rio Paguate, approximately 115 vertical feet. The Jackpile pit, prior to mining, was probably an intermediate height, Dakota Sandstone capped mesa without a single trunk drainage line, but with some indeterminable number of mesa side slope drainages running east, south and west. The slope of these were probably in the range of 14 to 65 feet per thousand discussed above. The most stable channel configuration for draining the reclaimed pit, and probably the least labor and equipment intensive, would be to excavate large steps, or knickpoints, into the sandstone ramp/bench behind the abandoned conveyor location. The dimensions of the stepped excavations, in concept, could be 20 feet in elevation drop, with beveled 1:1 drop and side slopes (for animal access and safety), 30 feet wide and 100 feet engineering design. Depending on the final backfill elevation, 4 or 5 steps would be required to bring the channel down from near the lip elevation to an elevation where the channel would join the Rio Paguate. The lowermost knickpoint would hava a vertical drop (i.e., not beveled) to a plunge pool excavated in the material, shale, probably underlying the sandstone.

Gardner (1983) lists 3 criteria as being necessary for parallel knickpoint retreat, as opposed to knickpoint reduction or replacement:

1. resistant caprock;

2. underlying unit of nonresistant material that is exposed to erosion; and

3. removal of material from the plunge pool.

It is anticipated that the turbulence of the plunge pool (i.e., waterfall hydraulicking; Higgins, 1984) will be sufficient to entrain in-place shale particles, thus maintainig a situation where the shale in the plunge pool will be more erodible than the sandstone knickpoint lip. This situation is necessary to maintain a near vertical knickpoint. The slope of the channel segment connecting the lowermost knickpoint with the Rio Paguate should be between 0.008 and 0.012 to provide sufficient gradient to remove material derived from, and delivered to, the lowermost knickpoint/plunge pool.

The advantages of a stepped knickpoint channel configuration are as follows:

1. it provides the shortest route to a confluence with the Rio Paguate, involving the least amount of labor and equipment;

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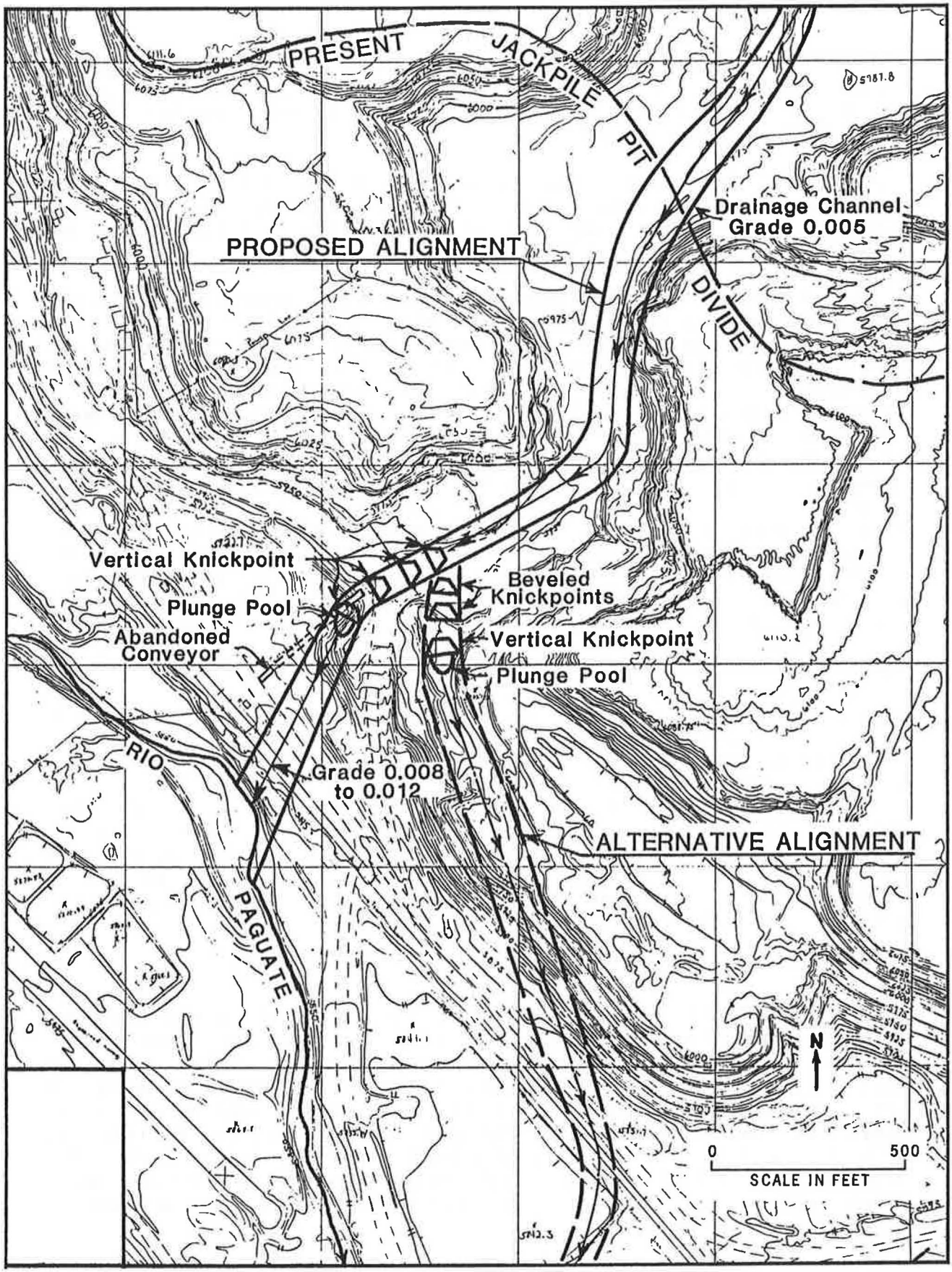

FIGURE E-2
DOI Drainage Option – Plan View

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2. It's a geomorphically stable configuration, i.e., any changes in channel character the Rio Paguate may make in response to the reclaimed conditions (e.g., channel incision) cannot be transmitted headward beyond the vertical knickpoint; and

3. the sandstone/shale contact, whatever its elevation, provides the necessary contrast in erodibility to maintain a vertical knickpoint, thus protecting the reclaimed pit from rapid downcutting and exposure of the protore.

The competency of the Jackpile/Brushy Basin sandstone is rarely expressed as a steep gradient channel reach. In the field, the Jackpile/Brushy Basin sandstone is directly overlain and protected by the more competent Dakota Sandstone. However, the La Gotera geologic quadrangle map (next quad to northeast of the Moquino quad) shows a naturally occurring channel reach through the Jackpile/Brushy Basin sandstone as having a gradient of 0.023. The forces of nature would work on the beveled knickpoint reach, decreasing in gradient with time, and achieving a quasi-equilibrium gradient on the order of 0.020 extending into the pit. The lowermost knickpoint/plunge pool, spanning the sandstone/shale contact, would maintain a near vertical riser face with time. In geomorphic studies of the San Juan Basin, Grimm (1983) and Wells (1983) provide rates of canyon incision (Bear Canyon, 0.052 ft/yr) and rates of badland development (0.013 to 0.197 ft/yr), respectively. These rates may be losely applied as rates of knickpoint retreat for the Jackpile drainage line, indicating between 10 and 200 feet of retreat in 1000 years.

Should the sandstone/shale contact occur at an elevation difference of greater than 40 feet, relative to the elevation of the confluence with the Rio Paguate, then a smooth gradient (0.025) channel could be excavated down the remaining shale section along the approximate south ramp location, removing the veneer of Y dump and creating a low relief shoulder intervening between the Rio Paguate and the channel alignment (Figure E-2). A vertical knickpoint would still be utilized at the head of this reach. Once down the ramp, the channel gradient could be reduced to 0.008 across the abandoned floodplain to join the Rio Paguate near the corner of the lease area.

North and South Paguate Pits

Based upon BLM's preliminary volumetric estimates, it is possible that the North and South Paguate pits will be filled to a level equal to the nearby elevation of the Rio Paguate. If backfill volumes are not sufficient to achieve a free draining reclaimed surface, then provision for channels draining otherwise closed basin remnants will be necessary. Engineered channels should have the geometry described for the fill or alluvium of the Jackpile pit, gradients equal to or less than the premining Rio Paguate (0.012), and should join the Rio Paguate at a smooth grade. Reclaimed hillslope conditions should be the same as stated for the Jackpile pit.

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Summary

Table E-1 provides a summary of the geomorphic criteria discussed in this report for the DOI drainage option. Depending on of the backfill levels at the Jackpile pit, and the economics of excavation versus additional backfill, a drainage channel could be engineered to drain stormflow, and eroded solids and dissolved material, from the reclaimed pit. A floodplain 50 to 100 feet wide inside the pit is needed to trap and protect backfill. A stepped channel configuration, with drop and side slopes beveled to 1:1 on the upper configuration, with drop and side beveled to 1:1 on the upper knickpoints and a vertical drop on the lowermost knickpoint, combines consideration for access to the reclaimed pit by livestock (i.e., beveled knickpoints) and geomorphic stability (i.e., a vertical face on the lowermost knickpoint does not allow channel changes to be transmitted in a headward direction). The stepped channel configuration allows the final design of the channel in the reclaimed pit bottom to be shifted up or down in elevation, according to volume and elevation of backfill. The basic step configuration is unchanged by any expected volume of backfill or excavation above the steps. The Morrison sandstone remaining in the present closed basin lip provides a naturally occurring material in which to excavate the steps. The sandstone/shale contact, whatever its elevation, should be exploited as the location of the lowermost knickpoint. The erodibility contrast across that contact will provide for long-term maintenance of a near vertical riser face, thus forming a barrier to transmission of changes (if any) in channel geometry of the trunk stream, the Rio Paguate.

Reclaimed hillslopes should everywhere be no greater than 3:1, should have a high infiltration capacity, and have a high degree of surface roughness. Slope lengths should be reduced to the neighborhood of 200 feet by forming curvilinear hillslopes with wide and open elevation contour crenulations and resultant, poorly defined tributary drainage lines.

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TABLE E-1

SUMMARY OF GEOMORPHIC CRITERIA FOR DOI DRAINAGE OPTION

Geomorphic Component	Guideline Value	Practical Range
Pit Fill		
curvilinear hillslopes	*	*
slope gradient	3:1	3:1-or less
slope length	150 feet	100-300 feet
surface roughness	40% cobbles and gravel	30-50% cobbles and gravel
surface infiltration rate	1.0 ft/hr	0.1 ft/hr-or more
Drainage Channel		
on fill in pit:		
slope	0.005	0.003-0.010
width, bottom	20 feet	10-30 feet
side slopes	3:1	2:1-3:1
floodplain	**	**
on sandstone lip:		
slope	0.005	0.003-0.010
width, bottom	20 feet	20 feet or wider
side slopes	2:1	1:1-3:1
on beveled knickpoint steps		
slope across step:	0.005	0.003-0.010
width, bottom	20 feet	20 feet or wider
step height (beveled 1:1)	20 feet	10-30 feet
step length	5X height	3-7X height
number of beveled steps	4	3-5
on vertical knickpoint step spanning sandstone/shale contact:		
slope across step	0.005	0.003-0.010
width	20 feet	20 feet or wider
step height	20 feet	10-30 feet
step length	5X height	3-7X height
number of vertical steps	1	1
on fill/alluvium below last step:		
slope	0.010	0.008-0.012
width, bottom	20 feet	15-30 feet
side slopes	3:1	3:1 or less

*Purpose: Reduction of slope length reduces erosive capacity of overland flow. Reclaimed hillslopes to be formed in curvilinear pattern with radii of curvature on the order of 700 to 1000 feet including noseslopes, headslopes and intrabasin divides. Broad radius of curvature results in poorly defined tributaries to trunk channel(s).

**Purpose: 1) storage of hillslope-derived sediment at break in slope; and
2) buffer zone for protection of toeslopes from overbank flood flows.

Tapers from 50 feet wide at its headward end, to 100 feet wide at the bedrock lip or the confluence with base level streams.

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Glossary

GLOSSARY

ACRE-FOOT. The quantity of water required to cover 1 acre to a depth of 1 foot. It is equal to 43,560 cubic feet or 325,851 gallons.

ADIT. A horizontal or near-horizontal passage from the ground surface into a mine or underground installation.

ADVERSE VISUAL IMPACT. Any impact on the land form, water form, or vegetation, or any introduction of a structure that negatively changes or interrupts the visual character of the landscape and disrupts the harmony of the natural elements.

AIRBLAST. A motion-producing sound generated by an explosive blast and resulting rock breakage and movement; it is commonly expressed as a relative sound level in decibels (dB) at a particular frequency that is measured in hertz (Hz). Like ground vibration, it is an undesirable side effect of the use of explosives to break rock for mining, quarrying, excavation and construction.

ALLUVIUM. Clay, silt, sand and gravel deposited by running water.

AMBIENT. Conditions in the vicinity of a reference point, usually related to physical environment (e.g., the ambient temperature is the outdoor temperature).

ANGLE OF REPOSE. The maximum slope at which a heap of any loose or fragmented solid material will stand without sliding when poured or dumped in a pile or on a slope; also called the angle of rest.

AQUIFER. A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield a significant quantity of water to wells or springs.

ATOM. A particle of matter indivisible by chemical means. It is the fundamental building block of the chemical elements. An inner core (the nucleus) is composed of protons and neutrons, while one or more much smaller electrons orbit the nucleus.

ATOMIC MASS UNIT (amu). One-twelfth the mass of an atom of carbon-12. 1 amu = 1.66057×10^{-27} kg.

ATOMIC NUMBER. The number of protons in the nucleus of an atom. It is shown as a subscript in atomic nomenclature. For uranium-238 ($_{92}U^{238}$) the atomic number is 92.

ATOMIC WEIGHT. The sum of the number of protons and neutrons in the nucleus of an atom. It is shown as a superscript in atomic nomenclature. For uranium-238 ($_{92}U^{238}$) the atomic weight is 238.

BACK. The rock above any opening, such as a tunnel, stope or drift; the roof.

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BACKGROUND LEVEL. The concentration of a pollutant that would exist in the absence of the particular source under study. A "standard" against which the contribution of the particular source can be compared.

BACKGROUND RADIATION. The radiation in man's natural environment, including cosmic rays and radiation from the naturally radioactive elements.

BALLAST. Rough, unscreened gravel used to form the bed of a railway or as substratum for new roads.

BASE FLOW. The sustained or normal flow of a stream.

BED. The smallest division of a stratified series of rock layers, marked by a more or less well-defined divisional plane from its neighbors above and below.

BENCH. In open-pit mines, a ledge that forms a single level of operation above which mineral or waste materials are excavated from a contiguous bank or bench face. The mineral or waste is removed in successive layers, each of which is a bench, several of which may be in operation simultaneously in different parts of and at different elevations in an open-pit mine.

BORROW PIT. Location from which soil materials are taken to be used as topsoil on reclaimed sites.

BULKHEAD. A tight partition of wood, rock or concrete in mines to contain some material.

CAVING. The action of caving in, collapsing; the failure and sloughing in of boreholes, mine workings or excavations.

CHARGE DELAY. The time separation, usually in milliseconds, between detonation of individual charges of explosives in a blast.

COEFFICIENT. In physics, a number commonly used in computation as a factor, expressing the amount of some change or effect under certain conditions such as temperature, length, time or volume.

COHESION. That property of like mineral grains that enables them to cling together in opposition to forces tending to separate them; measured in pounds per square foot.

COLLUVIUM. Loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity.

COLOR. The property of an object that reflects light of a particular wavelength, enabling the eye to differentiate otherwise unidentifiable objects.

CONSOLIDATED. In geology, having been pressed into a hard rock. In soil mechanics, having simply been brought into equilibrium with the applied forces causing a decrease in volume.

04000252

CONTOUR FURROWING. Plowing along the contour lines of uneven terrain to limit erosion.

CONTRAST. The effect of a striking difference in the form, line, color or texture of the landscape features within an area being viewed.

CONTROL. A standard of comparison in scientific experimentations; check.

COUNTRY ROCK. Rock adjacent to or surrounding a mineral deposit or dike in which no minerals of economic interest occur.

CREST. The top of an excavated slope; the highest natural projection that crowns a hill or mountain.

CROSSCUT. In underground mining, an opening driven across a deposit, or, in general, across the direction of the main workings.

CUBIC FOOT PER SECOND (ft^3/s or cfs). The rate of discharge representing a volume of 1 cubic foot of water passing a given point during 1 second. It is equivalent to 7.48 gallons per second, or 448.8 gallons per minute.

CURIE. The measurement of radioactivity of a substance. One curie equals the disintegration of 37 billion (3.7×10^{10}) nuclei per second, which is approximately the rate of decay of 1 gram of radium.

DAUGHTERS, PROGENY. Nuclides formed by the radioactive decay of other nuclides (the parents).

DECAY, RADIOACTIVE. The spontaneous emission of radiation from the nucleus a radioactive atom. This will either transform one nuclide into a different nuclide, or change the energy state of the same nuclide.

DECIBEL (dB). A unit used to express the relative intensity of sounds on a scale from 0 (for the average least perceptible sound) to about 130 (for the average pain level).

DECLINE. A shaft sunk at an angle from the vertical.

DENDRITIC. Formed or marked in a branched or tree-like pattern.

DIABASE (DIABASIC). A fine-grained intrusive rock composed mainly of plagioclase feldspar and pyroxene.

DIKE. An igneous intrusion that cuts across the planar structures of the surrounding rock (See Sill).

DIP. The angle of a slope, vein, rock stratum or borehole as measured from the horizontal plane downward.

DISCHARGE. The rate of flow at a given instant in terms of volume per unit of time (e.g., cubic feet per second or gallons per minute).

04000253

DOSE, ABSORBED. The amount of radiation absorbed; the energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest. The special unit of absorbed dose is the rad.

DOSE COMMITMENT. The total dose that an organism is expected to receive in its lifetime from a given quantity of radioactive material deposited in the body.

DOSE EQUIVALENT. A common scale measurement of the effects of the different types of radiation. The unit of dose equivalent is the rem. The following are considered equivalent to 1 rem of dose: 1) a dose of 1 Roentgen (R) due to X- or gamma rays; 2) a dose of 1 rad due to X-, gamma or beta radiation; 3) a dose of 0.1 rad due to neutrons or high-energy protons; and 4) a dose of 0.5 rad due to particles heavier than protons (i.e., alpha radiation).

DRAWDOWN. Vertical distance the free water elevation is lowered, or the reduction of the pressure head due to the removal of free water.

DRIFT. A horizontal passage underground, with neither end reaching the surface.

ELECTRON. An elementary particle having a charge of -1 esu (electrostatic unit) and a mass of 1/1837 amu (atomic mass unit).

ENTRY. An underground passage for hauling, ventilation or as a way of transit for miners.

EPHEMERAL STREAM. A stream or portion of a stream that flows only in direct response to precipitation in the immediate locality, and whose channel is at all times above the water table.

EXPOSURE. The quotient dq/dm, where "dq" is the absolute value of the charge of the ions of one sign produced in air, when all the electrons (negatrons and positrons) liberated by photons in a volume element having mass "dm" are completely stopped by air. The special unit of exposure is the roentgen (R).

EXPOSURE RATE. The exposure per unit of time (e.g., roentgens/minute, milliroentgens/hour).

FACE. In any adit, tunnel or stope, the end at which work is progressing or was last done.

FAULT. A fracture or fracture zone along which there has been displacement of the two sides relative to one another and parallel to the fracture.

FLUVIAL. Of or pertaining to a river or rivers. Produced by the action of a stream or river.

FORM. The mass or shape of an object or objects which appear unified, such as in the shape of the land surface or patterns placed on the landscape.

04000254

FORMATION. A more or less related group of rocks grouped together into a unit that is convenient for description and mapping.

FRACTURE. Failure by the parting of a material.

FRICTION ANGLE. The angle between the perpendicular to a surface and the resultant force acting on a body resting on the surface, at which the body begins to slide.

FRICTION ANGLE (ANGLE OF INTERNAL FRICTION). The angle which characterizes the increase in sheer strength with increasing normal stress on a given plane in a material. The tangent of the angle of internal friction is the increase in shear strength for a unit increase in normal stress. It is approximately equal to the angle of repose for dry, cohesionless materials.

FUGITIVE DUST. Particulates made airborne by forces of wind, man's activities, or both.

GRADIENT. The ratio of vertical fall of a river's channel to its length.

GRANTS MINERAL BELT. Includes the area of uranium deposits from Gallup on the west to the western edge of the Rio Grande trough on the east.

GROSS ALPHA. The total rate of alpha particle emission from a sample without regard to energy distribution or source nuclide.

GROSS BETA. The total rate of beta particle emission from a sample without regard to energy distribution or source nuclide.

GROUND VIBRATION. An undesirable side effect of the use of explosives to break rock for mining, quarrying, excavation and construction; expressed as the velocity of a particular point or particle in the ground (particle velocity), and measured in inches per second (in/s).

GROUND WATER MOUNDING. The mound-shaped build-up of the potentiometric surface resulting from the downward percolation of water into an aquifer.

GROWTH MEDIUM. A soils material, natural or reconstituted, that will support a plant community.

HALF-LIFE. The time required for a radioactive element to lose half of its atoms through radioactive decay. Each radionuclide has a unique half-life.

HEAD, STATIC. The height above a standard reference point of the surface of a column of water that can be supported by the static pressure at a given point.

04000255

HEAD, TOTAL. The total head of a liquid at a given point is the sum of three components: 1) elevation head, which is equal to the elevation of the given point above a reference point; 2) pressure head, which is the height of a column of static water that can be supported by the static pressure at the given point; and 3) velocity head, which is the height the kinetic energy of the liquid is capable of lifting it.

HERTZ (Hz). A unit of frequency equal to one cycle per second.

HIGH PASS. A method of measuring airblast in decibels (dB) at a certain frequency in hertz (Hz).

HIGH-RADIATION AREA. Any area accessible to individuals in which a major portion of the body could receive, in any one hour, a dose in excess of 100 millirems.

HIGHWALL. The excavated face of exposed overburden and/or ore in an open-pit mine.

HORIZON. Layers (in a soil profile) resulting from soil-forming processes are grouped into three categories (A, B and C). The subdivisions of these categories are called horizons.

HYDRAULIC CONDUCTIVITY. The rate of flow of water in gallons per day through cross-section of 1 square foot of a subject medium under a unit hydraulic gradient. (Synonym, permeability coefficient.)

IN SITU. In its natural position or place.

INTERNAL RADIATION. Radiation from a source within the body as a result of deposition of radionuclides in body tissues by ingestion, inhalation or implantation.

INTRUSION. A feature (land and water form, vegetation or structure) that is generally considered out of context because of excessive contrast and disharmony with the characteristic landscape.

ION. An atom that carries a positive or negative electric charge as a result of having lost or gained one or more electrons.

IONIZATION. The process by which a neutral atom acquires a positive or negative charge.

ISOTOPES. Atoms with the same atomic number but different atomic weights. The difference in atomic weight is due to the number of neutrons in the atom's nucleus.

LEVEL. A horizontal passage or drift into or within a mine. It is customary to work mines by levels at regular intervals in depth.

LINE. The path, real or imagined that the eye follows when perceiving abrupt differences in form, color or texture. Within landscapes, lines may be found as ridges, skylines, structures, changes in vegetative types, or individual trees or branches.

04000256

MAJOR (STRUCTURAL) BLAST DAMAGE. The most severe type of damage to structures caused by blasting. This type of damage affects the load-supporting ability of a structure (e.g., rupture of arches, falling of masonry, structural weakening).

MINING HEIGHT. The height of an underground mine opening.

MINOR BLAST DAMAGE. An intermediate level of damage to structures caused by blasting (e.g., loosening and falling of plaster, hairline to 1/8-inch-wide cracks, falling of loose mortar).

MUCK. Broken ground from an underground mining operation.

NEUTRON. An elementary particle having no charge and a mass of 1 atomic mass unit.

ORE. A mineral of sufficient value (quality and quantity) that it may be mined with profit.

ORE ZONE. A horizon in which ore minerals are known to occur.

OVERBURDEN. Soil and rock horizons as measured from the surface down to a specific mineral layer.

OVERPRESSURE. The pressure in an airblast wave in excess of the atomopheric pressure.

PAN EVAPORATION. The amount of water that evaporates from a standard U.S. Weather Bureau 4-foot-diameter evaporation pan. Measured in inches per year.

PERCHED WATER TABLE. A water table, usually of limited area, maintained above the normal free water elevation by the presence of an intervening, relatively impervious, confining earth layer.

PERCOLATION. The movement of gravitational water through soil.

PIEZOMETER. An instrument for measuring pressure head, usually consisting of a small pipe tapped into the side of a closed or open conduit and flush with the inside. It is connected to a pressure gage, water column, or other device for indicating pressure head. May also be a small-diameter well placed in an aquifer.

PILLAR. In situ rock between two or more underground openings.

PIPING. Erosion by percolating water in a layer of subsoil, resulting in caving and the formation of narrow conduits, tunnels or pipes.

PLANT ASSOCIATION. Plant community of definite composition, presenting a uniform physiognomy and growing in uniform habitat conditions.

PLUTONIC. Of igneous origin.

PORE. Interstice or void; a space in rock or soil not occupied by solid mineral matter.

04000257

POROSITY. The ratio (usually expressed as a percentage) of the volume of voids in a given mass to the total volume of the mass.

PORTAL. The surface entrance to a decline or an adit.

POTENTIOMETRIC SURFACE. An imaginary surface representing the total head of ground water above a reference level for a particular area, and defined by the level to which water will rise in a well drilled in that area. (Synonym, piezometric level.)

PRESSURE. Force per unit area applied to the outside surface of a body.

PRESSURE HEAD. Equivalent to the height of a column of water that can be supported by the pressure.

PROTORE. As used in this EIS, a component of the Jackpile Sandstone. This component material was stockpiled during mining because it contains elevated but sub-economic uranium concentrations that might become economical to process at some future time because of rising prices or improved technology. At the Jackpile-Paguate mine, the protore contains .02 to .059 percent uranium (U_3O_8).

RAD. The special measurement unit of absorbed dose; the quantity of any type of ionizing radiation that imparts a dose of 100 ergs to 1 gram of tissue (from Radiation Absorbed Dose).

RADIATION. Particles or energy emitted from the nucleus of a radioactive atom.

RADIATION AREA. Any area accessible to individuals in which a major portion the body could receive, in any one hour, a dose in excess of 5 millirems (mrems) or, in any 5 consecutive days, a dose in excess of 100 mrems.

RADIOACTIVE MATERIAL. Any material (solid, liquid or gas) that emits radiation spontaneously.

RADIOACTIVITY. The disintegration of unstable atomic nuclei by the emission of radiation.

RADIUM-226. A radioactive metallic element in group II of the periodic system; one of the alkaline-earth metals. Radium resembles barium in its chemical properties.

RADIUS OF INFLUENCE (OF A WELL). The distance from the center of a pumping well to the closest point at which the ground water is not lowered.

RADON-222. A heavy, radioactive gaseous element. It emanates from (i.e., is a daughter product of) radium-226. Radon has a half-life of 3.823 days and is an alpha particle emitter.

RAISE. An opening, like a shaft, made in the back (roof) of an underground level to reach a level above.

04000258

REM. A measure of the dose of any radiation to body tissue, in terms of its estimated biological effect relative to a dose of 1 roentgen (R) of X-rays (from Roentgen Equivalent Man). One millirem (mrem) = 0.001 rem.

RESTRICTED AREA (CONTROLLED AREA). Any area to which access is controlled to protect individuals from exposure to radiation and radioactive materials.

ROCK. Geologically, any naturally formed aggregate of mineral matter constituting an essential and appreciable part of the earth's crust.

ROCKFALL. The relatively free falling of a newly detached segment of rock of any size from a cliff, steep slope, or underground opening.

ROENTGEN. The unit of exposure. The quantity of X- or gamma radiation that produces ions carrying 1 electrostatic unit (esu) charge of either sign (+ or -), in 1 cubic centimeter of dry air at standard temperature and pressure.

ROOM. A wide working place in a flat mine (corresponds to a stope in steep vein).

ROOM AND PILLAR MINING. Method of underground mining where drifts are driven on a regular pattern leaving pillars to support the overburden. The pillars are usually removed at the end of mining in that area.

SAFETY FACTOR. The ratio of forces available to resist slope failure and the forces tending to cause this failure.

SCALE. The proportionate size relationship between an object and the surroundings in which the object is placed. Also, to remove surface loose rock from excavation faces.

SCALED DISTANCE. A factor in blast design, equal to the actual distance from the blast in feet divided by the square root of the explosive weight in pounds.

SEEPAGE. See Percolation.

SEISMIC. Pertaining to, characteristic of, or produced by earthquakes or earth vibration (as from blasting).

SET. A frame for supporting the ground around a shaft, tunnel or other excavation.

SHAFT. A vertical or steeply inclined excavation or opening from the surface down through the strata to the mineral to be mined.

SILL. An igneous intrusion that parallels the planar structure of the surrounding rock (See Dike).

SINUOSITY. The ratio of a river's channel length to the length of its valley.

04000259

SLIDE. A relatively deep-seated failure of a slope, also called a landslide or slope failure. Slides are considered to have large lateral displacement in contrast to slumps, which are local or restricted displacements.

SLUMP. Material that has slid down from high rock slopes; to slip down en masse.

SOIL PROFILE. The characteristic features of the soil, as seen by a vertical cut through the weathered soil mass into the relatively unweathered material, and finally to bedrock.

SPECIFIC (UNIT) WEIGHT. The dry weight per unit volume, measured in pounds per cubic foot.

STOPE. An underground excavation from which ore has been extracted. In New Mexico uranium mines, the terms "room" and "stope" are used interchangeably.

STRATA. Sedimentary rock layers.

SUBSIDENCE. A sinking down of a part of the earth's crust. The lowering of the strata, including the surface, due to underground excavations.

SUBSTRATE. The subsoil.

TEXTURE. The interplay of light and shadow created by the variation in the surface of an object; the visual result of the tactile surface characteristics.

THRESHOLD (COSMETIC) BLAST DAMAGE. The most superficial type of damage to structures caused by blasting, being of the type that develops in all homes in the absence of blasting (e.g., loosening of paint, small cracks in plaster, lengthening of old cracks).

TOE. The bottom of a slope.

UNCONFORMITY. A surface of erosion or nondeposition that separate younger strata from older strata.

UNDERFLOW. The ground water flowing beneath the bed of a surface stream generally in the same direction but at a much slower rate than the surface drainage.

UNDERGROUND OPENINGS. Natural or manmade excavations under the surface of the earth.

UNRESTRICTED AREA (UNCONTROLLED AREA). Any area to which access is not controlled to protect individuals from exposure to radiation and radioactive materials.

URANIUM. A naturally radioactive, silvery-white, metallic element of the actinide series of the periodic system.

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URANIUM ORE GRADE. The percentage of uranium in an ore.

URANIUM OXIDE (U_3O_8). A chemical compound made up of three atoms of uranium and eight atoms of oxygen, used as the measure of refined uranium. For uniformity and comparison, weights of other forms and compounds of uranium and uranium ore are usually converted to the equivalent weight of uranium oxide.

VISUAL RESOURCE. The land, water, flora, fauna and other features that are visible on all lands (scenic values).

WALL. The side of an underground level or drift.

WASTE. The barren (non-ore-bearing) rock in a mine.

WORKING(S). A working may be a mine shaft, level or stope. Usually used in the plural.

WORKING LEVEL (WL). A unit of measurement peculiar to the underground mining of uranium; a measure of the concentration of radon 222 daughter products in air. One Working Level is that concentration of radon daughters that will deliver 1.3×10^5 mev (million electron volts) of alpha energy per liter of air.

WORKING LEVEL MONTH (WLM). Exposure to 1 working level for 173 hours. The U.S. Mine Safety and Health Administration's limit for uranium miners is 4 WLM per year.

YELLOWCAKE. The final precipitate formed in the milling of uranium. Usually considered to be ammonium diuranate $[(NH_4)_2U_2O_7]$ or sodium diuranate ($Na_2U_2O_7$), but the composition is variable. Measured in the equivalent weight of U_3O_8.

04000261

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04000262

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04000270

Index

04000271

INDEX

Access Routes 1-17
Adits 1-18, 2-1, 2-13, 3-12
Air Quality 1-33, 2-61, 2-62, 3-36
Alpha Particles B-2
Alternatives Eliminated From Detailed Study 1-9
Alternatives Selected For Detailed Study. 1-9
Ambient Radon 2-36, 2-40
Arroyo Headcutting. 1-16, 1-32, 2-54, 3-29

Backfill Levels 1-14, 3-27
Backfill Materials. 1-14
Background Radiation. B-7
Beta Particles. B-2
Blasting During Reclamation 1-30, 3-1
Blocked Drainages 1-16, 2-60

Comments and Responses. 4-7
Comparison to Other Health Risks (Radiation). 3-25
Compliance. 1-20
Consultants and Contributors. 4-12
Cultural Resources. 1-34, 2-76, 3-44

Decline 1-18, 2-1, 2-13, 3-10, 3-12
Direct Gamma Radiation. 2-31
Distribution of the Draft EIS 4-6
Drill Holes 1-18

Erosion 2-54, 3-29
External Doses (Radiation). 3-13

Facilities. 1-4, 1-17, 2-9, 2-10
Fauna 1-34, 2-74, 3-42
Federal Radiation Standards 2-28
Federal Trust Responsibility. 1-5
Flora 1-33, 2-66, 3-37
Flow in Waste Dumps 2-54

Gamma Radiation 1-28, 2-31
Gamma Rays. B-1
Geology 2-14
Geomorphic Criteria E-1
Ground Vibration. 1-29
Ground Water. 2-51
Ground Water Quality. 1-27, 1-31, 2-55, 3-28
Ground Water Quality Data 2-55
Ground Water Recharge and Flow in the Pits. 1-31, 2-51, 3-28

Highwalls 1-15, 2-20
Highwall Stability. 1-30, 2-20, 3-4
History and Background. 1-1
Hydrology 2-46, 3-23

04000272

Ingestion (Radiation) 2-43
Ingestion Doses (Radiation) 3-17
Inhalation Doses (Radiation). 3-15
Interrelationships With Other Projects. 1-6
Irreversible and Irretrievable Commitment of Resources. . . . 1-34, 3-46
Issues and Concerns 1-7
Issues Dropped From Further Evaluation. 1-7
Issues Evaluated. 1-8

Jackpile Pit Highwall 1-15, 2-20
Jackpile Sandstone. 2-3

List of Preparers 4-9

Meteorology 1-29, 2-61
Mine Leases 1-1, 1-17, 2-2
Mineral Resources 1-30, 2-18, 3-2
Mining Operations 2-1
Mitigating Measures 1-13
Monitoring. 1-20, 1-27, 2-14, 2-15

Non-Radiological Accidents. 1-34, 3-47
Non-Radiological Minesite Hazards 2-19, 3-4
Non-Radiological Particulates 1-28
North Paguate Pit Highwall. 1-15, 2-20

Open Pits 1-4, 1-14, 2-1, 2-4
Overburden. 2-3

Paguate Reservoir 2-2
Particulates (Radioactive). 1-28, 2-37, 2-42, 3-15
Ponding in Open Pits. 2-48
Post-Reclamation Access 1-14
Post-Reclamation Health Effects (Radiation) 3-19
Post-Reclamation Land Uses. 1-21
Post-Reclamation Radiation Doses. 3-12
Post-Reclamation Radiological Impacts 1-31, 3-9
Previous Reclamation. 2-12
Protore Stockpiles. 1-4, 1-16, 2-4, 2-6, 2-8
Public Review of the Draft EIS. 4-5
Purpose and Need for Reclamation. 1-4

Radiation 2-27, 3-9, B-1
Radiation Exposure Pathways and Existing Levels of Radiation. . . . 2-31
Radiation Standards 2-27
Radioactive Elements and Their Half-Lives B-2
Radiological Characteristics of Surface Materials 2-30
Radiological Impacts to Workers Involved in Reclamation 3-22, D-1
Radon - 222 . . . . . 1-28, 2-38, 3-15
Radon Exhalation. 1-28, 2-41
Rail Spur 1-18, 2-2, 2-9

04000273

Reclamation Completion. 1-21
Revegetation Methods. 1-19
Revegetation Success. 1-20, 2-72
Rios Paguate and Moquino. 2-2, 2-46

Schematic Diagrams. A-1
Scope of the EIS. 1-5
Scoping and Chronology of the EIS 4-1
Security. 1-20
Sedimentation in Paguate Reservoir. 1-32, 2-2, 2-58, 3-30
Slope Stability 2-19
Socioeconomic Conditions. 1-34, 2-77, 3-46
Soils 1-29, 1-33, 2-3, 2-63, 3-36
Soil Borrow Site Characteristics. 2-66, 2-68
Somatic and Genetic Effects (Radiation) 3-21
Sources of Radiation at the Minesite. 2-27
South Paguate Pit Highwall. 1-15, 2-20
State Highway 279 . . . . . 1-6, 2-2
Stockpiled Soils. 2-66
Stream Stability. 1-16, 1-32, 2-59, 3-31
Subsidence. 1-30, 2-23, 2-25, 3-8
Summary of Impacts. 1-13
Surface Disturbance 1-4, 2-1, 2-4
Surface Disturbed Areas Not Reclaimed 2-69
Surface Disturbed Areas Reclaimed 2-70
Surface Water 2-46
Surface Water Quality 1-27, 1-31, 2-53, 3-26
Surface Water Quality Data. 2-50
Surface Water Quantity. 1-31, 2-49, 3-25

Team Organization and Contributors. 4-7
Threatened and Endangered Species 2-76
Topsoil Stockpiles. 1-4, 2-4, 2-9
Total Individual and Population Dose Commitments (Radiation). . . . 3-19
Total Suspended Particulates. 2-65, 3-38
Types of Ionizing Radiation B-1

Underground Disturbance 2-12, 2-13
Underground Openings. 1-18, 1-30, 2-13, 2-26, 3-8
Undisturbed Natural Vegetational Areas. 2-66
Undisturbed Soils 2-63
Units of Measure for Radioactivity and Radiation. B-3
Units of Radioactivity. B-5
Uranium - 238 Decay Series. B-4

Ventilation Holes 1-18
Village of Laguna 2-2
Village of Paguate. 2-2
Visual Resources. 1-34, 2-76, 3-44

04000274

Waste Dumps 1-4, 1-15, 1-22, 2-4, 2-6, 2-62
Waste Dump Dimensions 2-60
Waste Dump Slope Erosion. 1-32, 2-61, 3-36
Waste Dump Slopes 2-59, 3-32
Waste Dump Stability. 1-30, 2-22, 3-6
Water (Radiation) 2-43
Water - Bearing Units (Aquifers). 2-51
Water Use (Ground Water). 2-54
Water Use (Surface Water) 2-49
Water Wells 1-17
What Is Known About the Health Effects of Radiation B-7

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JACKPILE-PAGUATE URANIUM MINE
RECORD OF DECISION
COMPLIANCE ASSESSMENT

September 2007

Prepared for:
Pueblo of Laguna

Prepared by:
OA Systems Corporation

Table of Contents

Section	Title	Page
I	BACKGROUND AND OVERVIEW	1
II	RECORD OF DECISION REQUIREMENTS	1
III	OAS APPROACH	3
IV	ROD COMPLIANCE	5
	1. PIT BOTTOMS	6
	A. Backfill Levels	6
	1. Pits will remain as closed basins	6
	2. Groundwater recovery level monitoring program	7
	B. Backfill Materials	9
	C Stabilization	10
	1. Sloping	10
	2. Pit Berms and Retention Ponds	11
	D. Post-Reclamation Access	11
	2. PIT HIGHWALLS	13
	A. Jackpile Pit Highwall	13
	B. North Paguate Pit Highwall	13
	C. South Paguate Pit Highwall	13
	3. WASTE DUMPS	15
	a. Waste dumps H and J	15
	b. Dump slopes reduced to 3:1	15
	c. Dumps with Jackpile Sandstone	16
	c.(1) Shale Cover	17
	c.(2) Topsoil	18
	d. Berms installed to control erosion	20
	e. Additional surface treatment	21
	4. PROTORE STOCKPILES	21
	5. SITE STABILITY AND DRAINAGE	22

Section	Title	Page
	A. Stream Stability	22
	1. Rio Paguate	22
	2. Rio Moquino	23
	3. Concrete drop structure across Rio Moquino	24
	B. Arroyo Headcutting	25
	C. Blocked Drainages	25
	1. Waste dump J & protore stockpiles SP-17BC & SP-6-B	25
	2. Blocked drainages north of FD-I and F dumps	26
6.	SURFACE FACILITIES/STRUCTURES	27
	A. Lease No. 1	27
	B. Lease No. 4	28
	C. Access Routes	29
	D. Water Wells	30
	E. Rail Spur	30
7.	DRILL HOLES	31
8.	UNDERGROUND MODIFICATIONS	31
	A. Ventilation Holes	31
	B. Adits and Declines	32
9.	REVEGETATION METHODS	33
	A. Top Dressing	33
	B. Surface Preparation	34
	C. Seeding and Seed Mixtures	34
	D. Revegetation Success	35
10.	MONITORING	39
	a. Meteorologic	40
	b. Air Particulates	40
	c. Ambient Radon	42
	d. Radon Daughter Levels	43
	e. Radon Exhalation	43

Section	Title	Page
	f. Gamma Survey	44
	g. Soil	46
	h. Radionuclide and Heavy Metal Uptake into Vegetation	48
	i. Water Quality	50
	11. SECURITY	67
	12. RECLAMATION COMPLETION	68
	13. POST-RECLAMATION LAND USES	68
V	CONCLUSIONS AND RECOMMENDATIONS	69

TABLES

		Page
Table 1	Monitor Well Survey Information	7
Table 2	Groundwater Elevations in Pits	8
Table 3	Shale Layer for Radon Cap, Field Verification Depths	18
Table 4	Top Soil Layer, Field Verification Depths	19
Table 5	Areas with Chronic Erosion Problems	21
Table 6	Movement of Contaminated Soils & Fill Material	23
Table 7	Movement of Waste and Protore Piles Along the Rio Moquino	24
Table 8	Lease No. 1 - Facilities Structures Status	27
Table 9	Lease No. 4 - Facilities Structures Status	29
Table 10	New Shops - Facilities Structures Status	29
Table 11	Access Routes Status	30
Table 12	Water Wells Status	30
Table 13	Adits and Declines Status	32
Table 14	Revegetation Success Sampling Requirements Comparison	36
Table 15	Meteorologic Monitoring Requirements Comparison	40
Table 16	Air Particulate Monitoring Requirements Comparison	41
Table 17	Radon Gas Monitoring Requirements Comparison	42
Table 18	Radon Exhalation Monitoring Requirements Comparison	43
Table 19	Gamma Radiation Monitoring Requirements Comparison	44

Table 20 Soils Testing Requirements Comparison 46
Table 21 Monitoring Requirements for Radionuclide and Heavy Metal Uptake into Vegetation Comparison 48
Table 22 Summary of Results of the Heavy Metal and Radionuclide Vegetation Uptake Monitoring for the Jackpile Reclamation Project 49
Table 23 Groundwater Monitoring Points 51
Table 24 Surface Water Monitoring Points 53
Table 25 Groundwater Parameters 53
Table 26 Surface Water Parameters 55
Table 27 Water Quality Data Condition 57
Table 28 2005 Groundwater Quality (Major Cation and Anion) Summary 60
Table 29 Gross Alpha Exceedances of the MCL = 15 pCi/L 62
Table 30 Total Uranium Exceedances of the MCL = 0.03 mg/L 62
Table 31 Salinity Hazard (USDA) 64
Table 32 Subsidence Monitoring Requirements Comparison 66
Table 33 Blast Monitoring Requirements Comparison 67

APPENDICES

Appendix A Comparative Tables of Contractor Work Breakout Schedules and Work Activities
Table A-1 ROD Requirements Versus Likely Data Sources
Table A-2 Comparative Table to Identify Work Areas to EIS Designated Areas
Table A-3 Matrix Relating the Work Units to the ROD Areas
Table A-4 Matrix Tracking the Work Unit Progress
Appendix B Photographic Documentation
Appendix C Jackpile-Paguate Uranium Mine Site Maps (on CD-ROM)
Exhibit 1 2003 Aerial Photograph – With Site Features of the Jackpile-Paguate Uranium Mine
Exhibit 2 1995 Topographic Base Map – With Site Features of the Jackpile-Paguate Uranium Mine
Appendix D Analysis and Review of Re-vegetation, Cedar Creek Vegetation Survey, Gamma Rad-Radon Gas, Soils and Uptake, Water Quality and Water Quality Addendum (Monitoring Results, Water Quality and Water Quality Addendum also on CD-ROM)
Appendix E Aerial Photographs - Jackpile-Paguate Uranium Mine, 1989 – 2003 (on DVD-ROM)

JACKPILE - PAGUATE

Uranium Mine Reclamation Project

RECORD OF DECISION

DECEMBER 1986

US DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT
ALBUQUERQUE DISTRICT OFFICE

BUREAU OF INDIAN AFFAIRS
ALBUQUERQUE AREA OFFICE

The following measures are approved as the minimum level of reclamation required under the scope of the Record of Decision:

1. Pit Bottoms

   A. Backfill Levels

      Pts will remain as closed basins. Pit bottoms will be backfilled to at least 10 feet above the Dames and Moore (1983) projected ground water recovery levels as indicated below. A schematic diagram is shown in the FEIS, Appendix A (Figure A-1, DOI Proposal).

Proposed Minimum Pit Backfill Levels	
Jackpile	5939'
North Paguate	5958'
South Paguate	5995'
South Paguate (SP-20)	6060'

      A groundwater recovery level monitoring program will be implemented. Additional backfill will be added as necessary to control ponded water. The duration of the monitoring program will be a minimum of 10 years.

   B. Backfill Materials

      Backfill materials will consist of protore, waste dumps H and J, and excess material obtained from waste dump resloping and stream channel clearing. These materials will be covered with 3 feet of overburden and 2 feet of topsoil (i.e., Tres Hermanos Sandstone or alluvial material).

   C. Stabilization

      All backfill slopes will be reduced to no greater than 3:1 (horizontal to vertical). Surface water control berms will be constructed within pit bottoms to reduce erosion and retain soil moisture for plant growth. Surface runoff will also be directed to small retention basins in the pit bottoms. All areas in the pits will then undergo surface shaping, topsoil application and seeding as outlined under "Revegetation Methods" below.

   D. Post-Reclamation Access

      Human and animal access to pit bottoms will be prevented. Livestock grazing will be prevented with the use of sheep-proof fencing due to the uncertainties of predicting radionuclide and heavy metal uptake into plants (forage).

2. Pit Highwalls

   A. Jackpile Pit Highwall

      The top 15' of highwall will be cut to a 45 degree slope. All soil and unconsolidated material at the top of the highwall will be sloped 3:1. The highwall will be scaled to remove loose debris. A schematic diagram is shown in the FEIS, Appendix A (Figure A-7).

   B. North Paguate Pit Highwall

      The top 15' of highwall will be cut to a 45 degree slope. All soil and unconsolidated material at the top of the highwall will be sloped 3:1. The highwall will be scaled to remove loose debris. A schematic diagram is shown in the FEIS. Appendix A (Figure A-7). Additionally, the highwall will be fenced with 6-foot chain link.

   C. South Paguate Pit Highwall

      The top 15' of highwall will be cut to a 45 degree slope. All soil and unconsolidated material at the top of the highwall will be sloped 3:1. The highwall will be scaled to remove loose debris. A schematic diagram is shown in the FEIS, Appendix A (Figure A-7). Additionally, the highwall will be fenced with 6-foot chain link.

3. Waste Dumps

   Waste dumps H and J will be relocated to Jackpile pit as backfill. Most dump slopes will be reduced to 3:1 or less and the dump slopes will be contour furrowed; exceptions are noted in

Table 1-4 of the FEIS. Dumps which have Jackpile Sandstone on their outer surface and any Jackpile Sandstone exposed during resloping will be covered with 3 feet of overburden and 16 inches of topsoil. Dumps that do not contain Jackpile Sandstone on their outer surfaces will be covered with 18 inches of topsoil. Berms will be installed on all dump crests to control erosion. All dump tops will slope slightly away from their outer slopes. Dump slopes will be contoured so their toes are convex to prevent formation of major gullies on slopes. Additional surface treatment is outlined under "Revegetative Methods" below. Detailed modifications and treatments are presented in Table 1-4 of the FEIS. A schematic diagram is shown in the FEIS, Appendix A (Figure A-9).

4. Protore Stockpiles

All protore will be used as backfill material in pit areas. Backfill will be covered with 3 feet of overburden and 2 feet of Tres Hermanos Sandstone or alluvial material.

5. Site Stability and Drainage

A. Stream Stability

All contaminated soils and fill material within 100 feet of the Rio Paguate west of its confluence with the Rio Moquino will be excavated and relocated to the open pits. For the Rio Moquino, waste dumps S, T., U., N and N2 will be pulled back 50 feet from the centerline of the stream channel. The toes of these dumps will be armored with riprap. A concrete drop structure will be constructed across the Rio Moquino approximately 400 feet above the confluence with the Rio Paguate.

B. Arroyo Headcutting

Arroyos south of waste dumps I, Y and Y2, and the arroyo west of waste dumps FD-1 and FD-3 will be armored as shown in the FEIS, Appendix A (Figure A-13). Other headcuts encountered during reclamation will also be stabilized by armoring.

C. Blocked Drainages

Waste dump J and protore stockpiles SP-17BC and SP-6-B will be removed to unblock ephemeral drainage on south side of minesite. Two blocked drainages north of FD-1 and F dumps will remain blocked. Remainder of minesite, excluding open pits, will drain to Rios Paguate and Moquino.

6. Surface Facilities/Structures

A. Lease No. 1 (Jackpile Lease)

All buildings on Lease No. 1 will be demolished and removed except for the Geology building, miner trainer center and buildings at Old Shop and the Open Pit offices. The land surface (except pit highwalls and natural outcrops) will be cleared of radiological material (e.g., Jackpile Sandstone) until gamma readings of twice background or less are achieved. These areas will then be graded and seeded.

B. Lease No. 4

All structures and facilities associated with P-10 Mine and New Shop, including all buildings, roads, parking lots, sewage systems, power lines and poles will be left. All operational and maintenance equipment, including tools, machinery, supplies will be removed. All permanent structures and land surfaces (except pit highwalls and natural outcrops) will be cleared of radiological material until gamma readings of twice background or less are achieved. These areas will then be graded and seeded. Nonsalvageable contaminated buildings and materials will be removed to the pits for disposal.

C. Access Routes

The four major roads within minesite will be cleared of radiological material and left after reclamation for post-mining use. These access routes include: 1) access road from P-10 and

New shop to State Highway 279; 2) main road through mine; 3) road that passes between housing area and North Oak Canyon Mesa and then proceeds to P-10; and 4) road to Jackpile Well No. 4. All other roads (except on Lease No. 4) will be removed. These areas will then be graded and seeded.

D. Water Wells

Jackpile Well No. 4, P-10 Well, New Shop Well and Old Shop Well, and 3 wells and their associated sheltering structures (near housing area) will be left. The pumps, riser pipe, wiring and water storage tanks will be removed. Wells established for future monitoring purposes will also be left. All wells will be capped to prevent dust, soil and other contaminants from entering the well casing.

E. Rail Spur

The rail spur will be left intact and cleared of radiological material until gamma readings of twice background or less are achieved. Quirk loading dock will be demolished and hauled to the pits.

7. Drill Holes

All drill holes will be plugged according to the State Engineer's requirements. A 5-foot surface concrete plug will also be placed in each hole. Any cased holes will have the casing cut off at the surface. In addition, areas around drill holes will be seeded. Any exploration roads not wanted by the Pueblo will be reclaimed.

8. Underground Modifications

A. Ventilation Holes

Vent holes will be backfilled with waste material (Dakota Sandstone and Mancos Shale) to within 6 feet of surface. Surface casing will be removed, steel support pins installed in walls of vent holes, and sealed with a 6-foot concrete plug from backfill to surface. Areas around vent holes will be contoured and seeded.

B. Adits and Declines

A concrete bulkhead will be constructed approximately 680 feet below portal of P-10 decline. The decline will be backfilled from bulkhead to ground surface with Dakota Sandstone and Macos Shale. Sufficient material will be placed over the portal to allow for compaction and settling. The ground surface above the buried portal will be sloped and then top-dressed and seeded. The Alpine mine entry will be bulkheaded and backfilled. Mine entries not previously plugged by backfilling will be covered. Additionally, the H-1 mine adits will be bulkheaded and backfilled and the adits at the P-13 and NJ-45 mines will be backfilled.

9. Revegetation Methods

A. Top Dresssing

Following final sloping and grading, pit bottoms will be top dressed with 24", waste dumps with 18" and all other areas within the minesite with 12" of material composed primarily of Tres Hermanos Sandstone (stockpiled at three locations within minesite). In order to meet top dressing volume requirements for the northern portion of the minesite, additional material may be obtained from a topsoil borrow area in the Rio Moquino floodplain comprising 44 acres. For the southern portion of the minesite, additional topsoil borrow material located east of J and H dumps may be needed. Following topsoil removal, disturbed borrow areas, will be contoured, fertilized, seeded and mulched.

B. Surface Preparation

After applying top dressing, areas to be planted will be fertilized, followed by disking to a depth of 8 inches and then contour furrowing.

C. Seeding and Seed Mixtures

Before seeding operations begin, the entire minesite will be fenced to prevent livestock grazing. In most situations, seed mixtures will be planted with a rangeland drill. Broadcast seeding combined with hydromulching may be used on inaccessible sites or if determined to be more feasible than drilling. For both methods, the seed mixture will consist mainly of native plant species possessing qualities compatible with post-grazing use and adapted to local environment (Tables 3-10 and 3-11, FEIS). Following drill seeding, straw mulch will be applied at about 2 tons per acre, and crimped into place with a notched disk.

D. Revegetation Success

Using the Community Structure Analysis (CSA) or comparable method, plant establishment will be considered success when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover and production of undisturbed reference areas (but not sooner than 10 years following seeding). Livestock grazing will be prevented until 90 percent comparability values are met. At the end of the 10-year monitoring period, if an unsuccessful trend is shown retreatment may be necessary to achieve success criteria. In the pit bottoms, vegetation will be sampled annually for radionuclide and heavy metal uptake.

10. Monitoring

The monitoring period will vary for each parameter. Existing monitoring activities to be continued will include: meteorologic sampling, air particulate sampling, radon sampling (ambient), radon exhalation sampling, gamma survey, soil and vegetation sampling, water monitoring and subsidence. In addition, the monitoring program will be expanded to include: radon daughter levels (working levels) in any remaining mine buildings and ground water recover levels/salt build-up in the open pits. The ground water monitoring period will be of sufficient duration to determine the stable future water table conditions. Refer to Table 1-5 of the FEIS for details of the monitoring plan as described under the Preferred Alternative.

11. Security

Control of minesite access and security will continue during reclamation and monitoring activities. However, security during monitoring phase will require cooperation from Pueblo of Laguna and BIA to prevent livestock grazing on revegetated sites.

12. Reclamation Completion

Reclamation will be considered complete when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover and production of undisturbed reference areas (but not sooner than 10 years following seeding). In addition, gamma radiation levels must be no greater than twice background over the entire minesite. Outdoor radon – 222 concentrations must be no greater than 3pCI/l. Radon daughter levels (Working Levels) in any remaining surface facilities must not exceed 0.03WL.

13. Post-Reclamation Land Uses

Limited livestock grazing, light manufacturing, office space, mining and major equipment storage will be allowed. Specifically excluded are habitation and farming.

I. BACKGROUND AND OVERVIEW

OAS Systems Corporation (OAS) was tasked by the Pueblo of Laguna to perform an independent, third-party review and assessment of the overall conformance of reclamation activities carried out at the Jackpile-Paguate Mine (the "site") to those specific requirements as put forth in the site's 1986 Record of Decision (ROD) (*"Jackpile – Paguate Uranium Mine Reclamation Project Record of Decision"*, U.S. Department of the Interior, December 1986).

The Jackpile-Paguate Mine was primarily a multiple open-pit (3 pits) uranium mining operation developed on Pueblo of Laguna lands by the Anaconda Mining Company (previously Anaconda Copper Company). In late 1952, Anaconda negotiated exploration agreements and mining leases with the Laguna Indian Reservation, and mining commenced in 1953 at the Jackpile open pit, with operations subsequently expanding to include the North Paguate and South Paguate pit areas. Mined ore was transported approximately forty miles northwest to Anaconda's Bluewater Mill (northwest of Grants). In addition to open pit mining of uranium ore, Anaconda also conducted limited underground development and, circa 1969-70, pilot-scale applications of in situ uranium leaching utilizing sulfuric acid. At one time, the Jackpile-Paguate Mine was the largest open-pit uranium mine in the world. It produced 24 million tons of uranium ore. Four hundred million tons of rock was moved during the mining operation. Approximately 3,000 acres of the 7,000 acres leased were disturbed. Approximately 2,700 acres were reclaimed. Mining at the Jackpile-Paguate Mine was terminated in 1982 due to depressed uranium prices. Reclamation of the mine site commenced in 1990. Features such as roads, rivers, fence lines, dumps and monitoring points were added to a 2003 aerial photograph and a 1995 topographic base map to create Exhibits 1 and 2, respectively. These exhibits will be referenced frequently in this report.

II. RECORD OF DECISION REQUIREMENTS

The need for reclamation of the mine was identified in the *"Jackpile-Paguate Uranium Mine Reclamation Project Final Environmental Impact Statement"*, Volumes 1 and 2 (FEIS), completed in October1986. The subsequent *"Jackpile-Paguate Uranium Mine Reclamation Project Record of Decision"* (the ROD) was jointly issued by the U.S. Department of Interior's Bureau of Land Management (BLM) and the Bureau of Indian Affairs (BIA), respectively, in December 1986. The ROD evolved primarily from analyses and findings detailed within the October 31, 1986 FEIS for the site, as prepared by BLM and BIA and filed with the U.S. Environmental Protection Agency (EPA). However, consideration of public comment and subsequent technical discussion and analyses among BLM and BIA specialists also contributed to defining the "preferred alternative" (and subsequently, the ROD). As a result, the ROD-specified "preferred alternative" represented a combination of reclamation procedures that best reflected or achieved the intent of the ROD "Decision Factors", more appropriately described as site reclamation objectives. The Decision Factors, in order of importance, were stated in the ROD to include the following:

- Ensure human health and safety;
- Reduce the releases of radioactive elements and radionuclei to as low as reasonably achievable;
- Ensure the integrity of all existing cultural, religious, and archeological sites;
- Return the vegetative cover to a productive condition comparable to the surrounding area;
- Provide for additional land uses that are compatible with other reclamation objectives and that are desired by the Pueblo of Laguna;
- Eliminate the need for post-reclamation maintenance;
- Blend the visual characteristics of the mine site with the surrounding terrain; and,
- Employ the Laguna people in efforts that afford them opportunities to utilize their skills or train them as appropriate.

In general, the "preferred alternative" reclamation plan incorporated the following components: (i) backfilling of open pit areas to at least ten feet above projected groundwater recovery levels using protore and waste rock dump material; (ii) slope reduction on the upper fifteen feet of pit highwall slopes; (iii) recontouring and covering of remaining waste rock dumps; (iv) completion of arroyo drainage improvements and erosion controls; (v) decontamination of those structures to remain, and removal/disposal of all non-essential structures; (vi) plugging and bulkheading of underground ventilation raises and decline portals, respectively; (vii) reclamation of miscellaneous features such as wells, access roads, rail spur, drill holes, etc.; (viii) site wide revegetation of disturbed areas; and, (ix) provision of site security and long-term monitoring of reclamation success for a period of not less than ten years.

Following successful negotiation of agreements with the Anaconda Mining Company (the prior operator of the Jackpile-Paguate Mine) and the U.S. Department of Interior, Bureau of Indian Affairs (as Trustee), the Pueblo of Laguna accepted the terms and conditions as described in the *"Cooperative Agreement Pursuant to "638"*, adopted on March 24, 1987, to Perform the Management, Coordination, and Administration of the Jackpile-Paguate Reclamation Project on the Laguna Indian Reservation, Cibola County, New Mexico *("Pueblo of Laguna, Reclamation Project Agreements, Section 3-Cooperative Agreement between the Bureau of Indian Affairs and the Pueblo of Laguna"* [Cooperative Agreement Pursuant to "638"], December 5, 1986. Thus, the Pueblo of Laguna was authorized to conduct all aspects of site reclamation at the Jackpile-Paguate Mine.

The Board of Directors for Laguna Construction Company (LCC) was established in June 1988 to reclaim the Jackpile Mine. Officers and key personnel were hired in late 1988 through early 1989. Approximately 10 million dollars worth of equipment was purchased for the project. The Jackpile reclamation began on August 15, 1989 and completed on December 31, 1995, one year ahead of schedule at a cost of approximately 45 million dollars.

As described above, the ROD prescribed specific actions to be carried out with respect to the various mine features. These actions were to be followed by site-wide

revegetation of disturbed areas. Under the terms in the ROD, Section 12, Reclamation Completion, reclamation is to be considered complete when *"revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover, and production of undisturbed reference areas (but not sooner than 10 years following seeding). In addition, gamma radiation levels must be no greater than twice background over the entire mine site. Outdoor radon-222 concentrations must be no greater than 3 pico Curies/liter. Radon daughter levels (i.e., working levels or "WL") in any remaining surface facilities must not exceed 0. 0.03WL."*

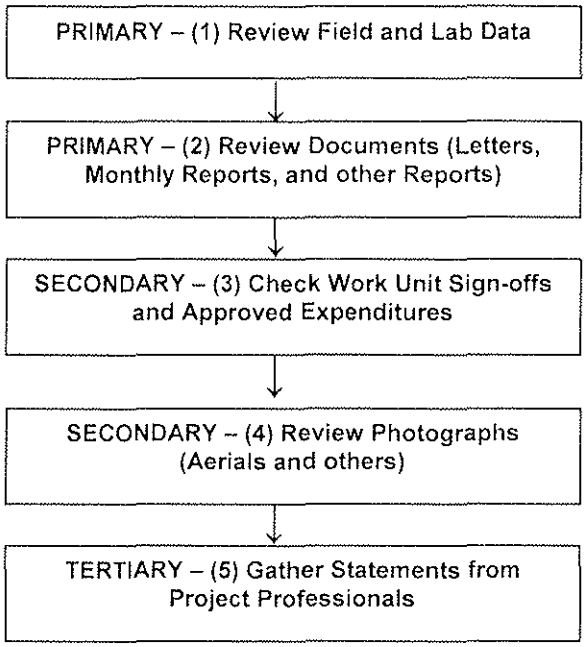
III. OAS APPROACH

Since there was no formal regulatory reporting during the reclamation and post-closure monitoring period, the first OAS endeavor was to assess and organize available data on the reclamation and monitoring activities. This was done by an initial site visit to the Laguna Pueblo to:

- meet with the Pueblo representatives ; Governor Roland Johnson, Chief of Operations Jim Hooper, and Environmental Manager Barbara Cywinska-Bernacik to formalize the scope of the project;
- meet with Jackpile – Paguate Mine Reclamation Project participants: BIA - Al Sedik and Laguna - Marvin Sarracino;
- review the available project documents; and
- tour the project site.

Prior to the meeting, OAS developed a matrix of ROD requirements versus likely data sources (Appendix A, Table A-1). Many of these sources proved to be unavailable. The Laguna Construction Company (LCC) organized its documentation around construction activities and work unit closeouts in order to justify progress payments. Without required periodic regulatory reporting requirements, there was no impetus to organize documentation around environmental requirements outlined in the ROD. Although, the Jacobs Engineering Group, Inc., *"Jackpile Project, Final Environmental Monitoring Plan"*, August 1989 (Jacobs Environmental Monitoring Plan) provided for annual Environmental Reporting, only a single annual report (1996) was found (Pueblo of Laguna, Reclamation Project Manager, *"Jackpile Reclamation Project, Pueblo of Laguna, New Mexico, Annual Report"*, 1996). Likewise, only a single quarterly report was located (*"Jackpile Reclamation Project, Pueblo of Laguna, New Mexico, Environmental Monitoring and Regulatory Compliance, Status Report No. 20"*, December, 1994-February, 1995). A tactical modification was made to try to piece compliance through other sources that included raw lab and field data, construction work unit reports and letter authorizations, field inspections and photographs, and verbal testaments of activities by project personnel.

SUBSTANTIATING ROD COMPLIANCE



As with most construction projects, a work breakout schedule was established, which quantified construction activities. There were approximately 300 work items tracked. Physical locations that were called out one way in the EIS and ROD were broken down into sub areas and renamed to match the Reclamation Project work breakout. OAS reviewed the EIS maps and compared those to the maps within the Project Status Report and devised a comparative table to identify work areas to EIS designated areas (Appendix A, Table A-2). OAS also generated a matrix that relates the work units to the ROD areas (Appendix A, Table A-3).

The monthly reclamation Project Status Reports were submitted to the POL throughout the reclamation period. There are 71 Project Status Reports, which are organized around work items. These reports contained maps of various work areas, percent completion within the work areas, photos of noteworthy activities, problems identified, change orders, and work item closeouts.

There are discussions within the Project Status Reports of design changes and variations that *"meet the intent of the ROD"*. These are generally in the form of letters of transference of a design change or discussion forwarded to the BIA and POL for review or approval. The design packages that were actually submitted were not attached to the Project Status Reports that OAS received. When a reference to a letter of approval was discussed in the Project Status Report, it was impossible to link that acceptance to a specific design change. There were no letters available with attachments that stated that there was a deviation from the ROD requirement and delineating the accepted change with a three party signature. The Change Orders listed were for quantity changes that affected the contract price.

As each work item was completed, field inspections by the three agencies (Pueblo of Laguna, Bureau of Indian Affairs, and Laguna Construction Company) were conducted and all three agencies signed off on each work item, signifying agreement with the manner of the work, completeness of the work and payment approval. This is the only formal documentation of approvals of work that could be found. Pueblo of Laguna, *"Jackpile Reclamation Project, Pueblo of Laguna, New Mexico"*, Volume 1 of 2 – Completed Work Packages, 1989-1991, contains the signoff forms from the 3 agencies approving closeout of a work item and payment approval. Volume 2 of 2 was never located. To supplement this document, OAS reviewed each Project Status Report and logged whether activity took place on that work unit and if it was listed as closed out. The matrix tracking the work unit progress is presented in Appendix A, Table A-4. This table is used to indicate the approval of the work by the three agencies, each of who had a field inspector. Absent more direct documentation, OAS has used the Project Status Report summaries to indicate that the parties involved signed off on the work as either conforming to the requirements of the ROD or an authorized deviation from the ROD.

IV. ROD COMPLIANCE

Most current RODs are prepared in a manner that specifies certain environmental criteria that must be met, but do not specify the methods required to meet the environmental goals. The Jackpile ROD was written in a different manner in that it specified certain engineering approaches that were to be initiated during reclamation, which would meet the goal of stability and the protection of human and animal health and safety rather than specifying environmental compliance thresholds. Consequently, there were some difficulties in determining if compliance with the ROD items was met. There were instances in which the letter of the ROD was met but the intent was not met. Conversely, there were cases in which the letter of the ROD was not met, but the intent or goal of the ROD was met.

For an example of the first instance, the ROD specified that an erosion control structure was to be installed along the Rio Moquino. The structure was installed as required, but the bank below the toe of the waste pile is eroding in spite of the control structure. If the erosion continues, the waste pile could be compromised at some time in the future, which is contrary to the intent of the ROD.

There are also a couple of examples that were evaluated in which the prescribed engineering design was not performed, but in which the goal of the ROD was met. The first involved an area on the Rio Moquino where a structure designed to prevent headcutting was not installed, but the in situ sandstone formation prevented further erosion. A second instance where the letter of the ROD was not followed but the intent was met, was where a gabion drop structure was to be installed on the Rio Moquino at a road crossing. The Rio Moquino washed out of its old channel and the rivers' new channel does not require an erosion control structure to prevent exposure of the waste pile.

In general, the purpose of the OAS evaluation of whether the approach to each ROD item was compliant or non-compliant, was to determine whether the intent of the ROD was met rather than the letter of the ROD.

In this section, the ROD is examined point by point for compliance. Where there is direct proof of compliance it is presented and referenced. Where there is deviation from the ROD, justification is presented where there is authorization documented or implied through contractual signoffs. If there appear to be unauthorized deviations, then discussions present potential impacts of the deviation.

It should be noted that the Reclamation Team recognized that strict compliance to the letter of the ROD was not anticipated, as reflected in the following from a May 9, 1990 summary of recommendations that were forwarded to the POL Council and BIA for approval. (*"Jackpile Reclamation Project, Final Design Recommendations for BIA Approval"*, May 9, 1990, pg 2, ¶ 4).

"These items are felt to be within the "spirit" of the ROD and consistent with the Decision Factors (Page 3 of the ROD) but may not necessarily be to the "letter" of some of the specifics in the ROD Measures. However, enough new information has become available to the responsible parties on the Project (from late 1989 to the present) which have identified opportunities to better meet the longer term goals and objectives in a more cost-effective way utilizing current industry practice. Many of the design conditions have changed since the early and mid-1980's; field conditions at the Jackpile site have been identified which make compliance with the "letter" of the ROD virtually unachievable in some cases and financially burdensome to the POL in others."

ROD Requirements
The ROD requirements are presented in ***Bold Italics***.

1. ***PIT BOTTOMS***

   A. ***Backfill Levels:***

      1. ***Pits will remain as closed basins. Pit bottoms will be backfilled to at least 10 feet above the Dames and Moore (1983) projected ground water recovery levels as indicated below. A schematic diagram is shown in the FEIS, Appendix A (Figure A-1, DOI Proposal):***

Pit:	*Proposed Minimum Backfill Level:*
Jackpile 41	*5,939 ft. amsl*
North Paguate 20	*5,958 ft. amsl*
South Paguate 34	*5,995 ft. amsl*
South Paguate 35	*6,060 ft. amsl*

The minimum back fill levels can be confirmed by the survey data presented for ground elevations at the pit wells. The LCC provided the following survey

information for the monitoring wells installed in the North and South Paguate Open Pits. Additional wells were installed in the Jackpile Pit in April 2007.

Table 1
Monitor Well Survey Information

WELL ELEVATION			TAKEN: 3-31-92 By: LCC, Inc.	
LOCATION	**N**	**E**	**GROUND ELEVATION**	**TOP CAP ELEVATION**
North Paguate NP-OP-20 W	1,504,823.95	638,745.96	5966.2	5968.17
North Paguate NP-OP-20 E	1,505,123.28	641,582.11	5961.85	5963.93
South Paguate SP-OP-34	1,500,641.39	637,928.55	5995.04	5997.84
South Paguate SP-OP-35	1,501,033.20	634,954.17	6060.89	6031.21
Jackpile JP-OP-41 S	1,505,868.90	648,232.78	5939.80	5943.40
Jackpile JP-OP-41 N	1,508,348.33	649,080.80	5937.37	5941.07

Based on these provided surveyed finish grade ground elevations at the monitoring wells in the Paguate pits, the elevations match or exceed the minimum elevations proposed by Dames & Moore in the ROD.

Conclusions – All monitoring well installation indicate that the minimum finished grades were achieved.

Recommendations - Based on the fact that backfill elevations in all cases met or exceed the minimum proposed backfill level(s), the ROD objective has been achieved.

2. ***A groundwater recovery level monitoring program will be implemented. Additional backfill will be added as necessary to control ponded water. The duration of the monitoring program will be a minimum of 10 years.***

This item requires that monitoring be performed to assure that the ROD projections were accurate in predicting groundwater elevation recovery levels. There were only four years of groundwater elevation data found for the North and South Paguate Pit Wells. The Jackpile wells were installed in April 2007 and sampling for 2007 indicates all pit wells, except NP-OP-20W, met the 10-foot separation required in the ROD. The NP-OP-20W well was found to have a

groundwater elevation of less than five feet consistently, as indicated in bold in the following table.

Table 2
Groundwater Elevations in Pits

Wells	NP-OP-20E	NP-OP-20W	SP-OP-34	SP-OP-35	JP-OP-41N	JP-OP-41S
Dates						
1996						
1997						
1998						
1999	29.91	**3.88**	19.4	75.5		
2000						
2001						
2002						
2003						
2004	31.87	**4.35**	18.15	81.33		
2005	31.62	**3.29**	17.6	71.57		
2006	31.4	**3.33**	17.46	70.88		
2007	31.80	**4.22**	19.04	70.86	32.85	38.99

Blank fields indicate no data was provided

Discussion - From the OAS site inspection, there is a permanent pond/wetland area in the North Paguate pit. A photograph of this ponded area is found in Appendix B, Photo B-1. This photo contains the NP-OP-20W well shown near the ponded area. The water table elevation of that well is not compliant with the ROD. The ponding is also evidenced by aerial photos (Appendix E) and established wetland vegetation species. Although, the Jacobs Environmental Monitoring Plan required that all ponded water within the pits be monitored annually for chemical constituents, there was no water quality data for this ponded area. A sample was collected from the NP Pond in 2007 which indicates elevated concentrations of radiologicals. These results are discussed in Section 10-Monitoring. Additional sampling and assessment of this situation will be needed to draw conclusions on the risk to humans, wildlife or domestic stock.

2006 was a very wet year with significant standing water in all three pits for most of the summer's duration.

Conclusions - Based on the fact that there is little elevation data where ten years of data are required and only one sample of the ponded water, accordingly, this aspect of site reclamation is considered ***non-compliant*** with the requirements of the ROD.

Recommendations -

- During preparation of this report, OAS made the recommendation that the two wells required by the ROD should be installed in the Jackpile Pit. This was done in April 2007
- Water table elevations should be monitored over a number of years to determine if the levels have stabilized, or are increasing or declining in order to evaluate whether the 10-foot below surface requirement is being met.
- Ponded water, wherever found within the pits, should be collected for chemical and radiological analysis.

These data can then be used to assess the risk of ponded water. The data can then be analyzed to determine if the water is groundwater or surface water and whether the chemical constituents or radiological levels present a threat to wildlife, domestic stock, or humans. As wetland areas are diverse ecosystems that are widely valued, it may be prudent to leave the North Paguate area as a wetland if the risk analysis so justifies. If chemical or radiological analysis indicates an unacceptable risk, then the ROD requirement to add additional fill to low areas would be warranted.

B. ***Backfill Materials:***

Backfill materials will consist of protore, waste dumps H and J, and excess material obtained from waste dump resloping and stream channel clearing. These materials will be covered with 3 feet of overburden and 2 feet of topsoil (i.e. Tres Hermanos Sandstone or alluvial material).

Waste Dumps H and J were not moved into the pits. Per M. Sarracino, their volumes were not required and the distance to move them was deemed prohibitive. Waste Piles H and J were sloped/terraced/seeded. Photos B-2 and B-3 show stable, vegetated waste piles H and J, respectively.

Project Status Reports document protore movements in the North Paguate, (Report No. 20), South Paguate (Report No. 26) and Jackpile (Report No. 43) Pits.

Activity codes in group 2E1 were authorized for payment for backfill movement. Table A-3, Appendix A, delineates which protore and waste piles were affiliated with which work units. Based on the Project Status Reports, backfilling took place in the following time frames:

Jackpile Pit	May 1991 through December 1994
North Paguate Pit	November 1991 through April 1991
South Paguate Pit	September 1990 through September 1991

There were approved design changes for required cover depths that are described later in Section 3c.

Conclusions - Although, Dumps H and J were not moved, there appears to be substantial compliance to the ROD. There was sufficient backfill material in proximity to the pits that Dumps H and J volumes were, in fact, not needed. The cover, slopes, and vegetation on these waste piles appear to be stable.

Recommendations – No further activities are recommended at this time.

C. ***Stabilization:***

All backfill slopes will be reduced to no greater than 3:1 (horizontal to vertical). Surface water control berms will be constructed within pit bottoms to reduce erosion and retain soil moisture for plant growth. Surface runoff will also be directed to small retention basins in the pit bottoms. All areas in the pits will then undergo surface shaping, topsoil application, and seeding as outlined under "Revegetation Methods" below.

1. Sloping

Project Status Report No. 11, dated June 1990, included remarks relating to changes in the sloping requirements listed in the ROD. This includes summary milestones (Section 2.4 MILESTONES):

- *"Michael Bone, P.E. of Roy F. Weston, Inc. submitted the final design criteria for slope heights, lengths, and terracing specifications."*

- *"Water Mills (Acting Asst. Secretary, Bureau of Indian Affairs, Washington, D.C.) formally approved the design changes submitted to George Farris in May 1990. These design changes will be incorporated into all future planning efforts."*

Project Status Report No. 11 also contains a memorandum (attachment) received June 12, 1990 from Acting Assistant Director of Indian Affairs, Walter Mills approving the design changes (pg 2, ¶ 2 & 3):

"On May 15, 1990, a new reclamation design criteria was presented by Landmark/Weston for BIA approval. This design criteria is important in that it sets basic design criteria while allowing for the flexibility necessary for the LCC and the Bureau to make some decisions on a case-by-case basis. The re-design will also eliminate the long slopes that are now required and at the same time result in a more stable slope design. This will also allow the project to blend more aesthetically with the surrounding topography.

Because we view this as an improvement on the existing design, I hereby approve the criteria set forth by Landmark/Weston on May 15. If there are any questions or if you need further assistance on this matter, please contact Mr. George R. Farris at FTS 268-4791."

Conclusions - There appears to be ***non-compliance*** to the letter of the ROD requirements in regard to the sloping. But many deviations were approved. It is difficult to determine pile by pile what exactly was done according to the ROD 3:1 sloping requirement and/or in accordance with the approved changes. In the OAS site inspection, there were no observed problems with the slope grades. Although there are deviations to the ROD, they appear to have met the intent of the ROD.

Some of the long runs of the terracing do appear to cause chronic blow-outs in some areas due to the pressure head of water building up along the terrace berm. The terracing problem is further discussed in Section 3e of this report.

Recommendations - There are no corrective actions recommended

2. Pit Berms and Retention Ponds

After reclamation was complete, the pit bottoms were contoured and there is no evidence that berms or retention ponds were installed. Therefore, it is unknown if that was done during reclamation.

Conclusions – The pit berms and retention ponds are not believed to be a concern for post closure health and environmental risks.

Recommendations – No further activities are recommended.

D. ***Post-Reclamation Access:***

Human and animal access to pit bottoms will be prevented with the use of sheep-proof fencing due to the uncertainties of predicting radionuclide and heavy metal uptake into plants (forage).

The reclamation construction specifications (Jacobs Engineering Group, Inc., *"Jackpile Project, Construction Specifications"*, August 1989) detailed a different type of fencing: four strand barbed wire, as shown in the project specifications. (Division 2, Sitework, Section 02833, Fences and Gates, pg. 2-36)

"2.1 MATERIALS

A. Reusable materials salvaged from demolition work specified in Section 02060 shall be utilized, to the extent practical, in the construction of the fence and gates specified in this section.

B. Fencing shall include posts, barbed wire, and all appurtenances and accessories required for complete installation.

C. Barbed wire shall conform to the requirements of ASTM A121, and shall consist of four lines of double stranded 12 ½-gage galvanized wire with

either 2-point or 4-point barbs spaced at 5-inch intervals. Galvanizing shall be Class 3.

D. Line post shall be galvanized tee, channel, or U-bar shapes, 1.33 pounds per foot.

E. Braces shall be 9-gage wire, twisted to tighten.

F. End, corner, and pull posts shall be 2-inch Schedule 40 galvanized steel pipe, or galvanized steel angle section 2 ½ x 2 ½ x ¼ inches.

G. Hardware for connecting members shall conform to commercial standards."

The fencing installed appears to be on the perimeter of the mine site rather than the pit bottoms. The fencing is the four strand barbed wire rather than the sheep-proof fencing called for in the ROD. Photo B-4 in Appendix B, is a photo taken of the fencing as it was installed in September 1990.

Based on Project Status Report No. 32, March 1992, and sightings during inspections of the site in 2006, there appears to be ongoing problems with cattle and horses entering the mine site in general, and the Jackpile pit bottom in particular. The existing fencing does not impede access of domesticated or wild animals.

The OAS 2006 report *"Jackpile-Paguate Uranium Mine Post-Reclamation, Soils and Plant Uptake Analysis"* concludes that vegetation growing on the reclaimed mine presents a minimal potential for hazards to domestic livestock or human health due to the low or normal concentrations of metals and radionuclides.

Based on sampling of the monitoring wells in the North Paguate and South Paguate pits, and the newly installed Jackpile wells, there are very high concentrations of radionuclides in the groundwater. Similarly, the 2007 sampling of the NP Pond indicates high concentrations of radiologicals in that surface water feature, which is readily accessible to grazing animals. Limited well construction information or water table elevation data were available, so conclusions cannot be drawn as to whether the water is surface water in origin, perched water, or true groundwater. Further investigation is necessary to determine the risk involved from access by humans or animals.

Conclusions - There appears to be substantial ***non-compliance*** with both the letter and intent of this Rod requirement. The fencing is clearly inadequate to prevent grazing. Installation of the perimeter fencing was approved in 1989. The perimeter fencing cannot be removed and should be maintained. One or two additional sampling events need to be conducted in the North Paguate pit. Additional backfilling or permanent fence installation at North Paguate may be required based on those sampling events.

Recommendations – Additional monitoring and risk assessment is required to determine if there is any potential for impairment to the natural resources (both water and vegetation) that are needed for grazing domestic animals and wildlife. Pit bottoms need to be fenced until a recommended risk assessment is completed.

2. *PIT HIGHWALLS*

A. *Jackpile Pit Highwall:*

The top 15 feet of highwall will be cut to a 45-degree slope. All soil and unconsolidated material at the top of the highwall will be sloped 3:1. The highwall will be scaled to remove loose debris.

B. *North Paguate Pit Highwall:*

The top 15 feet of highwall will be cut to a 45-degree slope. All soil and unconsolidated material at the top of the highwall will be sloped 3:1. The highwall will be scaled to remove loose debris. Additionally, the highwall will be fenced with 6-foot chain link.

C. *South Paguate Pit Highwall:*

The top 15 feet of highwall will be cut to a 45-degree slope. All soil and unconsolidated material at the top of the highwall will be sloped 3:1. The highwall will be scaled to remove loose debris. Additionally, the highwall will be fenced with 6-foot chain link.

The Jacobs Environmental Monitoring Plan states that blasting to reduce highwall slopes will be considered "OPTIONAL" work package items dependent on funding and POL desires.

Work on the highwalls started with the highwalls of the South Paguate Pit. There were objections to the blasting from the Paguate Village. Project Status Report No. 9, April 1990, references a Seismic Study and Project Status Report No. 11, June 1990, a Blast Study documenting damage too many of the buildings in the Village. Photos B-5, B-6, and B-7 in Appendix B, show present day conditions of several of the highwalls.

There is a two page document entitled *"Jackpile Reclamation Project, Final Design Recommendations for BIA Approval"* dated May 9, 1990, which summarizes several design variations. A signed copy of approvals and authorizations was not found. The following excerpt relates to the highwalls (pg. 2, ¶ 1).

> *"7) Some highwall trimming and scaling is seen as unnecessary and infeasible in some cases due to natural stabilization along alluvial material (mostly in the South Paguate-west end) and lack of safe access (places to*

safety situate heavy equipment). Along the Jackpile pit crest on Gavilan Mesa (where the presence of extremely competent Tres Hermanos Sandstone has showed no visible weathering or hazardous conditions) the trimming requirement would require blasting. Blasting has already had to be used to stabilize a portion of the South Paguate pit, but objections from the Pueblo on the use of blasting have precluded any future use of it for trimming or scaling."

A memorandum dated April 23, 1991 from J.H Olsen, Jr. to Governor Harry Early documented POL Council approved design changes and recommended forwarding description of changes to the BIA for approval. A signed copy of the approvals and authorizations was not found. One of the changes was to abandon the highwalls and allow them to erode naturally. The following is the relevant excerpt from the 1991 memorandum. (*"Pueblo of Laguna Council, Reclamation Project Issues"*, April 23, 1991, pg. 3, ¶ 2)

c) HIGHWALL TRIMMING & SCALING

Evaluation of the highwall trimming and scaling requirement has prompted questioning of its need and value. Operationally, the activities are extremely difficult to achieve because of inaccessibility and risk to equipment operators. Experience with drilling and blasting techniques in the spring, 1990 proved objectionable due to the potential blast damage in Paguate. (Many highwalls could only be trimmed and scaled with blasting techniques due to the presence of hard sandstone materials on the highwall crests and the danger of putting heavy equipment next to the edges.) Scaling probably loosens up more material than it effectively removes. Trimming of the crests would also enhance erosion since runoff would have more surface area on which to collect and run off. It is recommended that trimming and scaling requirements be suspended since it is judged that, over time, the highwalls will revert to a stable state much the same as natural mesas adjacent to the site which are composed of the same geologic materials. As mentioned, drilling and blasting is the only way to trim and scale some highwalls and the blast damage to structures in Paguate could actually aggravate the problem experienced from the active mining area. The unspent funds from this activity could be used to help repairing already-identified damage."

Work Units covering the trim and scaling of highwalls are 2E5. All work on these activities ceased in December 1991.

Four-foot high chain link fence was installed in the South Paguate area that was blasted. No fencing was observed in any other highwall areas.

Conclusions - This aspect of site reclamation is considered compliant with the desires of the Pueblo of Laguna and the deviation from the ROD requirements is well substantiated with the results of the blast studies. The Jacobs

Environmental Monitoring Plan listed this approach as an option that could be based on the wishes of the Pueblo of Laguna.

Recommendations - A field assessment of the highwalls and Old Highway 279 should be made periodically to make sure that the highwalls do not comprise a threat to normal Pueblo of Laguna activities, or if additional fencing or other corrective measures are required during the erosion process. If significant hazard potential is present, other means of slope reduction should be evaluated, such as ripping, or alternatively, localized berming or other protective measures may be warranted. The south-facing wall at the North Paguate pit also needs to be periodically assessed to assure that it is eroding sufficiently to cover the exposed Jackpile Sandstone, as planned.

3. *WASTE DUMPS*

a. Waste dumps H and J will be relocated to Jackpile pit as backfill.

As discussed in ROD Requirement C above, Waste Dumps H and J were not moved into the pits. Their volumes were not required and the distance to move them was deemed prohibitive. Waste Piles H and J were successfully sloped, terraced and seeded.

b. Most dump slopes will be reduced to 3:1 or less and the dump slopes will be contour furrowed; exceptions are noted in Table 1-4 of the FEIS.

As discussed in ROD Requirement C, there are references in several Project Status Reports (Reports No. 1, 6, 7, 9, 11, and 13) regarding variations to 3:1 sloping of waste piles.

A memorandum dated April 23, 1991 from J.H Olsen, Jr. to Governor Harry Early (*"Pueblo of Laguna Council, Reclamation Project Issues", April 23, 1991)* documented POL Council approved design changes and recommended forwarding description of changes to the BIA for approval. A signed copy of the approvals and authorizations was not found. Some of the changes related to deviations from the 3:1 sloping criteria. The following are the relevant excerpts from that memorandum.

Jackpile Area - (pg. 2, ¶ 1, 2 & 3)

"SPECIAL CASE DESIGN NO. 2- JACKPILE WASTE DUMP JP-WO-03: This dump was originally to be sloped at 3:1 and placement of more topsoil over the entire area. The top of this dump already meets the revegetation standards and as much as is practical will be salvaged when the 3:1 slope is cut. Grading to help channel the runoff to eliminate long term erosion in this area will help its stability. The revised design cost is estimated at this time to be equal to the Jacob's estimate of $330,000 for the sloping work.

"SPECIAL CASE DESIGN NO. 3- JACKPILE WASTE DUMP JP-WS-19: This dump, when sloped to 3:1 would move material off the site onto the Cebolletta Land Grant. To avoid this, the top of the dump will be moved southward into the Jackpile Pit until the height is reduced to allow for 3:1 sloping and keep this material on the Project Site.
Estimated cost for the sloping work is $540,000.

"SPECIAL CASE DESIGN NO. 4- GAVILAN MESA DUMP JP-WS-01: This dump cannot be dozed to 3:1 without blasting the existing mesa which is in the backslope. No provisions for blasting costs and its associated potential shock effects had been made in the original design. This is the most visible dump on the site and the visual characteristics of the finished slope needed to be considered. The recommended approach is to cut the top of the dump down to a level where the natural mesa is exposed; this will blend in with the surroundings and the remaining material will be sloped down to the 3:1 criteria and revegetated. Estimated cost at this time is judged to equal the Jacobs estimate of approximately $340,000."

South Paguate Area - (pg. 2, ¶ 4)

"SPECIAL CASE DESIGN NO. 5- OAK CANYON WASTE PILE SP-WO-06: This dump is north of the LCC shop area and runs along the north side of the Oak Canyon. Sloping of this dump to the 3:1 criteria had several difficulties: destroying and covering up the natural conditions in the canyon, upsetting the already-stable dump by increasing the potential for water runoff, original work schedule for this effort interfered with the topsoil stockpile removal, and the presence in certain spots of natural rock outcroppings which could not be done with existing equipment. The recommended treatment is to leave the dump as is and increase the vegetative cover using hydroseeding techniques. If this operation is not adequate, future sloping and additional topsoil placement could be done at the POL's direction.
Elimination of the sloping/soil cost in the Jacobs estimate is offset by the revegetation expense."

Although the letter of the ROD was not met, the approved modified methods (i.e. sloping) appear to have been put in place successfully. There have been no observed problems associated with the modifications that were implemented.

c. Dumps which have Jackpile Sandstone on their outer surface and any Jackpile Sandstone exposed during resloping will be covered with 3 feet of overburden and 18 inches of topsoil.

The cover requirement for the Jackpile Sandstone was reduced to a 1.0-foot radon cover and 1.5 feet of soil by the construction specifications, as shown below. (Jacobs Engineering Group, Inc. *"Jackpile Project, Construction Specifications"*, August 1989 – Division 2, Sitework, Section 02000, Earthwork, 3.5 Fill Construction, pg. 2-16)

"4. Cover Construction:

a. The Contractor shall place cover material at the locations and related thicknesses shown on the drawings. The requirements listed in Table 1 shall be followed unless otherwise shown on the drawings or directed by the Engineer:

TABLE 1

Surface Material Thickness	***Radon and Soil Cover***
Mancos Shale	*Soil – 1.5 ft.*
Tres Hermanos Sandstone	*None required*
Alluvium	*None required*
Jackpile Sandstone - Ore Associated Waste (greater than 40 percent of total area – outside of pit)	*Radon Cover – 1.0 ft.* *Soil – 1.5 ft.*
Jackpile Sandstone - Ore Associated Waste (greater than 40 percent of total area – inside of pit)	*Radon Cover – 1.0 ft.* *Soil – 2.0 ft.*
Jackpile Sandstone - Protore (inside of pit)	*Radon Cover – 1.0 ft.* *Soil – 2.0 ft.*
Mixed Material (Jackpile Sandstone less than 40 percent of total area)"	*Soil – 1.5 ft.*

c.(1) Shale Cover

The ROD required numerous areas to be covered with a radon barrier of shale prior to placement of topsoil. The requirements of the ROD are listed in the following table. These areas included both in situ ore left un-mined inside the pits and locations outside the pit from where protore was moved inside the pit. The reclamation team field verified shale layer depths and their measurements are summarized below. The field sheets from which these data were summarized are included in files labeled 'Shale Cover Data' in the project electronic library. The list was reviewed by M. Sarracino, and it appears to be comprehensive and the finished depths in compliance with the ROD requirements.

Table 3
Shale Layer for Radon Cap, Field Verification Depths

LOCATION Measured	JSS-Ore Inside Pit (min. 12")	Protore (min. 12")	Mixed Material (min. none)	Radon Barrier Shale Depth (inches)		Gamma after Shale Placement (mR/h) *
NP-D3-D2	X			min	12	13.7
				max	13.71	
NP-PS-13		X		min	12	No Data
				max	14.14	
NP-PS-14, 15		X		min	12	20.5
				max	12.7	
SP-PS-01		X		min	12	No Data
				max	13.07	
SP-PS-02		X		min	12	13.8
				max	12.3	
SP-PS-38		X		min	12	No Data
				max	12.7	
SP-WO-04			X	min	12	10.9
				max	13.43	
SP-WO-10			X	min	No Data	No Data
				max	No Data	
SP-WO-13			X	min	12	No Data
				max	14.1	

** Target Gamma concentration after cover placement was less than 2 times background (14 mR/h)*

c.(2) Topsoil

The ROD required numerous areas to be covered with Top Soil to a specified depth. The requirements of the ROD are listed in the Table 4. The reclamation team field verified top soil layer depths and their measurements are summarized below. The field sheets from which these data were summarized are included in files labeled 'Soil Cover Data' in the project electronic library.

Four categories of areas are listed in Table 4:

1.) Mancos Shale - Areas with the letter "S" opposite them are areas that served as sources of shale for radon barrier material. After the material for cover was removed these required 18" inches of topsoil according to the ROD. This appears to have been confirmed.
2.) JSS-Ore Inside Pit – These are areas of in situ un-mined Ore inside the pit which was covered with shale in an earlier step and required 24" of topsoil according to the ROD. There appears to be a deviation from the ROD and a targeted depth of 18 inches of topsoil for this category. It is unclear if this is a documented approved change in requirements.
3.) Protore - Protore stockpiles were placed into the pit and their locations documented for potential future use. These areas like the un-mined ore required

24 inches of topsoil on top of the shale radon barrier. There appears to be a deviation from the ROD and a targeted depth of 18 inches of topsoil for this category. Again, it is unclear if this is a documented approved change in requirements.

4.) Mixed Material – These areas are waste piles outside the pit that were sloped/contoured and covered with 18 inches of material. This is in accordance with the ROD and the depths were confirmed. Within the fourth category is a top soil source area marked "T". This was an area where topsoil was mined for cover. It is an area that should require no cover and not be covered by the ROD.

Table 4
Top Soil Layer, Field Verification Depths

Location Measured	EIS Map Label	Mancos Shale (min.18")	JSS-Ore Inside Pit (min.24")	Protore (min.24")	Mixed Material (min.18")		Top Soil Depth (inches)	Gamma After Shale Placement (mR/h)
JP-PS-24	SP 6a			X		min	20	
						avg	21.7	
JP-WO-06	H				X	min	18	
						avg	19.4	
JP-WO-05	J				X	min	18	
						avg	20.5	
JP-D12	???				X	min	18	
						avg	20.2	
JP-WS-17	FD-1	S				min	18	
						avg	18	
JP-WT-16	???				T	min	18	
						avg	18	
JP-PS-27	J1			X		min	18	
						avg	18	
JP-WS-15	A & B	S				min	18	
						avg	18	
JP-OP-41	Pit Bottom		X			min	18	
						avg	18	
NP-D1	Pit Bottom		X			min	18	10.6
						avg	19.8	
NP-D-2&3	Pit Bottom		X			min	18	
						avg	21.0	
NP-D4, NP-PS-13	SP-1			X		min	18	
						avg	20.83	
NP-PS-16	10. SP-2-D, SP-1-C			X		min	18	
						avg	20.77	
NP-D-5	NP-PS-14, 15			X		min	18	
						avg	19.7	
SP-CS-38	K & L				X	min	18	10.65
						avg	19.77	
SP-WO-04	Q & R				X	min	18	18.46

Location Measured	EIS Map Label	Mancos Shale (min.18")	JSS-Ore Inside Pit (min.24")	Protore (min.24")	Mixed Material (min.18")		Top Soil Depth (inches)	Gamma After Shale Placement (mR/h)
						avg	20.7	
SP-OP-34	Pit Bottom		X			min	18	14.34
						avg	19.11	
SP-OP-35	Pit Bottom		X			min	18	13.9
						avg	20.8	
SP-WS-18C & 20		S				min	18	13.9
						avg	18.5	
SP-PS-01	SP-1A			X		min	18	
						avg	21.1	
SP-PS-02	4-1			X		min	18	9.6
						avg	19.6	
SP-WO-10	Pit Bottom				X	min	18	10.13
						avg	21.17	
SP-WO-13A	Pit Bottom				X	min	18	9.1
						avg	18.9	
SP-WS-37	Pit Bottom	S				min	18	
						avg	20.11	

The topsoil covers were placed on sloped and contoured surfaces and then seeded. The target cover depth for all areas appears to have been 18 inches and 18 inches were achieved The target of less than 2 times background (with background 14 mR/h) appears to have been achieved in areas where it was monitored.

d. Berms will be installed on all dump crests to control erosion. All dump tops will slope slightly away from their outer slopes. Dump slopes will be contoured so their toes are convex to prevent formation of major gullies on slopes.

Erosion control berms were installed. As shown in an early photograph from Project Status Report No. 14, September 1990, Figure 6, B-8 shows the berms as constructed and recent OAS 2006 photos B-9 and B-10, Appendix B, indicate that they continue to retain precipitation event runoff.

Discussion - The berms and contouring are working well except in limited cases where the excessive berm length causes too large a buildup of water resulting in predictable, chronic blow-out areas. Photos B-11 and B-12, Appendix B, show areas of chronic blowouts, due to water build up on long berm runs. The locations presented in Table 5 have been observed by M. Sarracino and Laguna Construction Company (LCC), to have chronic erosion problems. Maps indicating these areas are presented in Appendix C (Exhibits 1 and 2).

Table 5
Areas with Chronic Erosion Problems

LOCATION	DESCRIPTION
Jackpile Area:	Area Y, Y2, X along terraces at, or around, transitions between piles
	Area A, B, FD-3 along terraces at, or around transitions between piles
	Area W & V at the drainage areas against natural mesa
	JP-WS-17, JP-WT-16 Y FD-1 drains along roadways and drains
North Paguate Area:	N2 at east end of drain system
	Area S, T, N at transitions between piles on slopes, drains
South Paguate Area	SP-WS-20, SP-WT-19 along slopes and drainage areas
	SP-WS-17, SP-WS-13A at drainage area
	SP-WS-07 at drainage area
	Q, R, Main Access Road slopes and drainage areas

Conclusions - OAS considers the non-use of dumps H and J (as backfill) to be a non-substantive variance from the ROD requirements, given that the features were otherwise closed in accordance with specified procedures. Issuance of Construction Specifications with alternate cover requirements from the ROD, implies an acceptance of those new depths by the relevant parties. However, the berming design that was implemented for the reclamation did not perform as expected. The areas of chronic erosion blow-outs will be considered non-compliant if radioactive material is exposed or RAD levels exceed the specified limits.

Recommendations - An evaluation of the chronic blowout areas, to determine if solutions can be designed to relieve these continuing maintenance problems, is recommended. Erosion should be monitored with appropriate equipment to determine if radiological safety is a concern. If the underlying material is non-RAD emitting, the slopes may be allowed to erode naturally.

e. Additional surface treatment is outlined under "Revegetation Methods" below. Detailed modifications and treatments are presented in Table I-4 of the FEIS.

Revegetation will be discussed in detail in Section 9 - Revegetation Methods.

4. PROTORE STOCKPILES

All protore will be used as backfill material in pit areas. Backfill will be covered with 3 feet of overburden and 2 feet of Tres Hermanos Sandstone or alluvial material.

As discussed in section 3c, the cover depths for the protore were revised by the construction specifications. The cover requirement for protore was established in the specifications, as a 1.0-foot radon cover and 2.0 feet of soil.

Protore was moved under Work Units 2E1N into the North Paguate Pit between December 1989 through closeout in April 1991 (Appendix A, Tables A-3 and A-4).

The quantities for these movements are listed in Project Status Report No. 20, March 1991, attachment.

Protore was moved under Work Unit 2E1S02 into the South Paguate Pit between April and May 1991 (Tables A-3 and A-4). The quantities for these movements are listed in Project Status Report No. 26, September 1991, attachment.

Protore was moved under Work Units 2E1J into the Jackpile Pit between May 1991 through closeout in April 1993 (Tables A-3 and A-4). The quantities for these movements are listed in Project Status Report No. 43, February 1993, attachment.

There are field records available where remediation technicians verified cover depths of shale placed on protore areas and depths of top soil on a variety of areas. These are found in the Library under "Shale Cover" and "Top Soil", respectively. Probes were used and depths recorded on 100-foot by 100-foot grids. In some cases gamma survey results after placement of shale, were also available. Those data are summarized in Tables 3 and 4 above in section 3c.

Conclusions - While the letter of the ROD was not met, the revised shale barrier depth was met in all cases tested. The top soil cover was less than the revised 24 inches, but in all cases it was at least 18 inches. The gamma concentration, after placement of the cover, was below the criteria of twice background levels.

Recommendations - Although the covers did not meet the ROD or the reclamation specifications, the covers appear to be adequate for radiation safety concerns. No further action is recommended.

5. *SITE STABILITY AND DRAINAGE*

A. *Stream Stability:*

1. ***All contaminated soils and fill material within 100 feet of the Rio Paguate west of its confluence with the Rio Moquino, will be excavated and relocated to the open pits.***

There were numerous piles along the Rio Paguate. The following charts their movement based on work units:

Table 6
Movement of Contaminated Soils and Fill Material

Work Unit	Area Moved to North Paguate Pit	Date Closed
2E1N04	Move Protore 2E	Feb-90
2E1N05	Move Protore 10,SP-2-D, SP-1-C	Nov-90
2E1N06	Move Protore 10,SP-2-D, SP-1-C	Nov-90
2E1N07	Move Protore SP-1-A	Nov-90
2E1N11	Move Protore SP-1	Feb-90
2E4N01	Contaminated Soils	Sep-91
2E4N01 A	North Rio Paguate East	Dec-91
2E4N01 B	North Rio Paguate West	Dec-91

Photo B-14, Appendix B, shows the area along the Rio Paguate where the piles once were.

Conclusions - The reclamation actions appear to have been compliant with this item of the ROD.

Recommendations – No further activities are recommended.

2. ***For the Rio Moquino, waste dumps S, T, U, N, and N2 will be pulled back 50 feet from the centerline of the stream channel. The toes of these dumps will be armored with rip-rap.***

A memorandum dated April 23, 1991 from J.H Olsen, Jr. to Governor Harry Early (*"Pueblo of Laguna Council, Reclamation Project Issues", April 23, 1991)* documented POL Council approved design changes and recommended forwarding descriptions of changes to the BIA for approval. A signed copy of the approvals and authorizations was not found. One of the changes was to revise the approach for erosion control along the Rio Moquino. The following is the relevant excerpt from that memorandum (pg. 1, ¶ 3).

"SPECIAL CASE DESIGN NO. 1-RIO MOQUINO: This case involves removing any potentially contaminated material within the Rio Moquino area which could erode downstream. It eliminates the need for the re-channelization and heavy erosion control structures in the first design. A bench will be excavated on the west side dump and appropriate erosion controls will be placed as needed. Hydraulic analysis on the existing channel was performed by Weston Engineering as a basis for determining the action taken. Estimated cost is now $1,400,000 compared to the $1,900,000 in the Jacob's estimate."

The following work units cover the movement of the waste and protore piles along the Rio Moquino above the confluence and the Rio Moquino Erosion Control activities:

Table 7
Movement of Waste and Protore Piles Along the Rio Moquino

Work Unit	Area Moved to North Paguate Pit	Date Closed
2E1N02	Move Protore SP-2C	Sep 91
2E1N03	Move Protore 1 B	Nov-90
2E1N010	Move Waste Pile N	Sep 91
2E6N01 A	Pull Back Contaminated Soil Along Rio Paguate	Nov 94

Photos B-15, 16, and 17, Appendix B, show an archived POL photo from approximately 1994 and two 2006 photos of the Erosion Control along the Rio Moquino.

Conclusions - The material appears to have been relocated or pulled back and armored to the specifications of the ROD and the approved changes. The Landmark/Weston Design, (Landmark Reclamation/Weston, "*Jackpile Reclamation Project, Pueblo of Laguna, New Mexico, Draft Special Case Designs*", December 1990) with the approved changes, reduced the rigor of the original erosion protection. The approved design was implemented and the letter of the ROD was met. However, the intent of the ROD is not being met because the design was inadequate to prevent erosion of the banks below the toes of the waste piles.

However, significant erosion has taken place in the past 12 years. If erosion continues at the same rate, there is serious potential for exposure of waste or contaminated soil at the toes of Piles S, T, U, N, and N2. In view of the fact that a less rigorous redesign was approved after the ROD, this unexpected erosion is a problem. If the erosion continues, waste material will be exposed creating the potential risk of human and wildlife exposure to unknown hazards, and a threat to the water quality of the Rio Moquino.

Recommendations - A more thorough inspection and hydraulic analysis and erosion study needs to be performed to determine if additional erosion protection is needed along the Rio Moquino above the confluence. A control structure on the Rio Moquino above the Pueblo of Laguna section may also be considered.

3. ***A concrete drop structure will be constructed across the Rio Moquino approximately 400 feet above the confluence with the Rio Paguate.***

There was a six-foot drop at the main Jackpile haul road crossing of the Rio Moquino. A control structure was planned and included in the ROD. A flood occurred in July 1993 and is documented in Project Status Report No. 48, July 1993. There were no photos of the roadway crossing washout presented in that

monthly report. The local USGS gauging station was washed out with the flood so the precise size of the storm was not recorded. It is estimated to have been greater than a 100-year flood. The flood washed out the crossing and the route was abandoned. This is documented in Project Status Report No. 48. The access route to the Jackpile site was re-routed to a low water crossing southwest of the Jackpile, which is currently used. Since the old crossing is no longer used there is no need to place a drop structure.

Photo B-18, Appendix B, is a 2006 OAS photo of the Rio Moquino at the former road crossing. Aerial photographs were reviewed pre flooding (1992) and post flooding (1993), however, the solution was insufficient to illuminate that area.

Conclusions - Due to the flash flood event that caused the stream crossing to be relocated and changed the stream flow conditions, the Rio Moquino drop structure was no longer needed. Therefore, compliance with this ROD requirement is not applicable.

Recommendations – No further activities are recommended.

B. *Arroyo Headcutting:*

Arroyos south of waste dumps I, Y, and Y2, and the arroyo west of waste dumps FD-1 and FD-3 will be armored as shown in the FEIS Appendix A (Figure A-13). Other headcuts encountered during reclamation will also be stabilized by armoring.

The arroyo headcutting west of the waste dumps ended when the sandstone outcropping was encountered at the surface. It was determined that armoring was not needed to prevent further headcutting. An OAS 2006 Photo B-19, Appendix B, shows the sandstone outcropping. There has been no appreciable headcutting in the area since the outcrop became exposed. Headcutting areas are shown on the Base Map.

Conclusions - Based on OAS field inspection documented in the photograph, field conditions changed when the headcutting encountered a natural outcropping of sandstone. The sandstone impedes further headcutting negating the need for armoring. Therefore, this is considered a non-substantive variance from the ROD requirements.

Recommendations – No further activities are recommended at this time.

C. *Blocked Drainages:*

1. ***Waste dump J and protore stockpiles SP-17BC and SP-6-B will be removed to unblock ephemeral drainage on the south side of the mine site.***

Blocked drainages are shown on Exhibits 1 and 2.

Waste dump J was found to not be blocking the stream. Distance made it uneconomical to transport the waste into the Jackpile pit, therefore, it was not removed. It was sloped, covered and seeded.

Protore Pile SP-6-B move is documented in Project Status Report No. 43, February 1992. However, SP 17BC was not mentioned in the Jackpile Protore report attached to Project Status Report No. 43. An aerial photo dated 8-21-03 indicates that material has been removed from both those protore areas and revegetation is taking place. This can be seen in the areas just to the east of the remaining waste dump J. The aerial photo also supports the statement that waste dump J does NOT block any drainage.

Photo B-20, Appendix B, shows waste dump J in the background and the level ground in the front formerly contained the protore piles SP-6B and SP-17BC.

Conclusions - While the letter of the ROD was not met with regard to the movement of waste dump J, closing it in place appears to meet the intent of the ROD and no problems have arisen to date by this action. However, this area could be a physical hazard in that livestock could become entangled in the submerged fence, or stuck in the mud.

Recommendations – Because the land grant property is in close proximity to the Pueblo of Laguna, an effort should be made to jointly maintain the existing dirt banks and monitor the ponded water to determine if it presents any chemical or radiological hazard for domestic animals or wildlife. After the evaluation has been completed, a long-term solution may be devised.

2. ***Two blocked drainages north of FD-I and F dumps will remain blocked. The remainder of the minesite, excluding open pits, will drain to Rios Paguate and Moquino.***

The blockages to the north of FD-1 and F were left and subsequently a semi-permanent ponded area has formed north of the Jackpile Pit. An OAS 2006 photo B-21, Appendix B shows the large ponded area.

M. Sarracino reports the pond stretches onto the Trust Lands to the north. Cattle from these lands have watered at this pond and several have drowned, leading to damage claims against the tribe.

There are no other ponded areas outside the pit on the Indian lands, so the remaining areas appear to be draining to the Rio Paguate and Rio Moquino, as planned.

Conclusions - The letter of the ROD has been met. However, an unforeseen circumstance has arisen in that the ponded water appears to be at least a physical

hazard, and potentially a chemical and radiation hazard, for the neighboring landowners and the cattle that are grazed on that land.

Recommendations - Since grazing livestock have access to the ponded water, POL should sample the water to determine if it presents any chemical or radiological threat to the grazing animals. Additionally, the pond has been in the past, a physical hazard for the domestic animals. The area needs to be evaluated and a long-term solution devised.

6. *SURFACE FACILITIES/STRUCTURES*

A. *Lease No. 1:*

All buildings on Lease No. 1 (Jackpile lease) will be demolished and removed except for the Geology building, miner training center and buildings at the old shop and the open pit offices. The land surface (except pit highwalls and natural outcrops) will be cleared of radiological material (e.g., Jackpile Sandstone) until gamma readings of twice background, or less, are achieved. These areas will then be graded and seeded.

Site inspection indicated all structures were removed and the areas appear to be re-vegetated successfully. Although the ROD noted that some structures were to remain at the site, deterioration and safety issues required dismantling of these structures.

Radiological Clearance is discussed in Section 10-Monitoring of this report.

Table 8
Lease No. 1 - Facilities/Structures Status

Jackpile Lease No. 1	Proposed	Status
Geology Building at Housing Area	Leave in Place	Deterioration and Safety Issues required dismantling. Panels stored at LCC shop area
Miner Training Center at Housing Area	Leave in Place	Deterioration and Safety Issues required dismantling.
Old Shop Buildings across Highway	Leave in Place	Deterioration and Safety Issues required dismantling.
Open Pit Offices	Leave in Place	Asbestos and Safety Issues required dismantling.
All other buildings	Demolish	Deterioration and Safety Issues required dismantling.

The information in the Status column above was provided to OAS by M. Sarracino, January 30, 2007. He further stated that all areas were disked and seeded. Some of this can be substantiated in the memorandum, dated April 23,

1991 from POL Project Manager J.H. Olsen, Jr. to Governor Harry Early recommending approval by the council of Special Cases. (*"Pueblo of Laguna Council, Reclamation Project Issues", April 23, 1991)*

B. ***Lease No. 4:***

All structures and facilities associated with the P-10 mine and new shop, including all buildings, roads, parking lots, sewage systems, power lines and poles, will be left in place. All operational and maintenance equipment, including tools, machinery, and supplies will be removed. All permanent structures and land surfaces (except pit highwalls and natural outcrops) will be cleared of radiological material until gamma readings of twice background or less are achieved. These areas will then be graded and seeded. Non-salvageable contaminated buildings and materials will be removed to the pits for disposal.

A memorandum dated April 23, 1991 from J.H Olsen, Jr. to Governor Harry Early (*"Pueblo of Laguna Council, Reclamation Project Issues", April 23, 1991)* documented POL Council approved design changes and recommended forwarding descriptions of changes to the BIA for approval. A signed copy of the approvals and authorizations was not found. Some of the changes related to deviations from facilities demolition plan. The following is the relevant excerpt from that memorandum. (pg. 4, ¶ 1)

" d) REMOVAL OF REMAINING BUILDINGS

Two buildings at the P-10 site need to be dismantled so the required backfill and site cleanup around the decline can be completed. The old welding shop also needs to be dismantled since the sheet metal panels are deteriorating and becoming a potential hazard. The old Geology Building and the P-10 compressor building have already been dismantled and the materials stored in the LCC Shop Yard. Unless other direction is received by May 31, 1991, the buildings will be dismantled by the LCC Surface Crew and the materials placed in the LCC Shop Yard for future use. Prior to release of these materials, however, a radiological survey would need to be performed by Eberline in accordance with the Environmental Monitoring requirements."

Site inspection indicated all structures were removed and the areas appear to be re-vegetated successfully.

Table 9
Lease No. 4 – Facilities/Structures Status

P-10 Lease No. 4	Proposed	Status
Buildings	Leave in Place	Deterioration and Safety Issues required dismantling.
Roads	Leave in Place	Left in Place
Parking Lots	Leave in Place	Abandoned, graded and seeded
Sewage Systems	Leave in Place	Abandoned Pond, graded and seeded
Power lines & Poles	Leave in Place	Dismantled due to aesthetics and safety issues

Information presented in the Status column above was provided to OAS by M. Sarracino, January 30, 2007. He further stated that all areas were disked and seeded. Some of this can be substantiated in the memorandum, dated April 23, 1991 from POL Project Manager J.H. Olsen, Jr. to Governor Harry Early recommending approval by the council of Special Case Designs. (*"Pueblo of Laguna Council, Reclamation Project Issues", April 23, 1991)*

Table 10
New Shops – Facilities/Structures Status

New Shops	Proposed	Status
Buildings	Leave in Place	Left in Place, Active
Roads	Leave in Place	Left in Place, Active
Parking Lots	Leave in Place	Left in Place, Active
Sewage Systems	Leave in Place	Left in Place, Active
Power lines & Poles	Leave in Place	Left in Place, Active

C. *Access Routes:*

The four major roads within the mine site will be cleared of radiological material and left after reclamation for post mining use. These access routes include: 1) the access road from P-10 and the new shop area to State Highway 279; 2) the main road through the mine; 3) the road that passes between the housing area and North Oak Canyon Mesa and then proceeds to P-10; and, 4) road to Jackpile well No. 4. All other roads (except on lease No. 4) will be removed. These areas will then be graded and seeded.

Site inspection revealed the following status of the roadways covered by the ROD. Exhibits 1 and 2 show the locations of these routes.

Table 11
Access Routes Status

Roads	Proposed	Status
P10 & New Shops to Hwy 279	Leave in Place	Active, maintained dirt road
Main Road Through Mine	Leave in Place	Active, maintained dirt road
Housing and Oak Canyon to P-10,	Leave in Place	Abandoned, other access way
Road to Jackpile well No.4	Leave in Place	Active, maintained dirt road
All others except Lease No. 4	Grade & Seed	Abandoned, no maintenance, no grading or seeding.

The information in the *Status* column above was provided to OAS by M. Sarracino, on January 30, 2007. Photos B-22 and B-23, Appendix B, respectively show the P-10 Well features and the New Shop Well features.

D. *Water Wells:*

Jackpile well No. 4, the P-10 well, the new shop well, the old shop well, and the 3 wells with associated sheltering structures (near the housing area) will be left. The pumps, riser pipe, wiring, and water storage tanks will be removed. Wells established for future monitoring purposes will also be left. All wells will be capped to prevent dust, soil, and other contaminants from entering the well casing.

Table 12
Water Wells Status

Water Supply	Well Pipe	Pump	Riser	Wiring	Tanks
Jackpile No.4	capped	removed	removed	removed	removed
P-10	capped	removed	remains	remains	remains
New Shop	active	active	active	active	active
Housing area (3 wells)	closed	removed	removed	removed	removed

E. *Rail Spur:*

The rail spur will be left intact. The rail spur must be cleared of radiological material until gamma readings of twice background or less are achieved. The Quirk loading dock will be demolished and hauled to the pits.

Based on OAS site inspections, the Quirk Loading Dock was demolished and the rail spur remains.

Conclusions - Based on memoranda, discussions with M. Sarracino and an OAS field inspection, some features shown which were anticipated to be kept or salvaged were found to be of very poor condition. While not in strict compliance with the ROD, the demolition and disposal of additional facilities in no way impairs the environmental integrity of the project. Therefore, this is considered a non-substantive variance from ROD requirements.

Recommendations – No further activities are recommended.

7. *DRILL HOLES*

All drill holes will be plugged according to the State Engineer's requirements. A 5-foot surface concrete plug will also be placed in each hole. Any cased holes will have the casing cut off at the surface. In addition, areas around drill holes will be seeded. Any exploration roads not wanted by the Pueblo will be reclaimed.

Project Status Report No. 4, November 1989, reports that Work Item 2S1S05 is to plug drill holes. However, the report states *"There is no work to be done in this package. The CMC inspector has gone over the entire area where the drill holes were, and did not find a single one open."*

Conclusions - It is unclear what happened to the drill holes. No drill holes were found by CSM and that work unit was closed out on approval of all three parties. Therefore, this is considered a non-substantive variance from the ROD requirements.

Recommendations – No further activities are recommended at this time.

8. *UNDERGROUND MODIFICATIONS*

A. *Ventilation Holes:*

Vent holes will be backfilled with waste material (Dakota Sandstone and Mancos shale) to within six feet of surface. Surface casing will be removed, steel support pins installed in walls of vent holes, and sealed with a six-foot concrete plug from backfill to surface. Areas around vent holes will be contoured and seeded.

Project Status Report No. 2, September 1989 reports ongoing activity with respect to locating vent holes. Project Status Report No. 4, November 1989 reports all the vent holes have been closed under Work Unit 2S1S04 except for one in the Jackpile Pit. Project Status Report No. 32, March 1992 indicates the closeout of Work Unit 2S1S04, therefore, it is assumed that the Jackpile vent hole was closed. There are no specifics with regard to the actual physical closures methods used on the vent holes.

Conclusions - It is unclear how the vent holes were closed and there are no records of how they were closed. Monthly reports indicated that the vent holes were being closed, and the work unit was closed out on approval of all three parties. Therefore, this is considered in compliance with the ROD requirements.

Recommendations – No further activities are recommended at this time.

B. ***Adits and Declines:***

A concrete bulkhead will be constructed approximately 680 feet below the portal of P-10 decline. The decline will be backfilled from bulkhead to ground surface with Dakota Sandstone and Mancos shale. Sufficient material will be placed over the portal to allow for compaction and settling. The ground surface above the buried portal will be sloped and then top-dressed and seeded. The Alpine mine entry will be bulkheaded and backfilled. Mine entries not previously plugged by backfilling will be covered. Additionally, the H-1 mine adits will be bulkheaded and backfilled and the adits at the P-13 and NJ-45 mines will be backfilled.

Exhibits 1 and 2 present the locations of these mine features.

Although the details of the closures are unknown, the closures appear to have been successful. The general site inspection of areas of the former underground features revealed no evidence of underground mining accesses, no evidence of subsidence, and in general, the areas were indistinguishable from surrounding areas, indicating successful revegetation. The following table summarizes the various entrances and the relevant work unit and closure date when available.

Table 13
Adits and Declines Status

ADITS	Status / Closure Means	Work Unit and Progress Status Reports	Closure Date
P-10	Bulkheaded and Backfilled, Checked for subsidence	2S1S02 Redesign – Project Status Report No. 16 Activity – Project Status Reports No. 30 & 31	March 1992
Alpine	Backfilled and Checked for subsidence	No Specific Work Unit	---
H-1	Backfilled and Checked for subsidence	2S1S03 Closure – Project Status Report No. 28	November 1990
P-13	Backfilled and Checked for subsidence	2S1S01 Closure – Project Status Report No. 29	December 1991

ADITS	Status / Closure Means	Work Unit and Progress Status Reports	Closure Date
NJ-45	Backfilled and Checked for subsidence	No Specific Work Unit	---
P 2/3 Adit	Backfilled and Checked for subsidence	2S1N01	March 1990

The information in the Status column above was provided to OAS by M. Sarracino, January 30, 2007.

Correspondence from the BIA to Governor Lucero, dated December 20, 1990, contains as an attachment a redesign proposed by Landmark Reclamation entitled "Report of Investigation of P-10 Design". Based on the content of the correspondence and attached memorandum, it appears that the new design was adopted by the project team (US Department of the Interior, Bureau of Indian Affairs, Correspondence to Governor Conrad W. Lucero, with attachments including Landmark Reclamation, *"Report of Investigation of the P-10 Decline – Jackpile Project"* (dtd July 30, 1990), December 20, 1990).

Conclusions - It is unclear how the mine entries were closed. But the work units were closed out on approval of all three parties. Because all three parties approved an alternate closure method, it is presumed that the intent of the ROD was met. However, the potential for subsidence may still exist.

Recommendations - Continue to monitor the P-10 and P 2/3 areas for subsidence. Closure methods apparently presented some potential for a "controlled accident", as was stated in the Landmark Reclamation report referenced above.

9. *REVEGETATION METHODS*

A. *Top Dressing:*

Following final sloping and grading, pit bottoms will be top dressed with 24 inches, waste dumps with 18 inches, and all other areas within the minesite with 12 inches of material composed primarily of Tres Hermanos Sandstone (stockpiles at three locations within the minesite). In order to meet top dressing volume requirements for the northern portion of the minesite, additional material may be obtained from a topsoil borrow area in the Rio Moquino floodplain comprising 44 acres. For the southern portion of the minesite, additional topsoil borrow material located east of J and H dumps may be needed. Following topsoil removal, disturbed borrow areas will be contoured, fertilized, seeded, and mulched.

Exhibit 2 shows the topsoil pile locations. Section 3 discusses the waste dumps and their sloping, contouring and cover depths. Verification of top soil depths is also presented in Section 3, Table 4.

B. ***Surface Preparation:***

After applying top dressing, areas to be planted will be fertilized, followed by disking to a depth of 8 inches and then contour furrowing.

A memorandum dated April 23, 1991 from J.H Olsen, Jr. to Governor Harry Early (*"Pueblo of Laguna Council, Reclamation Project Issues", April 23, 1991)* documented POL Council approved design changes and recommended forwarding descriptions of changes to the BIA for approval. A signed copy of the approvals and authorizations was not found. One of the changes was to revise the approach for top dressing and revegetation. The following is the relevant excerpt from that memorandum. (pg. 3, ¶ 1)

"TOP DRESSING AND REVEGETATION SPECIFICATIONS: This section specifies the disking, soil placement, seeding, mulching and crimping operations to be used. Following soil placement, the areas will be left fallow until after the typical rainy season so moisture can be re-established in the seedbed. A schedule of activities and the "time window" available to perform them was developed to help the construction activities be coordinated to take advantage of these aspects. Seed mixtures, application rates, and estimated costs are also included. Seeds types to be used include grama grasses, fourwing saltbush, sweetclover, Indian ricegrass, bluestem, sacaton, and others are recommended. Discing will be done to help bind the shale to the topsoil cover. Disking at 45 degrees to the slope will enhance this binding capacity. Seeding will be done with hydroseeding equipment but use of seed drilling equipment on the flat areas is optional and acceptable. Final crimping of mulch and cross-discing on opposing 45 to 60-degree passes on the final slope are also done to help control minor rilling and the formation of water pathways down the slopes. Monitoring procedures are included. An optional specification for tree planting (recommended species and planting procedures) was developed should the POL wish to utilize this technique. Work Packages for the estimated cost can be included in future Annual Operating Plans for Council consideration/action."

C. ***Seeding and Seed Mixtures:***

Before seeding operations begin, the entire minesite will be fenced to prevent livestock grazing. In most situations, seed mixtures will be planted with a rangeland drill. Broadcast seeding combined with hydromulching may be used on inaccessible sites or if determined to be more feasible than drilling. For both methods, the seed mixture will consist mainly of native plant species possessing qualities compatible with post grazing use and adapted to the local environment (Tables 3-10 and 3-11; FEIS). Following drill seeding, straw

mulch will be applied at about 2 tons per acre, and crimped into place with a notched disk.

There is some seed preparation and seeding that is documented in the *"Jackpile Project Final Design Recommendations for BIA Approval"*, May 9, 1990. (pg. 1, ¶ 1 & 5):

> *"1) Previously-reclaimed areas will be left in their current condition except where minor remedial work will be required to repair small rills or gullies. Re-seeding of bare spots on slopes will be done using "hydro-seeding" and mulching techniques. Any remedial work will be done so as to minimize any adverse impact on existing vegetation or other stabilizing features. Re-aligning of drainage paths will be done.*
>
> *5) Hydroseeding is the preferred method since recent reclamation experience on 3:1 slopes shows that use of seed drills and equipment to crimp the mulch actually cause more erosive pathways. Page 7 of the ROD allows for a more "feasible" technique than seed drilling, if available."*

D. ***Revegetation Success:***

Using the Community Structure Analysis (CSA) or comparable method, plant establishment will be considered successful when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover, and production of undisturbed reference areas (but not sooner than 10 years following seeding). Livestock grazing will be prevented until 90 percent comparability values are met. At the end of the 10-year monitoring period, if an unsuccessful trend is shown, retreatment may be necessary to achieve success criteria. In the pit bottoms, vegetation will be sampled annually for radionuclides and heavy metal uptake.

As the Jacobs Environmental Monitoring Plan states, revegetation of the site is a critical requirement for stabilizing the disturbed area against erosion and returning the site to productive use. It designated short term monitoring to determine that seeds have germinated and seedlings are growing appropriately and so that corrective measures can be taken to assure success and long term monitoring to meet the ROD. There are references to visual vegetation inspections by *"Ed Kelley, Ph.D. (revegetation consultant)"* in Project Status Reports (Reports No. 43, Feb 1993 and No. 51, October 1993). The ROD requirements are to compare waste pile and pit bottom revegetation against reference sites and to cease monitoring after the revegetated areas meet 90% of the reference site (for selected parameters) but no sooner than 10 years. Four studies were performed:

1) October 1990 (Landmark/Weston 1991) - Landmark Reclamation/Weston, *"Jackpile Reclamation Project, Pueblo of Laguna, New Mexico, Soils and Vegetation Evaluation for Final Reclamation"*, Final, April 1991.
2) September/October 1996 (Munk and Boden 1996) - Munk, Lewis P. and Boden, Paul, Soils and Biogeochemistry, *"Interim Reclamation Success Analysis, North and South Paguate Open Pits, Jackpile-Paguate Uranium Mine"*, December 1996
3) USDA Natural Resources Conservation Service, 1998 Paguate-Jackpile Mine 1998 Vegetative Inventory [Production Surveys], 1998
4) USDA, Natural Resources Conservation Service, Vegetation Inventory, Production Surveys, August 16, 2000.
5) OA Systems Corporation, *Jackpile-Paguate Uranium Mine Record of Decision Compliance Assessment*, 2007

Table 14
Revegetation Success Sampling Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	Transects on waste dumps, pit bottoms and off-site reference areas	Items 9D and 12. Same as EIS	Same as ROD & EIS	1) Early reclaimed mined areas and ref sites (Landmark/Weston 1991) 2) NP and SP pit areas and two reference areas (Munk and Boden 1996) 3) Pit Bottoms only, reference areas not used (NRCS 1998, 2000, 2006)
Frequency	Annually			1) Once in 1990 during reclamation 2) Once in 1996 within NP and SP only, three years after seeding. 3) Three times after reclamation completion

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Parameters	Density, Frequency, foliar cover, basal cover, and Production			1) All ROD Parameters 2) All ROD Parameters 3) Production Sampling, plus qualitative (wind erosion, water erosion, soil crust, plant vigor, seedlings and seed reproduction) plus qualitative assessment of rangeland health using NRCS rating categories.
Duration	CSA = 90% but no sooner than 10 years following reclamation			No regular sampling or duration. The 90% target is not being achieved.

The earlier vegetation studies by Landmark/Weston (1991) and Munk and Boden (1996) followed the procedures and parameter tests laid out by the ROD, but were conducted during and at the end of reclamation and not in the post closure period. During this prolonged study period (1989 through 2006), reference sites and their use as comparisons for successful revegetation evaluations were replaced by other methods. This is reflected in the 1996 Study (Munk and Boden) where they stated that *"the use of reference areas as a reclamation standard is complicated by the lack of a model reference with ideal site characteristics"* and that *"that the reclamation success is obscured by these simple single parameter statistical comparison because of the differences in the vegetative composition among the reclaimed and reference areas."* In subsequent studies conducted by the NRCS and Cedar Creek other evaluation criteria evolved, as discussed below.

Discussion - The three monitoring reports in 1991, 1996, and 2006 consistently determined that vegetation on the reclaimed mine areas can be considered successful in meeting the primary goals of landscape stability, productivity, and good to excellent plant communities.

- The1991 Landmark/Weston report recommended that the vegetation criteria be developed based on acceptable values rather than specific reference sites. Using these criteria, *"All of the reclaimed sites except one (vegetation survey site V-4) could be released for post-reclamation land uses without further monitoring."*

- The 1996 Munk and Boden report stated that, "*In general, reclamation in the pit bottoms can be considered successful in meeting the goals of landscape stability, productivity, and containment of the protore.*" The reclaimed areas did not meet the strict numerical standards of the ROD requirements, but had vigorous and productive plant communities with desirable perennial grasses and shrubs.
- In the 2006 monitoring report (Cedar Creek 2006), in addition to assessing cover and productivity, followed suggested protocol based on NRCS methods for evaluating and rating ecological sites for health and stability in Chapter 4 of the National Range and Pasture Handbook for inventorying and monitoring land resources. The sampling and monitoring results compared these naturalized plant communities (on the reclaimed mine site) to the desired plant community based on the reclamation and revegetation techniques (grading, topographic and water control, and seed mix) used on the Jackpile mine. The trends and ecological health of the plant communities, and other physical attributes, showed excellent balance and sustainability of the reclaimed areas for physical structure (topography, soils), hydrology (streams, runoff, watersheds, pools, springs and seeps), and ecology (vegetation, animals, and habitats).

The results of the vegetation monitoring show good to excellent plant communities with foliar cover values of 43-50%; according to Landmark/Weston (1991) regional values are 10.3% to 26.5%, so the cover values far exceed the 90% specified in the ROD; and plant production of 523-1,043 lbs/ac on the reclaimed lands. The trends in vegetation are stable for plant diversity and health. The reclaimed mine areas can be considered successfully revegetated based on the available monitoring data. The reclaimed mine has stable and self-sustaining diverse ecosystems with very good to excellent vegetative cover and productivity of desirable plant species, and good habitat for local wildlife. There are no comparable reference sites for determining the success standards of these ecosystems as required by the ROD. The conclusions of the monitoring reports were that the mine has successful vegetation based on production and other criteria of stability and sustainability.

Conclusions - The Jackpile Reclamation Project post reclamation vegetation monitoring program deviated from the requirement of the Record of Decisions. This was due to evolution in the methodologies developed, accepted and routinely accepted in the scientific community in determining vegetative success. The monitoring met the intent of the ROD in determining vegetation success, in that the mine was very successfully revegetated based on important vegetation parameters of cover and productivity. The revegetation did not meet the strict numerical standards of the ROD, but had vigorous and productive plant communities with desirable perennial grasses and shrubs. The condition of post-reclamation vegetation is very good to excellent, and the reclaimed mine has stable and self-sustaining diverse ecosystems, and good habitat for local wildlife. Trends in vegetation are stable for plant diversity and health.

Item 9-D of the ROD requires pit bottom vegetation be sampled annually for radiological and heavy metal uptake for a period of ten years. This was not done on a continuous basis during the 10-year period after reclamation was completed. Further discussion is presented in Section 10-Monitoring (f) and (g).

Recommendations - Vegetation uptake should continue to be monitored periodically in the future, especially in the pit bottoms. It has been suggested that monitoring be undertaken the next year and possibly every five years after next year; especially in the pit bottoms and in the North Paguate pit in particular.

10. *MONITORING*

The monitoring period will vary for each parameter. Existing monitoring activities to be continued will include meteorologic sampling, air particulate sampling, radon sampling (ambient), radon exhalation sampling, gamma survey, soil and vegetation sampling, water monitoring, and subsidence. In addition, the monitoring program will be expanded to include: radon daughter levels (working levels) in any remaining mine buildings, and groundwater recovery levels/salt buildup in the open pits. The groundwater monitoring period will be of sufficient duration to determine the stable future water table conditions. Refer to Table I-5 of the FEIS for details of the monitoring plan as described under the Preferred Alternative.

The Jacobs Environmental Monitoring Plan was developed for use during and after reclamation. This Environmental Monitoring Plan was approved October 1989 and implemented by the Pueblo of Laguna. To check for compliance with the ROD, OAS compared the Final EIS Table I-5 to both the Jacobs Environmental Monitoring Plan and the actual data sets provided by the POL.

It was stated in the introduction to the Jacobs Environmental Monitoring Plan that, *"as the Jackpile Project proceeded into the preparations of the final engineering designs and detailed project operating plans, modifications to the monitoring program were developed."* To view specific rationale for changes, the Jacobs Environmental Monitoring Plan should be reviewed. For the most part, the reasons included additional data obtained since the FEIS, technology advancements, closer review of existing data sets led to elimination of some monitoring as unnecessary, the decision to go with an independent party to collect and analyze the samples, and increased participation of the BIA in an oversight role. It is OAS' judgment that the reasons for modifying the FEIS lists appear to be reasonable and justified.

Many of the monitoring details were found in other documents and evolved over time. To address monitoring requirements, OAS broke the requirements out and addressed general areas of Water Quality, Soils and Plant Uptake, Vegetation Success and Radon. Since the data had not been organized, reviewed, QC checked or evaluated, OAS attempted to do this to some degree and has included individual reports in the Appendices of this document.

a. Meteorologic

The Jacobs Environmental Monitoring Report stated that the wind and precipitation data would be useful in determining when to conduct blasting operations, calculating radiation health impacts, determining irrigation needs in revegetation areas, and determining if operations should be stopped because of excessive dust.

There were some references to the purchase of a weather station in a Project Status Report and remnants of a weather station are near the old housing area. However, no data for weather monitoring was found.

Table 15
Meteorologic Monitoring Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	3	Item 10: Per EIS Table 1-5	One Site Location near the center of the designated site.	No Records Found
Frequency	Continuously		Continuously	
Parameters	Wind Speed and Direction		Wind Speed & Direction, temperature, precipitation,	
Duration	A minimum of three years after reclamation		During Reclamation and 3 years after	

The lack of meteorological monitoring data represents **non-compliance** with the ROD. However, the lack of data has no real impact on post closure health and the environment risk, since the disturbed areas have revegetated well and there is no risk posed from blowing dust. Consequently, failure to comply with this requirement is probably not a significant variance.

Conclusions - Meteorologic monitoring was reportedly conducted during reclamation. There is, however, no data for monitoring conducted during that time. Meteorologic monitoring data was collected during reclamation as was appropriate. However, recurring data collection equipment problems resulted in discontinuous data collecting during the post-reclamation period. At least two different monitoring equipment suppliers were tried, but the power supply problems and problems with livestock destroying the equipment continued.

Recommendations – No further activities are recommended.

b. Air Particulates

Table 16 below presents the air particulates monitoring requirements as proposed in the EIS, ROD and Jacobs Environmental Monitoring Plan compared to the

actual monitoring that was performed. The EIS proposed separate requirements for monitoring radiological and non-radiological particulates. The ROD and Jacobs requirements, and the actual monitoring that was performed, combined the radiological and non-radiological parameters as shown in the table. The table also shows the differences that were proposed in the number of sampling points and the duration of the monitoring.

Table 16
Air Particulate Monitoring Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	4	5	5	5
Frequency	Monthly	Monthly	Continuous	Continuous
Parameters	U (natural), Ra-226, Po-210, Th-230, Total Suspended Particulates (TSP)	U (natural), Ra-226, Po-210, Th-230, Total Suspended Particulates (TSP)	U (natural), Ra-226, Po-210, Th-230, Total Suspended Particulates (TSP)	U (natural), Ra-226, Po-210, Th-230, Total Suspended Particulates (TSP)
Duration	In perpetuity	During reclamation & a minimum of 3 years after	During construction until average levels ≤ 2 times background for 2 successive quarters; and after reclamation, one year & not more than 3 years	Requirement Phased-out

In Section 3.3 of the Jacobs 1989 report, it was stated that "concentrations of uranium (U-238), thorium (Th-230) and radium (Ra-226) were routinely monitored during mining operations and the reported results were within the standards of the NRC (10 CFR Part 20)." Because the reclamation activities were expected to produce less dust than the mining operations, it was anticipated that the radioactive particle concentrations would be very low. During the reclamation operations the results of continuous sampling indicated levels of 0.5 of background to two times background for at least two successive quarters. As the cover was being placed, the levels gradually declined. When the reclamation was completed the levels were consistently at background levels or less than background. Based on those results, the BIA Contracting Officer (CO) and Pueblo of Laguna reportedly agreed to discontinue the particulate sampling as allowed for in Section 5.4 of the 1992 Post Reclamation Long-Term Monitoring Program "Phase-Out of Reporting Requirements". That section allows the requirement to be phased out if the BIA CO agrees that it has been adequately demonstrated that the goals and objectives of the monitoring function have been met.

Conclusions – The BIA Contracting Officer (CO) and Pueblo of Laguna reportedly agreed that it had been adequately demonstrated that the goals and objectives of the monitoring function had been met and agreed to discontinue the particulate sampling.

Recommendations – No further activities are recommended.

c. Ambient Radon

The EIS requirement for monitoring of radon gas is compared to the ROD, Jacobs Environmental Monitoring Plan, and the actual monitoring that was performed, and is presented below in Table 17.

Table 17
Radon Gas Monitoring Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	5	Item 10: Per EIS Table 1-5	5 perimeter sites, including one between Paguate and the mine, 5 sites within the mine, 2 sites in Paguate, and 3 sites in onsite buildings.	Requirement was waived because measurements were consistently below the limit of 3.5 pCi/L set by the ROD
Frequency	Monthly		Continuous after construction <3pCi/L for 4 quarters, 2 location in N.Paguate pits, 3 locations outside N.Paguate pits, 2 locations in S.Paguate pits, 4 locations outside S.Paguate pits, 2 locations in Jackpile pits, 4 locations outside Jackpile pits, and 2 location in Paguate	
Parameters	Rn-222(pCi/L)		Rn-222(pCi/L)	
Duration	Minimum of 3 years after Reclamation		4 successive quarters no greater than 3pCi/L above background	

The specified limit for radon gas levels after reclamation was 3 picocuries per liter (3 pCi/L) above the background level of 0.5 pCi/L, for a total limit of 3.5 pCi/L. Radon-222 gas was measured as suggested by the monitoring report (Jacobs 1989). The cups were set up on post three feet above ground at each location, and collected quarterly from April 1990 to May 1997. The monitoring station locations and time were recorded on Radon Test Detector log sheets or field forms, and the results listed on Radon Measurement Data sheets and Monitoring Reports for each quarterly testing period. The complete radon-222 survey results were tabulated and reported in the 1996 Annual Report for the Jackpile Reclamation Project. Measurements are reported in picocuries per liter (pCi/L).

Conclusions - All recorded radon gas measurements were consistently below the limit of 3.5 pCi/L set by the ROD. Because of the consistently low measurements it was mutually agreed to phase out this requirement.

Recommendations – No further activities are recommended.

d. Radon Daughter Levels

No records of radon daughter monitoring in remaining mine buildings was located. It is not expected, but if any of the remaining mine buildings have residual Uranium series contaminants (U, Ra 226) and the air in the buildings is relatively stale, monitoring is advised prior to extended occupancy.

Conclusions – No records of radon daughter level monitoring in remaining mine buildings were located. A radon daughter limit of 0.03WL working level was the specified threshold for this parameter. This is ***potentially non-compliant*** with the ROD. However, the buildings were reportedly razed at the start of reclamation. Therefore, compliance could not have been conducted or expected.

Recommendations – It is not expected, but if any of the remaining mine buildings have residual Uranium series contaminants (U, Ra 226) and the air in the buildings is relatively stale, monitoring is advised prior to extended occupancy.

e. Radon Exhalation

Radon Exhalation is the rate of Radon-222 emanation at the ground surface. It is a flux measurement of rate over a surface area. The Jacobs Monitoring Plan eliminated the requirement to measure radon flux *"due to difficulty and technical infeasibility of accurately measuring radon flux"*. The correlations of flux to doses of inhaled radon-22 are poor. There was never a flux standard established in the EIS or ROD to compare flux measurements.

Table 18
Radon Exhalation Monitoring Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	5	Item 10: Per EIS Table 1-5	The monitoring of Radon-222 Flux was eliminated due to difficulty and technical feasibility of accurately measuring radon flux. The radon standard for the project was established as a concentration rather than a flux.	No Monitoring Performed
Frequency	Monthly			
Parameters	Rn-222			
Duration	Minimum of 3 years after Reclamation			

This monitoring requirement was eliminated by design at the time of monitoring program development, so while the letter of the ROD was not met, the elimination of this monitoring item was authorized when the monitoring program was adopted.

Conclusions - This monitoring requirement was eliminated by design at the time of monitoring program development, so while the letter of the ROD was not met, the elimination of this monitoring item was authorized when the monitoring program was adopted.

Recommendations – No further activities are recommended.

f. Gamma Survey

Table 19 below presents the gamma radiation monitoring requirements as proposed in the EIS, ROD, Jacobs Environmental Monitoring Plans, and the actual monitoring that was performed.

Table 19
Gamma Radiation Monitoring Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	Each waste dump and selected reclaimed areas	Each waste dump and selected reclaimed areas	Each waste dump and selected reclaimed areas	Shops, construction buildings, offices, housing area, Paguate townsite, waste dumps & protore stockpile areas, crusher areas, haul and access roads, loading dock & rail spur from Quirk Station north to the project boundary, 3 pits (N.Paguate, S.Paguate & Jackpile during backfilling & covering with shale and topsoil. The final aerial survey was not conducted
Frequency	As Needed	As Needed	As Needed	
Parameters	Ground survey, plus final aerial survey	Ground survey, plus final aerial survey	Ground survey, plus final aerial survey	Ground survey. Final aerial survey not conducted
Duration	Before seeding and once after reclamation is completed	Before seeding and once after reclamation is completed	Before seeding and once after reclamation is completed	Ground survey. Final aerial survey not conducted

The specified limit for gamma radiation levels after reclamation was twice the background level of 14 micro Roentgens per hour (μR/hr) for a total limit of 28 μR/hr.

Gamma radiation was measured using a TMA/Eberline gamma meter held three feet above the ground. The gamma surveys started during construction in 1990, and were concluded in 1993, when placement of the reclamation cover was completed. The required final aerial survey was not conducted. However, the ground survey that was conducted exceeded the requirement and it indicated no exceedance of the established threshold. There are no records of gamma radiation surveys after 1993. The following are the areas surveyed during the period of 1991 to 1993. They were selected based on recommendations from the EIS and monitoring reports.

1. Shops, construction buildings, and offices; housing area; Paguate townsite
2. Waste dumps and protore stockpile areas
3. Crusher areas; haul and access roads
4. Loading dock and rail spur from Quirk Station north to the project boundary (in 1990)
5. Three pits (North Paguate, South Paguate, and Jackpile) during backfilling and covering with shale and topsoil

Gamma radiation was measured using grids (100x100 feet or 200x100 feet) and recorded on field sheets, log and summary analytical sheets, and hand-drawn field maps. Measurements are recorded in micro Roentgens per hour (μR/hr).

Gamma radiation on the mine reclamation areas was reduced by moving protore and surfaces of the contaminated areas into the pits and covering them with shale and topsoil. Waste dumps that had Jackpile Sandstone on the surface were also covered with topsoil. These activities effectively reduced measured gamma radiation to acceptable levels of less than 25 μR/hr on the mine areas up to, and during, 1993. There were no records of post-reclamation monitoring of gamma radiation after completion of reclamation in 1996.

Conclusions – Based on this radiological measurement review, the following conclusions can be drawn:

1. Gamma radiation monitoring levels were consistently below the 28 μR/hr requirement, or lower, and a continuous monitoring program was not warranted.
2. The gamma radiation monitoring requirement stated that a ground survey, plus a final aerial survey, was to be conducted. The monitoring was to be conducted before seeding and after reclamation was completed. Monitoring was conducted before seeding, but the final aerial survey was not performed.

3. It is recommended that a final ground survey, or final aerial survey, be conducted. especially on the access roads. pit bottoms and former protore piles sites to verify that these areas meet the 28 µR/hr requirement.

Recommendations - Based on these conclusions, the following recommendations can be made:

1. Gamma radiation levels should be checked at least one more time to verify that reclaimed areas are meeting the standard of 28 µR/hr.
2. The reclaimed mine can be released from any requirement for radon gas measurements, and should present no hazards for human health.
3. The results of the process and sampling during the current and previous radiation monitoring should be reviewed.
4. Gamma radiation levels on the access roads, pit bottoms and former protore pile sites should be checked at least one more time, and in the future if the topography changes, to verify that those areas meet the 28 µR/hr requirement.

g. Soil

There were three types of soils testing discussed in documents associated with the Jackpile Reclamation: 1) testing for suitability for topsoil that could support revegetation goals, 2) testing of heavy metals and radiological compounds and 3) testing for salt buildup that could reach concentrations toxic to plants.

Table 20
Soils Testing Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	One grid per 50 acres on each waste dump and pit bottom	Item 10: EIS Table 1-5 Unspecific	For Salt Buildup NP Pit: 2 east, 2 west SP Pit: 2 east, 2 west Jackpile: 4 locations Half the locations in each pit will be in areas where ponding occurs after large precipitation events and half on well-drained areas. Sample collected from 3 to 9 inches below surface. Sampling points marked with 3 foot steel posts.	1.) For Topsoil Suitability Landmark/Weston (1991) collected 38 samples from 26 locations in the pit areas. 2.) For Potential for Plant Uptake Munk & Boden (1997) collected 12 samples 3.) No Salinity Sampling
Frequency	Once Prior to Seeding		Annually	1.) Once 2.) Once

Parameters	U(natural), RA-226, Th-230, Se, Va, As, Cd, Mo, Pb, Zn		EC of saturated paste extract	1.) pH, EC, saturation %, Ca, Mg, Na, SAR, soil characteristics 2.) As, Cu, Mo, Pb, Se, Zn, Va, Pb-210, Po-210, Ra-226
Duration	Once Prior to Seeding		Begin after backfilling and continue for 10 years	1.) Once 2.) Once

1) Topsoil. The Jacobs Monitoring Report discusses soil testing to determine suitability for topdressing which was part of the reclamation operations and included in the construction specifications. It was not a part of the Long Term Post Closure Monitoring Program discussed in ROD Item 10. There are several reports which contain data on soils for suitability for top dressing: Landmark/Weston (1991), Munk and Boden (1996) and Munk and Boden (1997) [Munk, Lewis P. and Boden, Paul, Soils and Biogeochemistry, "*Potential for Plant Uptake of Heavy Metals and Radionuclides, North and South Paguate Open Pits, Jackpile-Paguate Uranium Mine*", May 1997]. Appropriate topsoil source areas were found.

2) Radiologicals and Heavy Metals. The EIS Table 1-5 presents radiological and heavy metal parameters to be tested in soils from the dumps and pit bottoms, to assess potential for plant uptake. The Munk and Boden (1997) reports that samples were taken at 12 locations within the pits for some radiological and heavy metals compound. The analyses of the soil topdressing, shale cover material, and protore in the pit bottoms indicated that the heavy metals arsenic, copper, lead, molybdenum and zinc occurred at typical levels for natural soils. However, selenium, vanadium radium-226, Pb-210, Po-210 occurred at elevated levels in the Jackpile Sandstone protore. The exposed protore was considered the worst case scenario. All exposed protore within the pits were covered with the agreed upon barrier cover and topsoil depths and thus those elevated concentration should be of no concern. The ROD requirement for monitoring was met.

3) Salt Buildup. The ROD required salinity monitoring in the pits. The Jacobs Monitoring Plan directed the soils in the pits be monitored for salt buildup since a survey of drainages blocked by waste dumps showed the build-up of salts to levels toxic to plants in areas adjacent to the blockage. There were no data found regarding monitoring for salt in soils.

Conclusions – The topsoil, radiological and metals monitoring requirements of the ROD have been met. The salt buildup and impact to grazing has not been met.

Recommendations – The lack of salt monitoring represents ***non-compliance*** with the ROD requirements; however, the presence of well established vegetation would appear to indicate that salt buildup is not occurring. It is

recommended that the pit bottom soils be analyzed for salt build up, and in the future if it appears that salt buildup is occurring.

h. Radionuclide and Heavy Metal Uptake into Vegetation

The Jacobs Environmental Monitoring Report reports that early data sets showed that *"vegetation on the disturbed areas is not accumulating heavy metals or radionuclides in concentrations that are toxic to livestock"*, but that it would be prudent to monitor to see if uptake changed with time.

Table 21
Monitoring Requirements for Radionuclide and Heavy Metal Uptake Into Vegetation Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	Transects on selected reclaimed waste dumps and all pit bottoms	Item 12: EIS Table 1-5, minimum 10 years following reseeding	One location per dump with JSS on outer surface	Pit Bottoms
Frequency	Annually		Annually	2001,2003, 2005, 2006
Parameters	U(natural), RA-226, Po-210, Th-230, Se, V, As, Cu, Cd, Mo, Pb, Zn		Edible Fraction for Ra-226, Po-210, Pb-210, Se, Va, As, Mo, Pb, Cu, Zn	As, Cu, Pb, Mo, Se, V, Zn, Pb-210, Po-210, Ra-226
Duration	A minimum of 10 years following reclamation		Commence one year after reseeding for a minimum of 10 years following reclamation. Increase locations if the trends indicate that toxic levels are being approached.	

The Jacobs Environmental Monitoring Plan presents justification for eliminating some of the compounds contained in the EIS Table 1-5. The report stated *"Thorium-230 does not present a significant ingestion pathway, Uranium has a low plant uptake factor, Pb-210 presents the greatest human exposure"*.

There were four years (2001, 2003, 2005, and 2006) in which vegetation was clipped and analyzed for heavy metals and radionuclides. The data are summarized in the Table 22 below.

Table 22
Summary of Results of the Heavy Metal and Radionuclide Vegetation Uptake Monitoring for the Jackpile Reclamation Project

Year	2001 – 15 Samples			2003 – 10 Samples			2005 – 39 Samples			2006 – 16 Samples		
	Range	ND *	Avg.	Range	ND	Avg.	Range	ND	Avg.	Range	ND	Avg.
Metals												
As	0-0.8	13	0.2	-	10	-	0-5.0	10	0.8	0-3.3	12	0.4
Cu	1.1-4.0	0	2.5	1.3-4.7	0	2.4	1.4-3.8	0	2.5	1.9-7.6	0	2.9
Pb	0-1.3	13	0.1	0-1.8	8	0.02	0-4.0	25	0.4	0-2.2	12	0.4
Mo	0-2.1	12	0.2	0-3.7	9	0.4	0-3.3	6	0.4	0-3.1	8	0.5
Se	0-9.4	9	1.5	0-5.3	3	0.9	0-5.3	9	1.4	0.5-42.9	0	6.4
V	0-3.7	9	0.6	0-4.8	7	0.6	0-8.1	28	0.7	0-19.1	13	1.5
Zn	9-47	0	20	8-29	0	15	3-34	0	18	8-25	0	14
Radionuclides												
^{210}Pb	0.1-0.9	0	0.44	0-1.12	1	0.50	0-0.3	14	0.07	0-.87	4	0.28
^{210}Po	0-0.5	5	0.17	.03-.34	0	0.12	0-0.2	2	0.05	.02-1.16	0	0.28
^{226}Ra	0-0.5	5	0.17	0.2-0.5	0	0.38	0-2.1	2	0.72	.002-.51	1	0.19

Results are in mg/Kg (ppm) for metals, and pCi/g (picocuries per gram) for radionuclides.
**ND – number of samples below detection limits*

Metals

Measured uptake concentrations of metals into vegetation were either below, or within, normal ranges for all heavy metals analyzed. As discussed by Munk and Boden (1997), the potential for uptake by most plants is minimal given the soil properties in the pit bottoms. This was confirmed by the four growing seasons (2001 to 2006) of vegetation sampled and analyzed for heavy metals. There was some concern by Munk and Boden (1997) that selenium and vanadium may accumulate on the surface soils and be translocated from the Jackpile Sandstone backfilled and covered in the pit bottoms. However, there was no increasing trend of these two metals measured in the vegetation eleven years after revegetation was complete.

The concentration in one shrub (four-wing saltbush) analyzed for selenium was within a normal high range, and may indicate that this shrub species is a secondary accumulator. This species is a member of the goosefoot family, and is not generally grazed by domestic livestock when other more palatable grass species are available.

Domestic livestock can graze the grass/shrub vegetation in the pit bottoms without toxic effects from heavy metals. Selenium was the only metal found to have the potential for sub acute toxicity on one sample in one shrub species that is generally not browsed by livestock. It is not recommended that heavy metals be monitored in the future based on the sample results to date.

Radionuclides

The concentration levels of radionuclides in the plant samples analyzed were uniformly low with no increasing trends in levels over the four seasons vegetation was sampled. The concentration levels are well below the values that are considered toxic to domestic livestock or wildlife; therefore, radionuclides would not need to be sampled in the future.

Conclusions - The Jackpile Reclamation Project vegetation uptake-monitoring program deviated from the requirement of the ROD in that heavy metals and radionuclides were not measured for ten consecutive years after reclamation was completed. Vegetation had low levels of metal and radionuclide uptake based on sampling and laboratory analysis. It is believed that vegetation growing on the reclaimed mine presents a minimal potential for hazards to domestic livestock or human health due to the low or normal concentrations of metals and radionuclides.

Recommendations - As previously mentioned in ROD Item 9, it has been recommended that uptake monitoring be undertaken next year and possibly on five-year intervals thereafter in the pit bottoms and particularly in the North Paguate pit.

i. Water Quality

OAS reviewed the post-reclamation water quality monitoring and data with the intention of: determining if the post-reclamation water quality monitoring has met the requirements of the ROD, examining the water quality data collected as to its validity and its applicability in assessing long-term risks to people and the environment, defining contaminants of concern and trends of these data, and making recommendations as to future monitoring programs and steps that should be taken to ensure the health and safety of nearby residents. This study is documented in the report *"Jackpile-Paguate Uranium Mine Post-Reclamation Water Quality Review"* presented in Appendix D.

- ***Sampling Points***

Table 23 presents the groundwater monitoring points. The FEIS proposed using 17 existing wells, the Jacobs Environmental Monitoring Plan proposed nine (9) groundwater well locations and formations for completion and six (6) wells to monitor the open pit groundwater, and two (2) or more wells at the discretion of the POL and BIA. According to the Jacobs Environmental Monitoring Plan, the existing wells were old, poorly constructed and documented, not located properly for assessment of long term monitoring of contaminant transport, so in effect unusable. Eight (8) wells were established in accordance with the Jacobs Environmental Monitoring Plan, one deep upgradient well collapsed and was abandoned early in the monitoring period. The two wells to be designated after the monitoring program was initiated were never placed. It is assumed that the 7-well coverage was deemed

adequate by POL and BIA. Although the plan called for a downgradient well in the deeper Jackson Sandstone formation, both wells that are downgradient of the pits are completed in the Alluvium (MW-2 and MW-6). Four (4) of the six open pit wells were installed. No wells were installed in the Jackpile Pit. This oversight was corrected in 2007. None of the discretionary wells were installed.

Table 23
Groundwater Monitoring Points

Final EIS Preferred Plan	Jacobs Environmental Monitoring Plan		Actual	
Well Location	**Well Location**	**Formation for Completion**	**New Wells**	**Variation**
	GROUP A			
17 existing wells (no specific locations indicated) Old wells were not part of the reclamation monitoring program. These were deemed by Jacobs to be deteriorating, of unknown construction materials and configuration.	Southwest of South Paguate Pit (background well)	Jackpile Sandstone	MW-8	This was a deep well that collapsed early in the monitoring program (JSS, Steel, 456 ft.)
	North of North Paguate Pit (background well)	Jackpile Sandstone	MW-1	Upgradient of Paguate Pits (JSS, PVC, 231 ft.)
	North-northeast of Jackpile Pit (background well)	Jackpile Sandstone	MW-7	Upgradient of Jackpile Pit (JSS, PVC, 375 ft.)
	North of the Rio Paguate and west of the Rio Moquino near the confluence			Not Installed
	South of the Rio Paguate and north of the South Paguate Pit	Alluvium	MW-4	Between So. Pit and River (Alluvium, PVC, 50 ft.)
	South of the Jackpile Pit offices and east of the Rio Paguate	Alluvium	MW-3	Between No. Pit and River (Alluvium, PVC, 60 ft.)
	In Oak Canyon adjacent to the designated site boundary	Jackpile Sandstone	MW-5	Downgradient of South Paguate Pit (JSS, PVC, 262 ft.)
	Near the Intersection of the south end of the designated site boundary and the Rio Paguate	Jackpile Sandstone	MW-2	Downgradient of all pits along Rio Moquino (Placed in Alluvium, PVC, 40 ft.)

Final EIS Preferred Plan	Jacobs Environmental Monitoring Plan		Actual	
Well Location	**Well Location**	**Formation for Completion**	**New Wells**	**Variation**
	Near the Intersection of the south end of the designated site boundary and the Rio Paguate	Alluvium	MW-6	Downgradient of all pits along Rio Moquino (Alluvium, PVC, 60 ft.)
	GROUP B			
	In the North Paguate Pit after backfilling	Fill	NP-OP-20E	Unknown completion
	In the North Paguate Pit after backfilling west thumb	Fill	NP-OP-20W	Unknown completion
	In the South Paguate Pit after backfilling SP-20	Fill	SP-OP-35	Unknown completion
	In the main South Paguate Pit after backfilling	Fill	SP-OP-34	Unknown completion
	In the central portion of the Jackpile Pit after backfilling (2 wells)	JP-OP-41 N JP-OP-41 S		Not Installed until April 2007
	GROUP C			
	Two locations to be selected by the Pueblo of Laguna and Department of Interior More wells may be required if the migration of contaminated groundwater off the site is detected by the proposed monitoring wells.			Not Installed

In examining the monitoring wells outside the mine pits, the upgradient wells (MW-1 & MW-7) are screened in the Jackpile Sandstone. The intermediate wells (MW-2, MW-3, & MW-4) are screened in the Alluvium. The down gradient well in Oak Canyon is screened in the Jackpile Sandstone, but the downgradient well positioned to monitor the Jackpile pit and serve as the compliance well near the southern boundary of the site is in the Alluvium. **It is recommended that one of the discretionary wells be placed in the Jackpile Sandstone formation to determine the true impact to that valuable aquifer.**

Table 24 presents the surface water monitoring points. The FEIS proposed using 7 locations (unspecific in Table I-5), the Jacobs Environmental Monitoring Plan proposed six (6) descriptive locations plus each major pond in the open pits. The six (6) locations proposed in the Jacobs Environmental Monitoring Plan were sampled, plus a sampling point at the reservoir/lake. No ponded water in the open pits was sampled until April 2007, when the pond in the North Paguate Pit was sampled and analyzed.

Table 24
Surface Water Monitoring Points

Final EIS Preferred Plan	Jacobs Environmental Monitoring Plan	Actual	
Well Location	**Surface Water Sampling Locations**	**Sampling Points in Closure Monitoring Program**	**Variation**
7 Points (no specific locations indicated)	Upstream on the Rio Moquino	URM	
	Rio Moquino above the confluence	LRM	
	Upstream on the Rio Paguate	URP	
	Rio Paguate above the confluence	LRP	
	Rio Paguate below the confluence	RM	
	Rio Paguate – Ford Crossing	RT	
	Each major pond in the open pits		Not done Lake/Reservoir was designated as a permanent sampling point.

- ***Sampling Parameters***

Similarly to the sampling points, some of the sampling parameters and frequency changed (justifiably) between the time of the Final EIS and the development of the Jacobs Environmental Monitoring plan. Table 25 presents the groundwater monitoring parameter comparison.

Table 25
Groundwater Parameters

	Final EIS	Jacobs Environmental Monitoring Plan	Actual	
Duration	**During reclamation and 10 years thereafter**		**During Reclamation 1989-1994[2]**	**Post Reclamation 1995-2006[1]**
Parameters	**Semi-Annually**			
	pH	Annual	Twice per Year	Annual
	EC	Annual		Annual
	Temperature	Annual	Twice per Year	Annual
	Bicarbonate	Once Post Closure	Plus Carbonate	Alk-Carb, Bicarb, Total
	Chloride	Once Post Closure	Twice per Year	Annual

	Final EIS	Jacobs Environmental Monitoring Plan	Actual	
Duration	**During reclamation and 10 years thereafter**		**During Reclamation 1989-1994[2]**	**Post Reclamation 1995-2006[1]**
	Sulfate	Annual	Twice per Year	Annual
	Sodium	Once Post Closure		Dissolved, Annual
	Silicon dioxide	Once Post Closure		---
	Magnesium	Once Post Closure	Manganese	Dissolved, Annual
	Nitrate	Once Post Closure	Twice per Year	As N, Annual
	Manganese	Once Post Closure	Twice per Year	Dissolved, Annual
	Iron	---	Twice per Year	---
	Uranium (natural)	Annual	Twice per Year	---
	Radium 226	Annual	Twice per Year	---
	Annually: Same as Semi-Annual with:			
	Arsenic	Once Post Closure	Twice per Year	Dissolved, Annual
	Boron	---		---
	[illegible]	[illegible]	Twice per Year	Dissolved, Annual
	[illegible]	[illegible]	Twice per Year	Dissolved, Annual
	[illegible]	[illegible] Post Closure	Twice per Year	Total, Annual
	Cobalt	---		---
Parameters	Chromium	Once Post Closure	Twice per Year	Dissolved, Annual
	Copper	---		---
	Fluoride	Once Post Closure		Annual
	Mercury	Once Post Closure	Twice per Year	Annual
	Molybdenum	Annual	Twice per Year	Dissolved, Annual
	Nitrogen	Nitrites – Once Post Closure		Nitrite, as N, Annually
	Lead	Once Post Closure	Twice per Year	Dissolved, Annual
	Phosphate	Phosphorous – Once Post Closure	Total P	Orthophosphate, as P
	Selenium	Once Post Closure	Twice per Year	Annual
	Vanadium	Annual	Twice per Year	Dissolved, Annual
	Zinc	Once Post Closure	Twice per Year	Dissolved, Annual
	Ra228	---	Twice per Year	Dissolved, Annual
	Water Levels	Annual	Twice per Year	---
		Annual:		
		TDS	Twice per Year	Annual
		Gross Alpha	Twice per Year	---
		Lead 210	Twice per Year	Annual
		Polonium 210	Twice per Year	---
		Once Post Closure		
		Calcium	Twice per Year	Dissolved, Annual
		Silver	Twice per Year	Dissolved, Annual
		Potassium		Dissolved, Annual
		Once Post Closure organic substances:		
		Halogenated volatile organics (EPA Method 601)	8270 Once	Not Found
		Aromatic Volatile organics (EPA Method 602)	All Non Detectable	

	Final EIS	Jacobs Environmental Monitoring Plan	Actual	
Duration	**During reclamation and 10 years thereafter**		**During Reclamation 1989-1994[2]**	**Post Reclamation 1995-2006[1]**
		Base/neutral, acid extractables, and pesticides (EPA Method 625)		

[1] There was some variation year to year, but this represents the most consistent parameter list for the 10-year post closure monitoring effort

[2] Natural Resource Consultants and Testing Laboratory performed the early monitoring through about 1994 and did not analyze Ag,Zn,TSS. Hall Environmental Laboratory performed the later work and ran the list presented

Groundwater monitoring during construction (between 1989 and 1994) consisted of semi-annual monitoring of each of the monitoring wells with the exception MW-8, which was abandoned. Samples were taken in April/May and in November/December. The parameter list consisted of both sets of parameters recommended by the Jacobs Environmental Monitoring Plan. At the time of this review, water level information was only available on a semiannual basis between May 1992 and November 1994.

The post closure monitoring (1995-present) encompassed most of the parameters in the Jacobs Environmental Monitoring Plan and the sampling was performed annually across the board during April/May of each year, providing a redundancy that may not have been needed.

- ***Surface Water***

Table 26
Surface Water Parameters

	Final EIS	Jacobs Environmental Monitoring Plan	Actual	
Duration	**During reclamation and 10 years thereafter**		**During Reclamation 1989-1994[2]**	**Post Reclamation 1995-2006[1]**
Parameters	**Quarterly**			
	pH	Semi-Annual	Twice per Year	Annual
	EC	Semi-Annual		Annual
	Temperature	Semi-Annual	Twice per Year	Intermittent
	Bicarbonate	Once Post Closure	Plus Carbonate	Annual
	Chloride	Once Post Closure	Twice per Year	Annual
	Sulfate	Semi-Annual	Twice per Year	Annual
	Sodium	Once Post Closure		Annual
	Silicon dioxide	Once Post Closure		Intermittent
	Magnesium	Once Post Closure		Annual
	Nitrate	Once Post Closure	Twice per Year	Annual

	Final EIS	Jacobs Environmental Monitoring Plan	Actual	
Duration	**During reclamation and 10 years thereafter**		**During Reclamation 1989-1994[2]**	**Post Reclamation 1995-2006[1]**
	Manganese	Once Post Closure	Twice per Year	Annual
	Iron	---	Twice per Year	---
	Uranium (natural)	Semi-Annual	Twice per Year	Annual
	Radium 226	Quarterly	Twice per Year	Intermittent
	Semi-Annually:			
	Arsenic	Once Post Closure	Twice per Year	Annual
	Boron	---		---
	Barium	Once Post Closure	Twice per Year	Annual
	Cadmium	Once Post Closure	Twice per Year	Annual
	Cyanide	Once Post Closure	Twice per Year	Annual
	Cobalt	---		---
Parameters	Chromium	Once Post Closure	Twice per Year	Annual
	Copper	---		---
	Fluoride	Once Post Closure	Twice per Year	Annual
	Mercury	Once Post Closure	Twice per Year	Annual
	Molybdenum	---		Annual
	Nitrogen	Nitrite – Once Post Closure		Annual
	Lead	Once Post Closure	Twice per Year	Annual
	Phosphate	Phosphorous – Once Post Closure	Twice per Year	Annual
	Selenium	Once Post Closure	Twice per Year	Annual
	Vanadium	Semi-Annual	Twice per Year	Annual
	Zinc	Once Post Closure	Twice per Year	Annual
	Ra228	---	Twice per Year	---
	Water Levels	Annual	Twice per Year	Intermittent
		Quarterly:		
		TDS	Twice per Year	Annual
		Gross Alpha	Twice per Year	Intermittent
		Semi-Annual:		
		Lead 210		Intermittent
		Polonium 210	Twice per Year	Intermittent
		Once Post Closure		
		Calcium		Annual
		Silver	Twice per Year	Annual
		Potassium		Annual

Groundwater monitoring during construction (between 1989 and 1994) consisted of semi-annual monitoring of each

A total of seven surface water stations were monitored. These stations correspond to the six (6) river stations in the Plan plus the reservoir/lake. No samples were taken of the ponded water in the open pits until April 2007. Samples were analyzed for both sets of parameters recommended by the Jacobs Environmental Monitoring Plan on a semi-annual basis in April/May

and November/December between 1989 and 1994 and annually in April/May between 1995 and the present.

- ***Water Quality Assessment***

The Jacobs Environmental Monitoring Plan required that the Construction Management Company audit laboratory procedures, check for anomalies and proper analytical procedures, compile data on a quarterly basis (submitted to POL and BIA), and prepare annually an Environmental Monitoring Report (containing trend graphs, discussion relative to accepted standards, discussion of anomalies, etc). Only the 1996 annual report was found (*"Jackpile Reclamation Project, Pueblo of Laguna, New Mexico, Annual Report"*, 1996). The data available to OAS was raw data. The post closure monitoring data was provided electronically predominantly directly by the analytical lab. **There appears to have been no attempt to organize or evaluate the water quality data for the post closure period.** As a result, many parameters were analyzed much more frequently than required (some that were required to be monitored only once were sampled and analyzed for 18 years. sometimes twice a year). Also, opportunities for corrections and modifications to the monitoring plan were missed. Perhaps most importantly, the lab data was not reviewed and some of the lab data is suspect.

For this section, data were evaluated for the Post Closure Period (the last 10 yrs – 1997 through 2006). It should be noted that there are complete data sets for years prior to 1997 but these ten years were considered the most appropriate for this ROD evaluation. In the evaluation of these data sets, there were both positive and negative aspects as presented in Table 27. Overall, there appears to have been no effort to evaluate the data over the last ten years. Data was not organized, laboratory QC/QA was not analyzed, trends were not evaluated, and conclusions were not drawn as to the potential hazards groundwater or surface water posed to human health and the environment.

Table 27
Water Quality Data Condition

Positives	Negatives
• Lab sheets were clear. • Analytical methods were explained. • Duplicate samples and QA/QC samples were identified • Detection limits were for the most part satisfactory • With a few exceptions, all parameters as suggested by the Environmental Monitoring program were analyzed for each year • Samples were collected consistently during the	• Data was not organized. • Neither the laboratory nor the Reclamation Project performed standard quality control and quality assurance procedures. • Data transfer to logical readable tables was time consuming. • It appears that the data was not evaluated on an annual basis to identify trends and concerns.

Positives	Negatives
months of April and May for each year	• No water quality standards were defined in the ROD, Monitoring Plan or EIS. • No wells were installed in the Jackpile Pit • Ponded water in open pits was not sampled • A well was not installed in the Jackpile Sandstone formation near the downgradient boundary • Some of the depth to water measurements in the monitoring wells was not available. • Flow, although not required by the ROD would be helpful in understanding the surface water flow system.

- ***Quality Control and Quality Assurance***

In the evaluation of water quality data, quality control and quality assurance measures taken in the field and in the laboratory are of primary concern. The Jacobs Environmental Monitoring Plan goes into detail on how samples are to be collected in the field and use of duplicate samples to ensure that the laboratory analyses are acceptable. OAS was unable to obtain written sampling procedures from the current laboratory. For this review, it is assumed that these procedures were followed. Even though duplicate samples were taken, it is not apparent that these data were used anytime during the ten years of post reclamation monitoring to check on the accuracy of the lab. In addition, cation-anion balance calculations apparently, were not performed. The cation-anion balance is a long-practiced, standard procedure to check analytical data where relatively complete mineral analyses are available, which is true in this case. To calculate cation-anion balance, parameters for cations and anions are converted to meq/L and the sum of the major cations (Dissolved Calcium, Magnesium, Potassium and Sodium) should be within 5% of the sum of major anions (Total Alkalinity, Chloride, and Sulfate) in meq/L. In the case of the Post Reclamation monitoring only 42% of the samples were in the acceptable range (within 5% of each other), 33% fell within suspect range (within 5 to10% of each other) and 25% fell into the unacceptable range (greater than 10 % of each other). Every sampling period had at least one unacceptable sample. Had the data been reviewed and this simple calculation been made in a timely fashion, the laboratories could have been challenged. With only 42 % acceptable – we question the validity of the entire data sets.

- ***Data Review***

  - **Hydrochemistry - Groundwater**

EVOLUTION with RETENTION TIME	
CATION	**ANION**
Calcium	**Bicarbonate**
↓	↓
Magnesium	**Sulfate**
↓	↓
Sodium	**Chloride**

Hydro Geo Chem, Inc. did a complete evaluation the hydrochemistry of the Jackpile-Paguate Mine. (Hydro Geo Chem, Inc. *"Effects of Uranium Mine Dewatering on the Water Resources of the Pueblo of Laguna, New Mexico, Final Report"*, March 15, 1982) In their work, they concluded that groundwater at the mine site shows a chemical evolution from a calcium-sulfate to a sodium sulfate type. This is attributed to cation exchange along the groundwater flow path from the Zuni Uplift to the Pueblo area. When the water enters the Rio Puerco Fault Zone it mixes with more saline waters upwelling from the Permian rocks. Harold H. Zehner also evaluated groundwater at the mine site (Zehner, Harold H., US Geological Survey, Water Resources Investigation Report 85-4226, *"Hydrology and Water-Quality Monitoring Considerations, Jackpile Uranium Mine, Northwestern New Mexico"*, 1985). His analysis indicated that well water in direct contact with clay and shale are dominated by sodium cations and bicarbonate/sulfate anions, whereas water from wells completed in more oxidized clay and shale are predominated by sodium – sulfate waters. Wells at the time of the Zehner (1985) study ranged in total dissolved solids between 900 and 1,500 mg/L.

Evaluation of groundwater water quality data from the 2005 sampling (the last full set of data at the site available at the preparation of the report) indicates that groundwater has evolved over time with sulfate in most cases being the predominate anion and sodium being the predominate cation in pit wells and in wells which are completed in the Jackpile Sandstone. Wells completed in the alluvium range from calcium-sulfate type water (MW-4) and calcium-bicarbonate water (MW-3) in wells crossgradient to the mined pits to magnesium–sulfate water (MW-2 and MW-6) in wells downgradient of pits. These wells can be influenced by recharge from adjacent surface waters. These data are summarized in Table 28. Total dissolved solids (TDS) have increased from those reported in the earlier studies, ranging between 671 mg/L (MW-3) and 8,080 mg/L (NPOP20E).

Table 28
2005 Groundwater Quality (Major Cation and Anion) Summary

Well Number	Position	Total Dissolved Solids (mg/L)	Water Type	
			Predominant Cation	Predominant Anion
Jackpile Sandstone Formation Wells				
MW-1	Upgradient of NP Pit	719	Sodium	Sulfate
MW-7	Upgradient of Jackpile near large area of ponded surface water runoff	665.91	Sodium	Bicarbonate
MW-5	Downgradient of SP Pit	1359	Sodium	Sulfate
Alluvium				
MW-2	Downgradient of Jackpile Pit Adjacent Rio Moquino	3200	Magnesium	Sulfate
MW-3	Crossgradient of NP Pit Adjacent Rio Paguate	671.05	Calcium	Bicarbonate
MW-4	Crossgradient of SP Pit Adjacent Rio Paguate	1069	Calcium	Sulfate
MW-6	Downgradient of all pits Adjacent Rio Moquino near South Boundary	2460	Magnesium	Sulfate
Assumed Fill Material – both Protore and waste rock				
NPOP20E	Within NP Pit	5360.5	Sodium	Sulfate
NPOP20W	Within NP Pit	8080	Magnesium	Sulfate
SPOP-34	Within SP Pit	1329	Sodium	Sulfate
SPOP-35	Within SP Pit	2637	Sodium	Carbonate

Finally, trends in total dissolved solids in groundwater water samples are quite variable. While there appeared to be slight downward trends through 2005, the data obtained for 2006 and 2007 sampling events indicate the TDS values are returning to former levels.

- ***Hydrochemistry - Surface Water***

Zehner (1985) concluded that the Rio Moquino contains greater concentrations of dissolved solids than does the Rio Paguate. The mean dissolve solids concentrations at the time of the Zehner study in the Rio Moquino range from 1,600 mg/L upstream from the mine area to 1,900 mg/L just upstream from its confluence with the Rio Paguate. In the Rio Paguate the total dissolved solids increased to about 2,000 mg/L. The

Rio Moquino contained calcium, magnesium, and sodium concentrations in nearly equal proportions and sulfate concentrations greater than bicarbonate or chloride.

Again, looking at the last full set of data from 2005, there appears to be two types of water. Water samples from the Rio Paguate upstream from the mine (URP) and above the confluence (LRP) are calcium-magnesium-bicarbonate waters. Water samples from the Rio Moquino (URM, LRM) and at sampling stations on Rio Paguate below the confluence (PM) and at Ford Crossing (RT) are slightly more sodium rich with sulfate being the predominate anion. So the water is becoming more sodium-sulfate rich as it flows through the mine site.

➢ ***Contaminants***

One of the major concerns of the Record of Decision is the potential for contamination of surface water and groundwater, due to the mining and reclamation operations, to affect human health and post-reclamation land use opportunities. There were no contaminants of concern (COC) or limits set out in the ROD or FEIS. Therefore, it is difficult to determine compliance or not. OAS compared the data to available standards: Primary and Secondary Drinking Water Standards and Agricultural Standards.

Primary drinking water regulations (CFR Title 40 – *"Protection of Environment, Chapter 1 – Environmental Protection Agency, Part 141 – National Primary Drinking Water Regulations*"); and related regulations are applicable to public water systems. Secondary drinking water regulations (CFR Title 40 – *"Protection of Environment, Chapter 1 – Environmental Protection Agency, Part 143 – National Secondary Drinking Water Regulations*") control contaminants in drinking water that are non-health related, but intended to protect the public welfare. These regulations are not directly applicable to this situation, but are intended as guidelines.

Primary Drinking Water Regulations (Maximum Contaminant Limits)

- Fluoride – Concentrations exceeding 4 mg/L were found in all samples taken from MW-1, an upgradient well
- Lead – One excursion of the standard of 0.015 mg/L was found in MW-1
- Arsenic – One sample from MW-4 exceeded the standard of 0.01 mg/L.
- Gross Alpha – All surface waters, groundwater, and pit wells had exceedances of the Gross Alpha MCL except for the reservoir. Many had exceedances for each sampling period.

Table 4-1
Gross Alpha Exceedances of the 15 pCi/L MCL

Location	# samples > 15 pCi/L	Range	
Groundwater			
MW-1	1 of 9	ND	17.33
MW-2	10 of 10	12.51	97.67
MW-3	6 of 9	31.92	104.85
MW-4	9 of 9	20.99	202.3
MW-5	3 of 9	ND	23.94
MW-6	9 of 9	ND	118.72
MW-7	4 of 9	9.11	40.63
Surface Water			
NP Pond	1 of 1	1468.05	
Railroad Tresel	10 of 10	37.59	214.33
Lower Rio M	7 of 10	16.62	53.05
Lower Rio P	6 of 10	2.24	106.22
P-M Confluence	8 of 10	11.19	94.03
Upper Rio M	2 of 10	ND	35.11
Upper Rio P	1 of 10	ND	25.53
Paguate Lake	0 of 6	ND	3.04
Pit Wells			
NP-OP- 20 W	10 of 10	159.25	707.71
NP-OP- 20 E	10 of 10	8965.97	67,278.82
JP-OP- 41 N	1 of 1	385.07	
JP-OP- 41 S	1 of 1	323,803.05	
SP-OP-34	10 of 10	74.09	1490.91
SP-OP-35	10 of 10	1022	7385.57

- Uranium – All Surface waters, groundwaters, and pit wells had exceedances of the total uranium. Many had exceedances for each sampling period. The Lake/Reservoir is a public recreation area used for fishing.

Table 4-2
Total Uranium Exceedances of the 0.03 mg/L MCL

Location	# samples > 0.03 mg/L	Range	
Groundwater			
MW-1	6 of 9	3.87	6.27

0500072

Table 29
Gross Alpha Exceedances of the MCL = 15 pCi/L

Location	# samples > 15 pCi/L	Range	
Groundwater			
MW-1	1 of 9	ND	17.33
MW-2	10 of 10	12.51	97.67
MW-3	6 of 9	31.92	104.85
MW-4	9 of 9	20.99	202.3
MW-5	3 of 9	ND	23.94
MW-6	9 of 9	ND	118.72
MW-7	4 of 9	9.11	40.63
Surface Water			
NP Pond	1 of 1	1468.05	
Railroad Tresel	10 of 10	37.59	214.33
Lower Rio M	7 of 10	16.62	53.05
Lower Rio P	6 of 10	2.24	106.22
P-M Confluence	8 of 10	11.19	94.03
Upper Rio M	2 of 10	ND	35.11
Upper Rio P	1 of 10	ND	25.53
Lake/Reservoir	0 of 6	ND	3.04
Pit Wells			
NP-OP- 20 W	10 of 10	159.25	707.71
NP-OP- 20 E	10 of 10	8965.97	67,278.82
JP-OP- 41 N	1 of 1	385.07	
JP-OP- 41 S	1 of 1	323,803.05	
SP-OP-34	10 of 10	74.09	1490.91
SP-OP-35	10 of 10	1022	7385.57

- Uranium – All Surface waters, groundwater, and pit wells had exceedances of the total Uranium. Many had exceedances for each sampling period. The Lake is a public recreation area used for fishing.

Table 30
Total Uranium Exceedances of the MCL = 0.03 mg/L

Location	# samples > 0.03 mg/L	Range	
Groundwater			
MW-1	6 of 9	3.87	6.27
MW-2	10 of 10	0.07	299.32
MW-3	9 of 9	0.04	419.37
MW-4	9 of 9	0.09	624.51
MW-5	5 of 9	0.0002	11.76
MW-6	9 of 9	0.07	69.76

Location	# samples > 0.03 mg/L	Range	
MW-7	6 of 9	0.002	30.68
Surface Water			
NP Pond	1 of 1	3043.65	
Railroad Tresel	10 of 10	0.08	544.14
Lower Rio M	10 of 10	0.04	234.95
Lower Rio P	9 of 10	0.03	163.23
P-M Confluence	9 of 10	0.029	577.20
Upper Rio M	6 of 10	0.008	52.89
Upper Rio P	6 of 10	0.002	32.21
Lake/Reservoir	3 of 6	0.002	76.93
Pit Wells			
NP-OP- 20 W	10 of 10	0.86	7,928.19
NP-OP- 20 E	10 of 10	23.12	104,501.62
JP-OP- 41 N	1 of 1	10,832.15	
JP-OP- 41 S	1 of 1	427,233.06	
SP-OP-34	9 of 9	0.15	1021.27
SP-OP-35	9 of 9	5.12	20,538.10

- Radium 226 – Fewer samples exceeded the standard of 5 pCi/L. No surface water samples were above the standard. Groundwater wells exceeding the standard included (number of times exceeded are in parentheses): MW-1 (1), MW-6 (1) and MW-7 (4). All pit wells completed in fill material exceeded MCL in ***ALL*** sampling events except for NPOP20W and JPOP41N with the highest value of 384.89 pCi/l in JPOP41S.

Secondary Drinking Water Regulations

- Total Dissolved Solids – nearly all samples, both surface and groundwater, exceed the secondary standard of 500 mg/L
- Sulfate –most surface water and groundwater exceed the secondary standard of 250 mg/L
- Manganese – Several exceedances of the secondary standard of 0.05 mg/L during the 10 year monitoring period for both surface water and groundwater. These included (number of times exceeded are in parentheses) : MW-2 (10), MW-3 (3), MW-6 (7), SPOP35 (6), NPOP20W (10), NPOP20E (10), RT (2), LRM (5), LRP (6), PM (7), AND URP (8).
- pH – Two samples were in non-compliant, one from URM and the other from SPOP34.

➢ ***Agriculture***

Another concern of the ROD is the potential for the build up of salts in the bottom of the pits. Examination of the electric conductivity (EC) and TDS data indicates that all samples taken (in and out of the pits) present a

high to very high salinity hazard for irrigation water as presented in Table29. Due to salinity alone, the groundwater is unsuitable for irrigation and stock watering.

Table 31
Salinity Hazard (USDA)

	Conductivity (μmhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	<250	<200
Medium salinity, detrimental effects to sensitive crops	250 – 750	200 – 500
High salinity, adverse effects on many crops	750 – 2250	500 – 1500
Very high salinity, suitable only for salt tolerant plants	2250 – 5000	1500 – 3000

Conclusions - Based on this review it is concluded that the intent of the ROD was met for water quality sampling, but there are some rather large data gaps. Conclusions cannot be drawn as to environmental impacts and long term health risks associated with water quality at the closed mine. The results of the radiological analyses of the monitoring well, surface water and particularly the pit wells, indicated inconsistencies in the data which should be resolved. The results of some of the pit well samples indicate levels that need to be evaluated and confirmed as soon as possible.

The four data gaps 1) the depth to water measurements were reportedly recorded in order to calculate the volume of water to be purged prior to sampling of the wells, but the record of those depths was incomplete, 2) the Jackpile pit wells were not installed until 2007, 3) the ponded water was not sampled and analyzed until 2007 (ponds were not anticipated during reclamation; they appeared in the latter half of the reclamation monitoring), and 4) a downgradient boundary well in the Jackpile Sandstone was not installed (the Jackpile Sandstone is reportedly not present at the boundary), collectively represent a major deviation from the ROD and is therefore, ***non-compliant***.

Recommendations - Based on these observations, the following recommendations can be made:

1. Continue sampling Jackpile pit wells, and install a discretionary well(s).
2. Install a discretionary well near the downgradient boundary. The location(s) of any discretionary well(s) should be selected in order to assess downgradient groundwater conditions. Two areas that could be considered

for this purpose are 1) upgradient from the Rio San Jose and 2) at the Mesita Dam. The downgradient monitoring wells(s) should be constructed so that the screened interval allows for both environmental compliance monitoring, as well as water table elevation measurements. The existing monitoring wells MW-5 and MW-6 were apparently screened in the bottom 10 feet for water level measurement purposes only

3. Continue sampling ponded water within pits.
4. Sample the ponded water at the north end of the site outside the Jackpile pit at least one more time. This pond extends onto the trust lands to the north where domestic cattle graze. The pond causes waste piles to be saturated and could lead to the release of contaminants from the waste pile.
5. Monitoring should continue for all the wells and surface waters until a risk assessment has been completed. Continued monitoring of surface water may be necessary to protect fowl and animals. Parameters which should be monitored include field parameters, major cations and anions, manganese, total dissolved solids, arsenic, fluoride, lead, gross alpha, radium 226, uranium (total), gross beta and Po-210. At that time sample locations can be further evaluated to determine if the monitoring can be further limited.
6. Water usage should be prohibited pending the results of additional sampling activities, QA/QC of previous lab results and the findings of the proposed Risk Assessment.
7. With the completion of sampling, data should be evaluated as to its accuracy. The laboratories should be required to perform cation-anion balances and if not within acceptable ranges, the samples should be redone.
8. A Quality Control/Quality Assurance analysis of all general chemistry, chemical and radiological reports and results needs to be conducted to evaluate the sampling procedures and analytical results. This should be followed by re-sampling of the water.
9. A risk assessment should be performed to determine the potential hazards and risks of the high levels of gross alpha, radium 226, and uranium in most samples, especially in wells in fill material and areas of public access. A risk assessment is needed prior to Resource and Land Use planning for the mine site.
10. With both surface water and groundwater samples showing some level of contamination, an evaluation should be made to determine if any contaminants have migrated beyond the compliance boundary. A compliance boundary must first be established.

- ***Subsidence***

Subsidence was of concern because of underground mining (P-7/10 Mine and PW-2/3 Mine) under sections of old highway 279. The predicted rate of subsidence is very low, but it was deemed prudent to monitor subsidence ***if and when*** the new highway 279 was temporarily closed for reclamation activities and the public was ***required*** to use the old road.

Table 32
Subsidence Monitoring Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	89	Item 10: Per EIS Table 1-5	Whichever of 89 remain usable and reliable. Stations must be surveyed to 0.05 inch.	No Monitoring Done
Frequency	Quarterly		Quarterly during time periods when New NM 279 is closed. Monthly at sites that indicate 0.5 inch in any Quarter or 1.0 inch in a year. Visual survey conducted quarterly by walking both side of Old NM 279 and document in letter to POL and BIA any obvious signs of subsidence.	
Parameters	Ground Movement		Elevation Change	
Duration	Until SH279 is Re-aligned		During Periods of longer than 30 days when New NM 279 is closed and Old NM 279 is in use.	

Conclusions - The new highway was never closed for extended periods and the public is ***not required*** to use Old NM 279, so the letter of the ROD was met even though no monitoring took place.

Recommendations – Periodic inspection of Old NM 279 is recommended for subsidence and erosion.

- ***Ground Vibration***

The Jacobs Environmental Monitoring Plan states that blasting to reduce highwall slopes will be in "OPTIONAL" work package items which would be dependent on funding and POL desires.

Table 33
Blast Monitoring Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	Variable	Item 10: Per EIS Table 1-5	1.) Three locations in Village 2.)One location east perimeter of Village	Project Status Report No. 9, April 1990 references a Seismic Study. Project Status Report No. 11, June 1990 references a Blast Study of Buildings in the Village.
Frequency	Each Blast		Each Blast - After USGS Case Study	
Parameters	Particle and air blast		1.) Ground Acceleration Measured) and Ground Particle Velocity (Calculated) 2.) Air Blast	
Duration	Until all blast is completed		During Blasting	

Conclusions - The blasting in the South Paguate Pit was carefully monitored and formal reports were issued. There was a damage assessment performed in the Village of Paguate where considerable damage was documented. This was followed by inspections of other pit highwalls revealing considerable integrity of highwalls and few expected safety issues related to letting the areas erode naturally. The decision by POL and BIA was to forego further blasting of highwalls, but to visually inspect the highwalls for safety issues.

Recommendations - A field assessment of the highwalls should be made to determine the hazard potential, if the walls are eroding safely or if not then if additional fencing or other corrective measures are required during the erosion process. If significant hazard potential is present, other means of slope reduction should be evaluated, such as ripping, or alternatively, localized berming or other protective measures may be warranted.

11. *SECURITY*

Control of minesite access and security will continue during reclamation and monitoring activities. However, security during the monitoring phase will require cooperation from Pueblo of Laguna and BIA to prevent livestock grazing on revegetated sites.

This ROD item has no specific requirements to be met. Project Status Reports and observations in August 2006 indicate that grazing has not been prevented. While the data indicates that the plant uptake of radionuclides and heavy metals are no threat to

humans or wildlife, the groundwater concentrations for some contaminants of concern are elevated and further study is needed to determine the risk.

Conclusions - These requirements are addressed previously in the report. Additional sampling is required especially in the open pits and ponded water. Risk assessment may be required before grazing and other uses are allowed.

Recommendations - Immediate re-sampling of the pit water and ponded water is recommended. Evaluation of the radiological data is recommended.

12. *RECLAMATION COMPLETION*

Reclamation will be considered complete when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover, and production of undisturbed reference areas (but not sooner than 10 years following seeding). In addition, gamma radiation levels must be no greater than twice background over the entire minesite. Outdoor radon 222 concentrations must be no greater than 3 pCi/l. Radon daughter levels (working levels) in any remaining surface facilities must not exceed 0.03WL.

Conclusions - These requirements are addressed previously in the report. See previous discussions concerning revegetation, gamma radon, radon and radon daughter levels in Sections 9 and 10. Alternative methods used to survey vegetation indicate the revegetation was successful.

Recommendations - Please refer to previous recommendations concerning revegetation, gamma radon, radon and radon daughter levels in Sections 9 and 10.

13. *POST-RECLAMATION LAND USES*

Limited livestock grazing, light manufacturing, office space, mining and major equipment storage will be allowed. Specifically excluded are habitation and farming.
("Jackpile Reclamation Project, Final Design Recommendations for BIA Approval", May 9, 1990 (pg 2, ¶ 3).

"9) Elimination of the need for long-term maintenance of the site should be re-examined. Since monitoring must continue in the areas of ground water, revegetation success, and other environmental concerns, periodic inspection/repair of any noticeable erosion problems could be left under Pueblo of Laguna "care-taker" status and funded from the ground water monitoring. Although "elimination of post-reclamation maintenance" is one of the goals, situations may arise requiring some remedial action which, if performed early enough, will help to achieve the desired long-term stability. Monitoring of the inevitable livestock grazing and insuring that no farming or

home building takes place on the site is judged to require some proactive effort."

Conclusions – All ***non-compliant*** and ***potentially non-compliant*** issues need to be resolved before recommendations and discussions concerning long-term use can be undertaken.

Recommendations – This topic should be discussed with POL after all compliance issues have been resolved, recommended sampling and analysis completed, and risk assessment determinations have been made. Land use should be restricted, as it currently is, until all compliance issues are resolved.

V. CONCLUSION AND RECOMMENDATIONS

ROD Requirements
1. PIT BOTTOMS
A. Backfill Levels: **1. Pits will remain as closed basins. Pit bottoms will be backfilled to at least 10 feet above the Dames and Moore (1983) projected ground water recovery levels as indicated below. A schematic diagram is shown in the FEIS:** **Pit: — Proposed Minimum Backfill Level:** **Jackpile 41 — 5,939 ft. amsl** **North Paguate 20 — 5,958 ft. amsl** **South Paguate 34 — 5,995 ft. amsl** **South Paguate 35 — 6,060 ft. amsl**
Conclusions - All monitoring well installation indicate that the minimum finished grades were achieved.
Recommendations - Based on the fact that backfill elevations in all cases met or exceed the minimum proposed backfill level(s), the ROD objective has been achieved.
2. A groundwater recovery level monitoring program will be implemented. Additional backfill will be added as necessary to control ponded water. The duration of the monitoring program will be a minimum of 10 years.
Conclusions - Based on the fact that there is little elevation data where ten years of data are required and only one sample of the ponded water, accordingly, this aspect of site reclamation is considered ***non-compliant*** with the requirements of the ROD.
Recommendations - • During preparation of this report, OAS made the recommendation that the two wells required by the ROD should be installed in the Jackpile Pit. This was done in April 2007 • Water table elevations should be monitored over a number of years to determine if the levels have stabilized, or are increasing or declining in order to evaluate whether the 10-foot below surface requirement is being met.

- Ponded water, wherever found within the pits, should be collected for chemical analysis.

These data can then be used to assess the risk of ponded water. The data can then be analyzed to determine if the water is groundwater or surface water and whether the chemical constituents present a threat to wildlife, domestic stock, or humans. As wetland areas are diverse ecosystems that are widely valued, it may be prudent to leave the North Paguate area as a wetland if the risk analysis so justifies. If chemical analysis indicates an unacceptable risk, then the ROD requirement to add additional fill to low areas would be warranted.

B. Backfill Materials:

Backfill materials will consist of protore, waste dumps H and J, and excess material obtained from waste dump resloping and stream channel clearing. These materials will be covered with 3 feet of overburden and 2 feet of topsoil (i.e. Tres Hermanos Sandstone or alluvial material).

Conclusions - Although, Dumps H and J were not moved, there appears to be substantial compliance to the ROD. There was sufficient backfill material in proximity to the pits that Dumps H and J volumes were, in fact, not needed. The cover, slopes, and vegetation on these waste piles appear to be stable.

Recommendations – No further activities are recommended at this time.

C. Stabilization:

All backfill slopes will be reduced to no greater than 3:1 (horizontal to vertical). Surface water control berms will be constructed within pit bottoms to reduce erosion and retain soil moisture for plant growth. Surface runoff will also be directed to small retention basins in the pit bottoms. All areas in the pits will then undergo surface shaping, topsoil application, and seeding as outlined under "Revegetation Methods" below.

1. Sloping

Conclusions - There appears to be ***non-compliance*** to the letter of the ROD requirements in regard to the sloping. But many deviations were approved. It is difficult to determine pile by pile what exactly was done according to the ROD 3:1 sloping requirement and/or in accordance with the approved changes. In the OAS site inspection, there were no observed problems with the slope grades. Although there are deviations to the ROD, they appear to have met the intent of the ROD.

Some of the long runs of the terracing do appear to cause chronic blow-outs in some areas due to the pressure head of water building up along the terrace berm.

Recommendations - There are no corrective actions recommended

2. Pit Berms and Retention Ponds

Conclusions – The pit berms and retention ponds are not believed to be a concern for post closure health and environmental risks.

Recommendations - No further activities are recommended.

D. Post-Reclamation Access:

Human and animal access to pit bottoms will be prevented with the use of sheep-proof fencing due to the uncertainties of predicting radionuclide and heavy metal uptake into plants (forage).

Conclusions - There appears to be substantial ***non-compliance*** with both the letter and

intent of this Rod requirement. The fencing is clearly inadequate to prevent grazing. Installation of the perimeter fencing was approved in 1989. The perimeter fencing cannot be removed and should be maintained. At least one more sampling event of vegetation and surface water for both chemical constituents and radiological levels needs to be conducted in the North Paguate pit. Additional backfilling or permanent fence installation at North Paguate may be required based on those sampling events.

Recommendations – Additional monitoring and risk assessment is required to determine if there is any potential for impairment to the natural resources (both water and vegetation) that are needed for grazing domestic animals and wildlife. Pit bottoms need to be fenced until a recommended risk assessment is completed.

2. PIT HIGHWALLS

A. **Jackpile Pit Highwall:**
The top 15 feet of highwall will be cut to a 45-degree slope. All soil and unconsolidated material at the top of the highwall will be sloped 3:1. The highwall will be scaled to remove loose debris.

B. **North Paguate Pit Highwall:**
The top 15 feet of highwall will be cut to a 45-degree slope. All soil and unconsolidated material at the top of the highwall will be sloped 3:1. The highwall will be scaled to remove loose debris. Additionally, the highwall will be fenced with 6-foot chain link.

C. **South Paguate Pit Highwall:**
The top 15 feet of highwall will be cut to a 45-degree slope. All soil and unconsolidated material at the top of the highwall will be sloped 3:1. The highwall will be scaled to remove loose debris. Additionally, the highwall will be fenced with 6-foot chain link.

Conclusions - This aspect of site reclamation is considered compliant with the desires of the Pueblo of Laguna and the deviation from the ROD requirements is well substantiated with the results of the blast studies. The Jacobs Environmental Monitoring Plan listed this approach as an option that could be based on the wishes of the Pueblo of Laguna.

Recommendations - A field assessment of the highwalls and Old Highway 279 should be made periodically to make sure that the highwalls do not comprise a threat to normal Pueblo of Laguna activities, or if additional fencing or other corrective measures are required during the erosion process. If significant hazard potential is present, other means of slope reduction should be evaluated, such as ripping, or alternatively, localized berming or other protective measures may be warranted. The south-facing wall at the North Paguate pit also needs to be periodically assessed to assure that it is eroding sufficiently to cover the exposed Jackpile Sandstone, as planned.

3. WASTE DUMPS

a. **Waste dumps H and J will be relocated to Jackpile pit as backfill.**
b. **Most dump slopes will be reduced to 3:1 or less and the dump slopes will be contour furrowed; exceptions are noted in Table I-4 of the FEIS.**
c. **Dumps which have Jackpile Sandstone on their outer surface and any Jackpile Sandstone exposed during resloping will be covered with 3 feet of overburden and 18 inches of topsoil.**

d. Berms will be installed on all dump crests to control erosion. All dump tops will slope slightly away from their outer slopes. Dump slopes will be contoured so their toes are convex to prevent formation of major gullies on slopes. **e. Additional surface treatment is outlined under "Revegetation Methods" below. Detailed modifications and treatments are presented in Table I-4 of the FEIS.**
Conclusions - OAS considers the non-use of dumps H and J (as backfill) to be a non-substantive variance from the ROD requirements, given that the features were otherwise closed in accordance with specified procedures. Issuance of Construction Specifications with alternate cover requirements from the ROD, implies an acceptance of those new depths by the relevant parties. However, the berming design that was implemented for the reclamation did not perform as expected. The areas of chronic erosion blow-outs will be considered non-compliant if radioactive material is exposed or RAD levels exceed the specified limits.
Recommendations - An evaluation of the chronic blowout areas, to determine if solutions can be designed to relieve these continuing maintenance problems, is recommended. Erosion should be monitored with appropriate equipment to determine if radiological safety is a concern. If the underlying material is non-RAD emitting, the slopes may be allowed to erode naturally.

4. PROTORE STOCKPILES
All protore will be used as backfill material in pit areas. Backfill will be covered with 3 feet of overburden and 2 feet of Tres Hermanos Sandstone or alluvial material.
Conclusions - While the letter of the ROD was not met, the revised shale barrier depth was met in all cases tested. The top soil cover was less than the revised 24 inches, but in all cases it was at least 18 inches. The gamma concentration, after placement of the cover, was below the criteria of twice background levels.
Recommendations - Although the covers did not meet the ROD or the reclamation specifications, the covers appear to be adequate for radiation safety concerns. No further action is recommended.

5. SITE STABILITY AND DRAINAGE
A. Stream Stability:
1. All contaminated soils and fill material within 100 feet of the Rio Paguate west of its confluence with the Rio Moquino, will be excavated and relocated to the open pits.
Conclusions - The reclamation actions appear to have been compliant with this item of the ROD.
Recommendations – No further activities are recommended.
2. For the Rio Moquino, waste dumps S, T, U, N, and N2 will be pulled back 50 feet from the centerline of the stream channel. The toes of these dumps will be armored with rip-rap.
Conclusions - The material appears to have been relocated or pulled back and armored

to the specifications of the ROD and the approved changes. The Landmark/Weston Design, (Landmark Reclamation/Weston, "*Jackpile Reclamation Project, Pueblo of Laguna, New Mexico, Draft Special Case Designs*", December 1990) with the approved changes, reduced the rigor of the original erosion protection. The approved design was implemented and the letter of the ROD was met. However, the intent of the ROD is not being met because the design was inadequate to prevent erosion of the banks below the toes of the waste piles.

However, significant erosion has taken place in the past 12 years. If erosion continues at the same rate, there is serious potential for exposure of waste or contaminated soil at the toes of Piles S, T, U, N, and N2. In view of the fact that a less rigorous redesign was approved after the ROD, this unexpected erosion is a problem. If the erosion continues, waste material will be exposed creating the potential risk of human and wildlife exposure to unknown hazards, and a threat to the water quality of the Rio Moquino.

Recommendations - A more thorough inspection and hydraulic analysis and erosion study needs to be performed to determine if additional erosion protection is needed along the Rio Moquino above the confluence. A control structure on the Rio Moquino above the Pueblo of Laguna section may also be considered.

3. A concrete drop structure will be constructed across the Rio Moquino approximately 400 feet above the confluence with the Rio Paguate.

Conclusions - Due to the flash flood event that caused the stream crossing to be relocated and changed the stream flow conditions, the Rio Moquino drop structure was no longer needed. Therefore, compliance with this ROD requirement is not applicable.

Recommendations – No further activities are recommended.

B. Arroyo Headcutting:

Arroyos south of waste dumps I, Y, and Y2, and the arroyo west of waste dumps FD-1 and FD-3 will be armored as shown in the FEIS Appendix A (Figure A-13). Other headcuts encountered during reclamation will also be stabilized by armoring.

Conclusions - Based on OAS field inspection documented in the photograph, field conditions changed when the headcutting encountered a natural outcropping of sandstone. The sandstone impedes further headcutting negating the need for armoring. Therefore, this is considered a non-substantive variance from the ROD requirements.

Recommendations – No further activities are recommended at this time.

C. Blocked Drainages:

1. Waste dump J and protore stockpiles SP-17BC and SP-6-B will be removed to unblock ephemeral drainage on the south side of the mine site.

Conclusions - While the letter of the ROD was not met with regard to the movement of waste dump J, closing it in place appears to meet the intent of the ROD and no problems have arisen to date by this action. However, this area could be a physical hazard in that livestock could become entangled in the submerged fence, or stuck in the mud.

Recommendations – Because the land grant property is in close proximity to the Pueblo of Laguna, an effort should be made to jointly maintain the existing dirt banks and monitor the ponded water to determine if it presents any chemical or radiological hazard for domestic animals or wildlife. After the evaluation has been completed, a long-term

solution may be devised.
2. Two blocked drainages north of FD-I and F dumps will remain blocked. The remainder of the minesite, excluding open pits, will drain to Rios Paguate and Moquino.
Conclusions - The letter of the ROD has been met. However, an unforeseen circumstance has arisen in that the ponded water appears to be at least a physical hazard, and potentially a chemical and radiation hazard, for the neighboring landowners and the cattle that are grazed on that land.
Recommendations - Since grazing livestock have access to the ponded water, POL should sample the water to determine if it presents any chemical or radiological threat to the grazing animals. Additionally, the pond has been in the past, a physical hazard for the domestic animals. The area needs to be evaluated and a long-term solution devised.

6. SURFACE FACILITIES/STRUCTURES
A. Lease No. 1: **All buildings on Lease No. 1 (Jackpile lease) will be demolished and removed except for the Geology building, miner training center and buildings at the old shop and the open pit offices. The land surface (except pit highwalls and natural outcrops) will be cleared of radiological material (e.g., Jackpile Sandstone) until gamma readings of twice background, or less, are achieved. These areas will then be graded and seeded.**
B. Lease No. 4: **All structures and facilities associated with the P-10 mine and new shop, including all buildings, roads, parking lots, sewage systems, power lines and poles, will be left in place. All operational and maintenance equipment, including tools, machinery, and supplies will be removed. All permanent structures and land surfaces (except pit highwalls and natural outcrops) will be cleared of radiological material until gamma readings of twice background or less are achieved. These areas will then be graded and seeded. Non-salvageable contaminated buildings and materials will be removed to the pits for disposal.**
C. Access Routes: **The four major roads within the mine site will be cleared of radiological material and left after reclamation for post mining use. These access routes include: 1) the access road from P-10 and the new shop area to State Highway 279; 2) the main road through the mine; 3) the road that passes between the housing area and North Oak Canyon Mesa and then proceeds to P-10; and, 4) road to Jackpile well No. 4. All other roads (except on lease No. 4) will be removed. These areas will then be graded and seeded.**
D. Water Wells: **Jackpile well No. 4, the P-10 well, the new shop well, the old shop well, and the 3 wells with associated sheltering structures (near the housing area) will be left. The pumps, riser pipe, wiring, and water storage tanks will be removed. Wells established for future monitoring purposes will also be left. All wells will be capped to prevent dust, soil, and other contaminants from entering the well casing.**

E. Rail Spur: **The rail spur will be left intact. The rail spur must be cleared of radiological material until gamma readings of twice background or less are achieved. The Quirk loading dock will be demolished and hauled to the pits.**
Conclusions - Based on memoranda, discussions with M. Sarracino and an OAS field inspection, some features shown which were anticipated to be kept or salvaged were found to be of very poor condition. While not in strict compliance with the ROD, the demolition and disposal of additional facilities in no way impairs the environmental integrity of the project. Therefore, this is considered a non-substantive variance from ROD requirements.
Recommendations – No further activities are recommended.

7. DRILL HOLES
All drill holes will be plugged according to the State Engineer's requirements. A 5-foot surface concrete plug will also be placed in each hole. Any cased holes will have the casing cut off at the surface. In addition, areas around drill holes will be seeded. Any exploration roads not wanted by the Pueblo will be reclaimed.
Conclusions - It is unclear what happened to the drill holes. No drill holes were found by CSM and that work unit was closed out on approval of all three parties. Therefore, this is considered a non-substantive variance from the ROD requirements.
Recommendations – No further activities are recommended at this time.

8. UNDERGROUND MODIFICATIONS
A. Ventilation Holes: **Vent holes will be backfilled with waste material (Dakota Sandstone and Mancos shale) to within six feet of surface. Surface casing will be removed, steel support pins installed in walls of vent holes, and sealed with a six-foot concrete plug from backfill to surface. Areas around vent holes will be contoured and seeded.**
Conclusions - It is unclear how the vent holes were closed and there are no records of how they were closed. Monthly reports indicated that the vent holes were being closed, and the work unit was closed out on approval of all three parties. Therefore, this is considered in compliance with the ROD requirements.
Recommendations – No further activities are recommended at this time.
B. Adits and Declines: **A concrete bulkhead will be constructed approximately 680 feet below the portal of P-10 decline. The decline will be backfilled from bulkhead to ground surface with Dakota Sandstone and Mancos shale. Sufficient material will be placed over the portal to allow for compaction and settling. The ground surface above the buried portal will be sloped and then top-dressed and seeded. The Alpine mine entry will be bulkheaded and backfilled. Mine entries not previously plugged by backfilling will be covered. Additionally, the H-1 mine adits will be bulkheaded and backfilled and the adits at the P-13 and NJ-45 mines will be backfilled.**
Conclusions - It is unclear how the mine entries were closed. But the work units were

closed out on approval of all three parties. Because all three parties approved an alternate closure method, it is presumed that the intent of the ROD was met. However, the potential for subsidence may still exist.

Recommendations - Continue to monitor the P-10 and P 2/3 areas for subsidence. Closure methods apparently presented some potential for a "controlled accident", as was stated in the Landmark Reclamation report referenced above.

9. REVEGETATION METHODS

A. Top Dressing:
Following final sloping and grading, pit bottoms will be top dressed with 24 inches, waste dumps with 18 inches, and all other areas within the minesite with 12 inches of material composed primarily of Tres Hermanos Sandstone (stockpiles at three locations within the minesite). In order to meet top dressing volume requirements for the northern portion of the minesite, additional material may be obtained from a topsoil borrow area in the Rio Moquino floodplain comprising 44 acres. For the southern portion of the minesite, additional topsoil borrow material located east of J and H dumps may be needed. Following topsoil removal, disturbed borrow areas will be contoured, fertilized, seeded, and mulched.

B. Surface Preparation:
After applying top dressing, areas to be planted will be fertilized, followed by disking to a depth of 8 inches and then contour furrowing.

C. Seeding and Seed Mixtures:
Before seeding operations begin, the entire minesite will be fenced to prevent livestock grazing. In most situations, seed mixtures will be planted with a rangeland drill. Broadcast seeding combined with hydromulching may be used on inaccessible sites or if determined to be more feasible than drilling. For both methods, the seed mixture will consist mainly of native plant species possessing qualities compatible with post grazing use and adapted to the local environment (Tables 3-10 and 3-11; FEIS). Following drill seeding, straw mulch will be applied at about 2 tons per acre, and crimped into place with a notched disk.

D. Revegetation Success:
Using the Community Structure Analysis (CSA) or comparable method, plant establishment will be considered successful when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover, and production of undisturbed reference areas (but not sooner than 10 years following seeding). Livestock grazing will be prevented until 90 percent comparability values are met. At the end of the 10-year monitoring period, if an unsuccessful trend is shown, retreatment may be necessary to achieve success criteria. In the pit bottoms, vegetation will be sampled annually for radionuclides and heavy metal uptake.

Conclusions - The Jackpile Reclamation Project post reclamation vegetation monitoring program deviated from the requirement of the Record of Decisions. This was due to evolution in the methodologies developed, accepted and routinely accepted in the scientific community in determining vegetative success. The monitoring met the intent

of the ROD in determining vegetation success, in that the mine was very successfully revegetated based on important vegetation parameters of cover and productivity. The revegetation did not meet the strict numerical standards of the ROD, but had vigorous and productive plant communities with desirable perennial grasses and shrubs. The condition of post-reclamation vegetation is very good to excellent, and the reclaimed mine has stable and self-sustaining diverse ecosystems, and good habitat for local wildlife. Trends in vegetation are stable for plant diversity and health. Item 9-D of the ROD requires pit bottom vegetation be sampled annually for radiological and heavy metal uptake for a period of ten years. This was not done.
Recommendations - Vegetation uptake should continue to be monitored periodically in the future, especially in the pit bottoms. It has been suggested that monitoring be undertaken the next year and possibly every five years after next year; especially in the pit bottoms and in the North Paguate pit in particular.

10. MONITORING
The monitoring period will vary for each parameter. Existing monitoring activities to be continued will include meteorologic sampling, air particulate sampling, radon sampling (ambient), radon exhalation sampling, gamma survey, soil and vegetation sampling, water monitoring, and subsidence. In addition, the monitoring program will be expanded to include: radon daughter levels (working levels) in any remaining mine buildings, and groundwater recovery levels/salt buildup in the open pits. The groundwater monitoring period will be of sufficient duration to determine the stable future water table conditions. Refer to Table I-5 of the FEIS for details of the monitoring plan as described under the Preferred Alternative.
a. Meteorologic
Conclusions - Meteorologic monitoring was reportedly conducted during reclamation. There is, however, no data for monitoring conducted during that time. Meteorologic monitoring data was collected during reclamation as was appropriate. However, recurring data collection equipment problems resulted in discontinuous data collecting during the post-reclamation period. At least two different monitoring equipment suppliers were tried, but the power supply problems and problems with livestock destroying the equipment continued.
Recommendations – No further activities are recommended.
b. Air Particulates
Conclusions - The BIA Contracting Officer (CO) and Pueblo of Laguna reportedly agreed that it had been adequately demonstrated that the goals and objectives of the monitoring function had been met and agreed to discontinue the particulate sampling.
Recommendations – No further activities are recommended.
c. Ambient Radon
Conclusions - All recorded radon gas measurements were consistently below the limit of 3.5 pCi/L set by the ROD. Because of the consistently low measurements it was mutually agreed to phase out this requirement.
Recommendations – No further activities are recommended.
d. Radon Daughter Levels

Conclusions – No records of radon daughter level monitoring in remaining mine buildings were located. A radon daughter limit of 0.03WL working level was the specified threshold for this parameter. This is ***potentially non-compliant*** with the ROD. However, the buildings were reportedly razed at the start of reclamation. Therefore, compliance could not have been conducted or expected.

Recommendations – It is not expected, but if any of the remaining mine buildings have residual Uranium series contaminants (U, Ra 226) and the air in the buildings is relatively stale, monitoring is advised prior to extended occupancy.

e. Radon Exhalation

Conclusions - This monitoring requirement was eliminated by design at the time of monitoring program development, so while the letter of the ROD was not met, the elimination of this monitoring item was authorized when the monitoring program was adopted.

Recommendations – No further activities are recommended.

f. Gamma Survey

Conclusions – Based on this radiological measurement review, the following conclusions can be drawn:

- Gamma radiation monitoring levels were consistently below the 28 µR/hr requirement, or lower, and a continuous monitoring program was not warranted.
- The gamma radiation monitoring requirement stated that a ground survey, plus a final aerial survey, was to be conducted. The monitoring was to be conducted before seeding and after reclamation was completed. Monitoring was conducted before seeding, but the final aerial survey was not performed.
- It is recommended that a final ground survey, or final aerial survey, be conducted, especially on the access roads, pit bottoms and former protore piles sites to verify that these areas meet the 28 µR/hr requirement.

Recommendations - Based on these conclusions, the following recommendations can be made:

- Gamma radiation levels should be checked at least one more time to verify that reclaimed areas are meeting the standard of 28 µR/hr.
- The reclaimed mine can be released from any requirement for radon gas measurements, and should present no hazards for human health.
- The results of the process and sampling during the current and previous radiation monitoring should be reviewed.

Gamma radiation levels on the access roads, pit bottoms and former protore pile sites should be checked at least one more time, and in the future if the topography changes, to verify that those areas meet the 28 µR/hr requirement.

g. Soil

1) Topsoil

2) Radiologicals and Heavy Metals

3) Salt Buildup

Conclusions – The topsoil, radiological and metals monitoring requirements of the ROD have been met. The salt buildup and impact to grazing has not been met.

Recommendations - The lack of salt monitoring represents ***non-compliance*** with the ROD requirements, however, the presence of well established vegetation would appear to indicate that salt buildup is not occurring. It is recommended that the pit bottom soils

be analyzed for salt build up, and in the future if it appears that salt buildup is occurring.

h. Radionuclide and Heavy Metal Uptake into Vegetation

Metals

Radionuclides

Conclusions - The Jackpile Reclamation Project vegetation uptake-monitoring program deviated from the requirement of the ROD in that heavy metals and radionuclides were not measured for ten consecutive years after reclamation was completed. Vegetation had low levels of metal and radionuclide uptake based on sampling and laboratory analysis. It is believed that vegetation growing on the reclaimed mine presents a minimal potential for hazards to domestic livestock or human health due to the low or normal concentrations of metals and radionuclides.

Recommendations - As previously mentioned in ROD Item 9, it has been recommended that uptake monitoring be undertaken next year and possibly on five-year intervals thereafter in the pit bottoms and particularly in the North Paguate pit.

i. Water Quality

Conclusions - Based on this review it is concluded that the intent of the ROD was met for water quality sampling, but there are some rather large data gaps. Conclusions cannot be drawn as to environmental impacts and long term health risks associated with water quality at the closed mine. The results of the radiological analyses of the monitoring well, surface water and particularly the pit wells, indicated inconsistencies in the data which should be resolved. The results of some of the pit well samples indicate levels that need to be evaluated and confirmed as soon as possible.

The four data gaps 1) the depth to water measurements were reportedly recorded in order to calculate the volume of water to be purged prior to sampling of the wells, but the record of those depths was incomplete, 2) the Jackpile pit wells were not installed until 2007, 3) the ponded water was not sampled and analyzed until 2007 (ponds were not anticipated during reclamation; they appeared in the latter half of the reclamation monitoring), and 4) a downgradient boundary well in the Jackpile Sandstone was not installed (the Jackpile Sandstone is reportedly not present at the boundary), collectively represent a major deviation from the ROD and is therefore, ***non-compliant.***

Recommendations - Based on these observations, the following recommendations can be made:

1. Continue sampling Jackpile pit wells, and install a discretionary well(s).
2. Install a discretionary well near the downgradient boundary. The location(s) of any discretionary well(s) should be selected in order to assess downgradient groundwater conditions. Two areas that could be considered for this purpose are 1) upgradient from the Rio San Jose and 2) at the Mesita Dam. The downgradient monitoring wells(s) should be constructed so that the screened interval allows for both environmental compliance monitoring, as well as water table elevation measurements. The existing monitoring wells MW-5 and MW-6 were apparently screened in the bottom 10 feet for water level measurement purposes only.
3. Continue sampling ponded water within pits.
4. Sample the ponded water at the north end of the site outside the Jackpile pit at least one more time. This pond extends onto the trust lands to the north where

domestic cattle graze. The pond causes waste piles to be saturated and could lead to the release of contaminants from the waste pile.

5. Monitoring should continue for all the wells and surface waters until a risk assessment has been completed. Continued monitoring of surface water may be necessary to protect fowl and animals. Parameters which should be monitored include field parameters, major cations and anions, manganese, total dissolved solids, arsenic, fluoride, lead, gross alpha, radium 226, uranium (total), gross beta and Po-210. At that time sample locations can be further evaluated to determine if the monitoring can be further limited.
6. Water usage should be prohibited pending the results of additional sampling activities, QA/QC of previous lab results and the findings of the proposed Risk Assessment.
7. With the completion of sampling, data should be evaluated as to its accuracy. The laboratories should be required to perform cation-anion balances and if not within acceptable ranges, the samples should be redone.
8. A Quality Control/Quality Assurance analysis of all general chemistry, chemical and radiological reports and results needs to be conducted to evaluate the sampling procedures and analytical results. This should be followed by re-sampling of the water.
9. A risk assessment should be performed to determine the potential hazards and risks of the high levels of gross alpha, radium 226, and uranium in most samples, especially in wells in fill material and areas of public access. A risk assessment is needed prior to Resource and Land Use planning for the mine site.
10. With both surface water and groundwater samples showing some level of contamination, an evaluation should be made to determine if any contaminants have migrated beyond the compliance boundary. A compliance boundary must first be established.

➢ **Subsidence**

Conclusions - The new highway was never closed for extended periods and the public is ***not required*** to use Old NM 279, so the letter of the ROD was met even though no monitoring took place.

Recommendation – Periodic inspection of Old NM 279 is recommended for subsidence and erosion.

➢ **Ground Vibration**

Conclusions - The blasting in the South Paguate Pit was carefully monitored and formal reports were issued. There was a damage assessment performed in the Village of Paguate where considerable damage was documented. This was followed by inspections of other pit highwalls revealing considerable integrity of highwalls and few expected safety issues related to letting the areas erode naturally. The decision by POL and BIA was to forego further blasting of highwalls, but to visually inspect the highwalls for safety issues.

Recommendations - A field assessment of the highwalls should be made to determine the hazard potential, if the walls are eroding safely or if not then if additional fencing or other corrective measures are required during the erosion process. If significant hazard potential is present, other means of slope reduction should be evaluated, such as ripping, or alternatively, localized berming or other protective measures may be warranted.

11. SECURITY
Control of minesite access and security will continue during reclamation and monitoring activities. However, security during the monitoring phase will require cooperation from Pueblo of Laguna and BIA to prevent livestock grazing on revegetated sites.
Conclusions – These requirements are addressed previously in the report. Additional sampling is required especially in the open pits and ponded water. Risk assessment may be required before grazing and other uses are allowed.
Recommendations – Immediate re-sampling of the pit water and ponded water is recommended. Evaluation of the radiological data is recommended.

12. RECLAMATION COMPLETION
Reclamation will be considered complete when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover, and production of undisturbed reference areas (but not sooner than 10 years following seeding). In addition, gamma radiation levels must be no greater than twice background over the entire mine site. Outdoor radon 222 concentrations must be no greater than 3 pCi/l. Radon daughter levels (working levels) in any remaining surface facilities must not exceed 0.03WL.
Conclusions – These requirements are addressed previously in the report. See previous discussions concerning revegetation, gamma radon, radon and radon daughter levels in Sections 9 and 10. Alternative methods used to survey vegetation indicate the revegetation was successful.
Recommendations – Please refer to previous recommendations concerning revegetation, gamma radon, radon and radon daughter levels in Sections 9 and 10.

13. POST-RECLAMATION LAND USES
Limited livestock grazing, light manufacturing, office space, mining and major equipment storage will be allowed. Specifically excluded are habitation and farming.
Conclusions – All ***non-compliant*** and ***potentially non-compliant*** issues need to be resolved before recommendations and discussions concerning long-term use can be undertaken.
Recommendations – This topic should be discussed with POL after all compliance issues have been resolved, recommended sampling and analysis completed, and risk assessment determinations have been made. Land use should be restricted, as it currently is, until all compliance issues are resolved.

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APPENDIX A

COMPARATIVE TABLES OF CONTRACTOR BREAKOUT SCHEDULES AND WORK ACTIVITIES

TABLE A-1 Jackpile-Paquate Uranium Mine ROD Requirements, Assumed Resources and Actual References

			Assumed		Actual Confirming
	ROD Requirement	Verify	Resources Available	Action	References
1	Pit Bottoms				
1A	Backfill Levels	Backfill to 10 feet above gw recovery levls	Verify meeting elevations proposed in FEIS	FEIS, App A, Fig. A-1 Proposed backfill elevations for 4 pits	Compare GW elevation to Fig A-1, check for >10 feet	Looking for GW elevation data in pit wells from post closure monitoring
			Check Actual GW recovery elevations	Before and After backfill elevation survey data	Compare survey data to gw elevation data	+ Have surveyed ground elevations at pit wells
				Remediation Report	Document activites referenced in Remed. Report	No Remediation Reports Generated
				Aerial Photos	Confirm no open water from recent aerials	No open water from recent aerials, but Open Water in All Pits during summer 2006
1B	Backfill Materials	Backfill Materials: protore, waste dump H&J, additional waste dump and stream channel clearing/sloping.	Verify acceptable fill material, cover material, and depths used	Remediation Report - Backfill and Cover	Document activites referenced in Remed. Report	Work Unit 2E1- Movement of Backfill Material (Closed NP 3/91, SP 12/91 & JP betw 3/92 and 12/94)
		Cover Material - 3 feet overburden and 2 feet topsoil		Aerial Photos	Compare Volumes removed at dumps/other places and volumes placed in pit according to remediation documents	Work Unit 2E3- Cover Placement (closed JP 4/93-6/96, NP 4/91 - 12/92 & 8/91 - 3/92)
				Trench or Coring Logs	Review trenching/coring logs	Confirmation Boring Grids
1C	Stabilization	< 3:1 slopes	Verify Slopes	Remediation Report	Document activites referenced in Remed. Report	No Remediation Reports Generated
		surface water control berms	Check surface water control		Inspect Site - look for erosion	
		surface runoff to small retention basin	Inspect for erosion, subsidence,veg. cover etc.		Photo document site	Work Unit 2E2 - Closed 9/91-6/95
		shaping, contouring, reseeding				
1D	Fencing	Sheep -proof fencing of pit bottoms		Jackpile		Work Unit 2S5J02 closed 12/91
				N Paguate		Work Unit 2S5N02 closed 12/91
				S. Paguate		Work Unit 2S5S02 closed 12/91
				Construct Permanent Fencing All Areas		Work Unit 2S5J09 Active 6/95 last monthly report)

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		Assumed		Actual Confirming
ROD Requirement	Verify	Resources Available	Action	References

2 Pit Highwalls

2A	Jackpile	Cut top 15' highwall to slope of 45 degrees	Verify slopes	FEIS, App. A, Fig. A-7	Compare to planning diagram	Work Unit 2E5J01- No Charges
		Soil and unconsolidate material to slope to 3:1	verify loose material removal	Remediation Report	Document activites referenced in Remed. Report	No Remediation Report
		Scale remaining to remove loose debris			Inspect and photograph site	Work Unit 2E5J02 - No Charges
		Fence Highwall with 6 foot chain link				Work Unit 2S5J02 closed 12/91; BUT No visible highwall fencing
2B	North Paguate	Cut top 15' highwall to slope of 45 degrees	Verify slopes	FEIS, App. A, Fig. A-7	Compare to Planning diagram	Work Unit 2E5N01 closed 12/91; BUT no highwall work done in this highwall area
		Soil and unconsolidate material to slope to 3:1	verify loose material removal	Remediation Report	Document activites referenced in Remed. Report	No Remediation Report
		Scale remaining to remove loose debris			Inspect and photograph site	Work Unit 2E5N02 - closed 12/91; BUT no work done in this highwall area
		Fence Highwall with 6 foot chain link	verify fence			Work Unit 2S5N02 closed 12/91; BUT No work done in this highwall area
2C	South Paguate	Cut top 15' highwall to slope of 45 degrees	Verify slopes	FEIS, App. A, Fig. A-7	Compare to Planning diagram	Work Unit 2E5S01- closed 12/91
		Soil and unconsolidate material to slope to 3:1	verify loose material removal	Remediation Report	Document activites referenced in Remed. Report	No Remediation Report
		Scale remaining to remove loose debris			Inspect and photograph site	Work Unit 2E5S02 - closed 12/91
		Fence Highwall with 6 foot chain link	verify fence			Work Unit 2S5S02 closed 12/91

3 Waste Dumps

	H & J	Relocate to Jackpile for fill		remediation report	Document activites referenced in Remed. Report	Work Unit 2E1--- and 2E2---
		Slope to 3:1; exceptions in Table I-4	verify slopes	FEIS Table I-4, App. A Fig A-9	Inspect and photograph site	Relates to moving waste stockpiles, cutting and grading
		Exposed Jackpile Sandstone-covered by 3 feet overburden and 18 inches topsoil	verify cover	Cores or trenching logs	Compare Volumes removed at dumps/other places and volumes placed in pit according to remediation documents	Check for variation authorization
		Without Jackpile Sandstone - cover with 18 inches topsoil		Aerial Photos		
		Contour per instructions		Maps of Dumps		Work Unit 2T2---

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		Assumed		Actual Confirming
ROD Requirement	Verify	Resources Available	Action	References

4 Protore Stockpiles

						Work Unit 2E2J04
						Work Unit 2E1---
		All protore will be used as backfill material in pit areas		Maps	Document activites referenced in Remed. Report	No Remediation Report
				Aerial Photos	Inspect and photograph site	
		Backfill will be covered with 3 feet of overburden and 2 feet of TH Sandstone or alluvial material		Cores or trench logs	Compare Volumes removed at dumps/other places and volumes placed in pit according to remediation documents	

5 Site Stability and Drainage

						Work Unit 2E6N01A
5A	**Stream Stability**	Remove contaminated and fill material within 100 feet of Rio Paguate west of confluence with Rio Moquino and place in pits.	Verify Removal	Remediation Report	Document activites referenced in Remed. Report	
		On the Rio Moquino, pits S,T, U, N and N2 will be pulled back 50 feetfrom centerline stream channel. Toes of these dump areas will be armored with riprap	Verify channel cleared and riprap	Maps	Compare Volumes removed at dumps/other places and volumes placed in pit according to remediation documents	
		Construct concrete drop structure on Rio M. 400 feet above confluence with Rio P.	Verify drop structure construction	Aerial Photos	Inspect and photograph site	Work Unit 2S5J02A
5B	**Arroyo Headcutting**	Arroyos south of dumps I,Y and Y2 and arroyo west of dumps FD-1 and FD-3 will be armored as shown in FEIS,App.A,A-13	Verify armoring	Maps, Aerial Photos, Remediation Report	Inspect and photograph site	Headcutting ceased when a sandstone outcropping was encountered, no need for this work.
		Othere headcuts encountered during reclamation will be stabilized by armoring		FEIS, App.A, A-13	Document activites referenced in Remed. Report	
5C	**Blocked Drainages**	Remove dump J and protore stockpiles SP-17BC and SP-6-B will be removed to unblock ephemeral drainage on south side of mine site.	Verify removals	Maps, Aerial Photos, Remediation Report	Inspect and photograph site	Work Unit 2E1J04
		Two blocked drainages north of FD-1 and F dumps will remain blocked			Document activites referenced in Remed. Report	Observed that Drainages remain Blocked

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		Assumed		Actual Confirming
ROD Requirement	Verify	Resources Available	Action	References

6 Surface Facilities/Structures

						N. Paguate Work Unit 2S3N01 closed 2/90
6A	**Lease No. 1 (Jackpile Lease)**	Demolish all buildings except: geology bldg, miner training center and buildings at Old Shop and Open Pit offices.	Verify demolitionm	Maps, Aerial Photos, Remediation Report	Inspect and photograph site	Jackpile Work Unit 2S3J01- activity 2/90 thru 12/90 no closure date
		The land surfaces (except pit highwalls and natural outcrops) will be cleared of radiological material to < 2X background gamma	Verify gamma levels	Review gamma screening	Document activites referenced in Remed. Report	
		Grade and seed these areas	Verify revegetation			
6 B	**Lease No. 4**	All facilities and structurtes at P-10 Mine and New Shop will remain		Maps, Aerial Photos, Remediation Report	Inspect and photograph site	South Paguate Work Unit 2S3S01 active 8/89 thru 10/91 no closure date
		O&M Equipment will be removed	Verify removal	Review gamma screening	Document activites referenced in Remed. Report	
		Permanenet structures and land surfaces (except pit highwalls and natural outcrops) will be cleared of radiological material to < 2X background gamma	Verify gamma levels			
		Grade and seed these areas	Verify revegetation			
		Non salvageable buildings will be demolished and placed inpits				
6 C	**Access Routes**	Four major roads within mine site will be cleared of radiological material	Verify contamination removal	Maps, Aerial Photos, Remediation Report	Inspect and photograph site	Construction Work Units: 2S5 - no activity
		All other roads (except Lease No. 4) will be be removed, graded and seeded.	Verify removal and reveg.	Gamma screening	Document activites referenced in Remed. Report	Kept only roads necessary for monitoring and maintenance activities.
6 D	**Water Wells**	Jackpile No. 4 well, P-10 Well, New Shop Well and 3 wells near housing areas and their sheltering will be left. All wells will be___?___ to prevent dust,soil and other contaminant from entering well casing	Verify the well locations and protections		Inspect and photograph site	No work units, MS related what wells were dismantled and what appertenances were left at each site.
		Pumps, risers, wiring and storage tanks will be removed	verify removal of these features		Document activites referenced in Remed. Report	
		Monitoring wells will remain.				

8600098

6 E	Rail Spur	The rails spur will be left intact but cleared of radiological material to < 2X gamma	Verify railway contamination levels	Maps, Aerial Photos, Remediation Report	Inspect and photograph site	Visual indicate remins, no specific work unit.
		Qurk loadeing dock will be demolished and disposed of in the pits.	verify removal and disposal	Gamma screening	Document activites referenced in Remed. Report	Visual indicated removed, No specific work unit.

7 Drilling Holes

		All drill holes will be plugged according to the State Engineer's requirements	Verify well closures	Maps, Aerial Photos, Remediation Report	Inspect and photograph site	Work Unit 2S1S05 closed 3/90
		5 foot concrete plug at surface and cut flush to surface, reseeded			Document activites referenced in Remed. Report	
		Unwanted access roads will be removed	Verify removals and Pueblo wishes			

8 Underground Modifications

8 A	Ventilation Holes	Closed per instructions	Verify Closures	Maps, Aerial Photos, Remediation Report	Inspect and photograph site	Work Unit 2S1S04 closed 3/92
					Document activites referenced in Remed. Report	
8 B	Adits and Declines	P-10 will have a concrete bulkhead constructed 690 feet below portal. It will be backfilled from bulkhead to Groundsurface with Dakota Sandstone and Mancos Shale. It will be sloped and seeded	Verify Closure	Maps, Aerial Photos, Remediation Report	Inspect and photograph site	Work Unit 2S1S02 closed 2/92
		Alpine Mine Entry will be bulkheaded and backfilled.	Verify Closure	Maps, Aerial Photos, Remediation Report	Document activites referenced in Remed. Report	No work unit applied to Alpine
		H-1 Mine adits will be bulkheaded and backfilled	Verify Closure	Maps, Aerial Photos, Remediation Report		Work Unit 2S1S03 closed 2/90
		P-13 and NJ-45 Mine Adits will be backfilled	Verify Closure	Maps, Aerial Photos, Remediation Report		Work Unit 2S1S01 closed 12/91
		Minre entries not previously plugged by backfilling will be covered.				
					Adit PW-2/3	Work Unit 2S1N01 closed 3/90
					JP-PS-46 Enntries	Work Unit 2S1J02 no activity
					JP-SS-50 Entries	Work Unit 2S1J01 no activity

6600050

		Assumed		Actual Confirming
ROD Requirement	Verify	Resources Available	Action	References

9 Revegetative Methods

9A	Top Dressing	Instructions	Verify methods used	Maps, Aerial Photos, Remediation Report	Document activites referenced in Remed. Report	
9B	Surface Preparation					
9C	Seeding and Seed Mixtures					
9 D	Revegetation Success	At 10 years or later, 90 % density, foliar cover, basal cover, and production of undisturbed reference areas per CSA or comparable mthod	Perform CSA or comparable	Maps, Aerial Photos, Remediation Report	Document activites referenced in Remed. Report	Check ROD against Constructin Specifications and Memos with Changes
		Livestock grazing will be prohibited until 90 % CSA met			Perform CSA or comparable	Work Units 2R1---activity Oct 1991 through Jun 1995
		At end of 10 year monitoring if unsuccessful, retreatment may be required			Make recommendations on areas in need of revegetation	
		Pit bottoms must be sampled annually for radionuclide and heavy metals	Annual Sampoling	Annual vegetation Monitoring Reports	Review annual Veg monitoring reports	Review Existing Reports and 2006 Data

10 Monitoring

	Monitoring Plan	FEIS, Table I-5 details monitoring plan	Verify monitoring requirements met	Monitoring Reports	Review data and compare to clean up standards	Compile and review lab data

11 Remediation Completion

	Vegetation	90 % CSA parameters	Verify levels met	Monitoring Reports	Review data and compare to clean up standards	No Clean Up Standards Set
	Gamma Radiation	< 2x background over entire site				
	Outdoor Radon 222	< 3 pCi/l				
	Radon daughters	< 0.03				

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TABLE A-2 Reconcile Monthly Maps with Draft EIS Map Areas

a.) EIS Report Includes "Jackpile Paguate Mine Site Visual A"
This figure contains a map with waste protore and topsoil areas designated
b.) Construction Work Areas taken from Monthly Report Maps

PROTORE, WASTE AND TOPSOIL PILES

Planning Areas (a)	Construction Work Unit Areas (b)	What Done?	Planning Areas (a)	Construction Work Unit Areas (b)	What Done?	Planning Areas (a)	Construction Work Unit Areas (b)	What Done?
JACKPILE			**NORTH PAGUATE**			**SOUTH PAGUATE**		
Top Soil								
TS-1	JP-SB-53	Used for TS cover	TS-2A	NP-SB-26	Used for TS cover	TS-3	SP-SB-42	Used for TS cover
B	JP-WT-16	Used for TS cover	TS-2B	NP-SB-27	Used for TS cover			
			West RM-104	JP-SB-64	Not used			
Waste								
U	JP-WO-14	Left in place covered	T, S	NP-WO-01	Left in place	Q,R	SP-WT-03	Left in place covered
				NP-WS-31	Used for shale cover		SP-WO-04	Left in place covered
A&B	JP-WS-15	Used for shale cover	N,N2	NP-WO-02	Left in place	South Dump	SP-WS-06	Left in place covered
FD-3	JP-WO-18 (SW)	Left in place covered		NP-WM-12	Left in place	SP Pit Waste	SP-WS-11	Left in place covered
FD-1	JP-WO-66	Left in place covered		NP-DN-11	Left in place		SP-WO-10	Left in place covered
	JP-WO-66A	Left in place covered	N	NP-WT-10	Used for Soil cover		SP-WM-12	Left in place covered
	JP-WO-18C	Left in place covered					SP-WO-13A	Left in place covered
	JP-WO-18 (North)	Left in place covered					SP-WO-14	In pit Used for backfill
	JP-WS-17	Used for shale cover					SP-WO-13B	Left in place covered
	JP-WS-19A	Left in place covered					SP-WS-17	Used for shale cover
	JP-WS-19C	Left in place covered					SP-WT-16	left in place
FD-2	JP-WS-01	Left in place covered					SP-WS-18A	Left in place covered
C,D,E,F,G	JP-WT-02	Left in place					SP-WS-18C	Left in place covered
	JP-WO-70	Left in place					SP-WT-19	Used for soil cover
H	JP-WO-06	Left in place covered					SP-WS-20	Used for shale cover
X,I,Y,Y2	JP-WO-03B	Left in place covered					SP-WS-37	Left in place covered
	JP-WO-03	Left in place covered					SP-WT-15	Used for soil cover
	JP-WO-04	Left in place covered					SP-WM-36	Left in place covered
	JP-WO-07	Left in place covered					SP-WS-07	Used for shale cover
W	JP-WO-11 (South)	Left in place covered					SP-WS-08	Used for shale cover
	JP-WO-12	Left in place covered					SP-WS-09	Used for shale cover
	JP-WS-08	Left in place covered					SP-WS-18B	Left in place covered
	JP-WO-10	Left in place covered				L, K	SP-WT-05	Left in place covered
	JP-WO-09	Left in place covered					SP-WO-38	Left in place covered
V	JP-WS-13	Left in place covered						
	JP-WO-11 (North)	Left in place covered						
	JP-WO-20	Left in place covered						
J	JP-WO-05	Left in place covered						
Jackpile Pit Waste	JP-WO-72	Used for backfill						
Protore								
SP-6-A	JP-PS-24	Hauled to JP-OP-41	SP-2-C	NP-PS-17	Hauled to NP-OP-20	SP-1-A	SP-PS-01	Hauled to NP-OP-20
SP-6-B	JP-PS-25	Hauled to JP-OP-41	1B	NP-PS-18	Hauled to NP-OP-20	4-1	SP-PS-02	Hauled to SP-OP-34
SP-1, J-1A,J-1-A,JLG	JP-PS-22	In JP-OP-41 covered	10, SP-2-D,SP-1-C	NP-PS-15	Hauled to NP-OP-20	PLG		In SP-OP-34 covered
17-E	JP-PS-23	Hauled to JP-OP-41		NP-PS-16	Hauled to NP-OP-20	PLG-1		In SP-OP-34 covered
J2	JP-PS-26	Hauled to JP-OP-41	2E	NP-PS-14	Hauled to NP-OP-20	1-D		In SP-OP-34 covered
J1	JP-PS-27	Hauled to JP-OP-41	1E	?	In NP-OP-20 covered			
SP-17BC	Off Work Unit Map	Hauled to JP-OP-41	SP-1	NP-PS-13	Hauled to NP-OP-20			
			SP-1-A	SP--PS-01	Hauled to NP-OP-20			

SHALE COVER OPERATIONS

JACKPILE	NORTH PAGUATE	SOUTH PAGUATE
None Available	NP-D1	SP-D1
	NP-D2	SP-D2
	NP-D3	SP-D3
	NP-D4	SP-D4
	NP-D5	SP-D5
	NP-D6	SP-D6
	NP-D7	SP-D7
	NP-D8	SP-D8
	NP-D9	
	NP-D10	SP-D11

TOPSOILCOVER

JACKPILE	NORTH PAGUATE	SOUTH PAGUATE
JP-D1	NP-D1	SP-D1
JP-D2	NP-D2	SP-D2
JP-D3	NP-D3	SP-D3
JP-D4A	NP-D4	SP-D4
JP-D4B	NP-D5	SP-D5
JP-D5	NP-D6	SP-D6
JP-D6	NP-D7	SP-D7
JP-D7	NP-D8	SP-D8
	NP-D9	
JP-D8A	NP-D10	SP-D10
JP-D8B		SP-D11
JP-D9A		
JP-D9B		
JP-D11		
JP-D12		
JP-D13		
JP-D14		
JP-D15		

TABLE A-3 Jackpile ROD vs. Work Packages

Used Marvin's Closeout Summary Table and Added entries from Monthly Report "Detail for PTD"		Marvin's Closeout Dates	Coded for Various Pile Categories					ROD Categories	Relate Draft EIS Piles to Work Units
	BACKFILLING		Protore	Waste	Shale	Topsoil	Contam.		EIS Protore, Waste & Topsoil Piles
Jackpile	J = Jackpile								
2E1J01/01B	Haul Roads and Ramps thru PY93								
2E1J02	JP-PS-23 to Backfill (JP-OP-41)	Dec-92	P					1B	move Protore pile 17E
2E1J03	JP-PS-24 Pit Backfill (JP-OP-41)	Apr-93	P					1B	Move Protore Pile SP-6A
2E1J04	JP-PS-25 Pit Backfill (JP-OP-41)	Apr-93	P					1B	5C Partial - moved Protore SP6B
2E1J05	Pit Backfill JP-PS-26 (JP-OP-41)	Feb-92	P					1B	Move Protore J2
2E1J06	Pit Backfill JP-WO-10 (JP-OP-41)	Feb-92		W				1B	Move Waste W
2E1J07	JP-PS-27 to Backfill (JP-OP-41)	Dec-92	P					1B	Move Protore J1
2E1J08	JP-WO-07 Pit Backfill (JP-OP-41)	Apr-93		W				1B	Move Waste Piles X,I,Y,Y2
2E1J09	JP-WO-12 to Pit Backfill (JP-OP-41)	Jul-94		W				1B	Move Waste W
2E1J10	JP-WS-08 to JP-OP-41	Not Used		W				1B	Move Waste W
2E1J11	JP-WS-15 Pit Backfill (JP-OP-41)	Nov-94		W				1B	Move Waste A,B
2E1J12	JP-WO-71 Pit Backfill (JP-OP-41)	Sep-93		W				1B	
2E1J13	JP-WO-03 Pit Backfill (JP-OP-41)	Feb-92		W				1B	Move Waste Piles X,I,Y,Y2
2E1J14	JP-WS-13 & WO-20 Backfill (JP-OP-42)	Dec-92		W				1B	Move Waste V
2E1J15	Jackpile Haul Roads- Force Account								
North Paguate	N=North Paguate								
2E1N01	Build No Paguate Haul Roads	Nov-90							
2E1N02	Haul to Pit NP-PS-17	Sep-91	P					1B	Move Protore SP-2-C
2E1N03	NP-PS-18 to No.Paguate Pit	Nov-90	P					1B	Move Protore 1B
2E1N04	Haul NP-PS-14 to Pit	Feb-90	P					1B	Move Protore 2E
2E1N05	NP-PS-15 to No.Paguate Pit	Nov-90	P					1B	Move Protore 10,SP-2-D, Sp-1-C
2E1N06	NP-PS-16 to No. Paguate Pit	Nov-90	P					1B	Move Protore 10,SP-2-D, Sp-1-C
2E1N07	SP-PS-01 to No. Paguate Pit	Nov-90	P					1B	Move Protore SP-1-A
2E1N08	No Work Unit Assigned this WBS								
2E1N09	No Work Unit Assigned this WBS								
2E1N10	NP-WT-10 Pit Backfill	Sep-91		W				1B	Move Waste Pile N
2E1N11	Relocate NP-PS-13 to Pit	Feb-90	P					1B	Move Protore SP-1
2E1N12	Cut Slopes NP-OP-19	Feb-90							
South Paguate	S=South Paguate								
2E1S01	Construct Sp Haul Roads								
2E1S02	Pit Backfill SP-PS-02	Sep-91	P					1B	Move Protore 4-1
2E1S03	SP-PS-02 Additional Volume	Dec-91	P					1B	Move Protore 4-1

05000102

Used Marvin's Closeout Summary Table and Added entries from Monthly Report "Detail for PTD"		Marvin's Closeout Dates	Coded for Various Pile Categories					ROD Categories	Relate Draft EIS Piles to Work Units
			Protore	Waste	Shale	Topsoil	Contam.		
									EIS Protore, Waste & Topsoil Piles
	DUMP SLOPING								
Jackpile	J = Jackpile								
2E2J01	JP-WO-11 Backfill	Jul-94		W				1B	Slope Waste V and W
2E2J02	JP-WT-16D Backfill	Jul-94		W				1B	
2E2J03	JP-WS-17 to Backfill (Dozers)	Dec-92		W				1B	Slope FD-1
2E2J04	JP-PS-22 Cut Slopes	Dec-92	P		P				Slope Protore SP-1, J-1A,J-1-A,JLG
2E2J05	Cut JP-WO-72 Slopes	Sep-92		W					Slope Jackpile Pit Waste
2E2J06	No Work Unit Assigned this WBS								
2E2J07	No Work Unit Assigned this WBS								
2E2J08	Cut JP-WS-01 Slopes	NC							Slope FD-2
2E2J09	Deleted (JP-WT-02A/02B/02C)								Slope C,D,F,G
2E2J10	JP-WO-73 Pit Backfill	Sep-93		W				1B	
2E2J11	No Work Unit Assigned this WBS								
2E2J12	JP-WO-06 Cut Slopes	Apr-93		W					Slope Wast e H
2E2J12	JP-WO-06 Cut Slopes	Sep-93		W					Slope Waste H
2E2J13	JP-WO-08 / WO-12 Cut Slopes	Apr-93		W					Slope Waste W
2E2J14	JP-WO-11 Cut Slopes	Feb-92		W					Slope Waste V & W
2E2J15	Cut Slopes JP-WS-15 (15A/15B Slopes)	Sep-91		W					Slope Waste A&B
2E2J16	JP-WO-05 Cut Slopes	Apr-93		W					
2E2J17	Cut JP-WT-16A/16B/16C/Slopes	NC		W					Slope Jackpile Pit Waste
2E2J18	Shale to JP-D4				S				
2E2J19	JP-WO-73 Pit Backfill	Apr-93		W				1B	
2E2J20	Cut Slope JP-WO-14	Dec-91		W					Slope Waste U
2E2J21	JP-WS-15A Cut Slopes	Feb-92		W					Slope A&B
2E2J22	JP-WS-19 B & C	Sep-92		W					Slope Waste FD-1
2E2J23	Cut JP-WS-19C Slopes			W					Slope Waste FD-1
2E2J24	Cut Slopes JP-WO-66	Sep-91		W					Slope Waste FD-1
2E2J25	Deleted (JP-WO-70)			W					Slope Waste C,D,E,F,G
2E2J26	JP-WO-18A / 66A Cut Slopes	Dec-92		W					Slope Waste FD-1
2E2J27	Cut Slopes JP-WO-18B & 66C	Sep-92		W					Slope Waste FD-1
2E2J28	JP-WO-18C / 66C	Dec-92		W					Slope Waste FD-1
2E2J29	JP-WO-03A Cut Slopes	Jul-94		W					Slope Waste X,I,Y,Y2
2E2J30	JP-WO-03B Cut Slopes	Sep-93		W					Slope Waste X,I,Y,Y2
2E2J31	JP-WO-04A Cut Slopes	Sep-93		W					Slope Waste X,I,Y,Y2
2E2J32	JP-WO-04B Cut Slopes	Sep-93		W					Slope Waste X,I,Y,Y2
North Paguate	N=North Paguate								
2E2N01	Cut Bench NP-WO-01	Feb-92		W					Slope Wast T&S
2E2N02	Cut Slopes NP-WO-02	Sep-91		W					Slope N, N2
2E2N03	Cut Slopes N P-WS-03	Sep-91		W					
2E2N04	Slope NP-WO-04	Nov-90		W					
2E2N05	Cut NP-WO-06 Slopes	NC							
2E2N06	Cut NP-WT-09 Slopes	NC							
2E2N07	Regrade NP-DN-22	Dec-91							
2E2N08	Cut Slopes NP-WM-12	Sep-91		W					Slope N, N2
2E2N09	Slope NP-HW-25	Nov-90							

05000103

Used Marvin's Closeout Summary Table and Added entries from Monthly Report "Detail for PTD"		Marvin's Closeout Dates	Coded for Various Pile Categories					ROD Categories	Relate Draft EIS Piles to Work Units
			Protore	Waste	Shale	Topsoil	Contam.		
									EIS Protore, Waste & Topsoil Piles
South Paguate	S=South Paguate								
2E2S01	Slope SP-WO-13A / WO-10	Nov-90		w					Slope SP Pit Waste
2E2S02	Cut Slopes SP-WS-17	Dec-91		w					Slope SP Pit Waste
2E2S03	Cut Slope SP-WO-13B & WS-18A	Dec-91		w					Slope SP Pit Waste
2E2S04	Cut SP-WO-14 Slopes	Feb-90		w					Slope SP Pit Waste
2E2S05	Cut SP-WS-18B Slopes	NC		w					Slope SP Pit Waste
2E2S06	Slope SP-WS-18C / WT-19	Nov-90		w					Slope SP Pit Waste
2E2S07	Slope SP-WT-03	Nov-90		w					
2E2S08A	SP-OP-34 Backfill (Force Account) SP-WT-06	NC		w				1B	slope Q&R
2E2S09	Cut SP-WO-38 Slopes	Feb-90		w					Slope L&K
2E2S10	SP-WS-06	Deleted		w					
2E2S11	Slope SP-WT-19A	Nov-90		w					Slope SP Pit Waste
2E2S12	Slope SP-WM-12 and WS-11	Nov-90		w					Slope SP Pit Waste
2E2S13	SP-WT-15A,B	Deleted							Slope SP Pit Waste
2E2S14	Backfill SP-OP-34 (D4-West)	Dec-91							
2E2S15	Slope SP-WT -16/37	Nov-90		w					Slope SP Pit Waste
2E2S16	Backfill SP-OP-34 (D4-East)	Dec-91						1B	
2E2S17	Backfill SP-OP-34 (SP-14)	Dec-91						1B	
2E2S18	Backfill SP-OP-34(Sh-2)	Dec-91						1B	
2E2S19	Misc. So. Paguate Sloping	Nov-90							
	COVER PLACEMENT								
Jackpile	J = Jackpile								
2E3J01	Haul Soil from JP-SB-53 to D4 Soil Cover	Apr-93				T		1B	
2E3J02	Haul Soil from JP-SB-53 to D5 Soil Cover	Apr-93				T		1B	
2E3J03	Haul Soil from JP-SB-53 to D6 Soil Cover					T		1B	
2E3J04	Haul Soil from JP-SB-53 to D9A	Jul-94				T		1B	
2E3J05	Haul Soil from JP-SB-53 to D1	Nov-94				T		1B	
2E3J06	Haul Soil from JP-SB-53 to D3					T		1B	
2E3J07	Haul Soil from JP-SB-53 to D2					T		1B	
2E3J08	Haul Soil from JP-SB-64 to D7					T		1B	
2E3J08A	JP-WO-07 Pit Backfill	Sep-93		w				1B	Related to Piles X,I,Y,Y2
2E3J09	Haul Soil from JP-SB-64 to D11	Nov-94				T		1B	
2E3J10	Haul Soil from JP-SB-64 to D12 or D12A	Sep-93				T		1B	
2E3J11	Haul Soil from JP-SB-54 to D16	Sep-93				T		1B	
2E3J12	Haul Soil from JP-SB-54 to D15	Jul-94				T		1B	
2E3J12	Soil JP-D15	Sep-93						1B	
2E3J13	Soil to JP-D4	Jul-94						1B	
2E3J14	1990 (JP-SB-54)	Deleted				T		1B	
2E3J15	Topsoil to H-1 mine area	Dec-91				T		1B	
2E3J16	Soil to JP-D13	Jul-94						1B	
2E3J17	Soil JP-D8B							1B	
2E3J18	Haul Shale from JP-WS-19 to D4	NC			S			1B	
2E3J19	Haul Shale from JP-WS-15 to D1	NC			S			1B	
2E3J20	Haul Shale from JP-WS-15 to D2 Shale Cover	Apr-93			S			1B	
2E3J21	Haul Shale from JP-WS-15 to D7	NC			S			1B	
2E3J22	Haul Shale from JP-WS-15 to D11	NC			S			1B	
2E3J23	Haul Shale from JP-WS-15 to D12	Apr-93			S			1B	
2E3J23	Shale JP-D15	Sep-93			S			1B	
2E3J24	Haul Shale from JP-WT-02 TO D8A	Nov-94			S			1B	Haul Shale C,D,E,F,G
2E3J24	JP-WO-02	NC						1B	
2E3J25									
2E3J26	Shale Cover JP-D13	Jul-94			S				
2E3J27	Shale JP-D14 or D4	Sep-93			S			1B	
2E3J28	Haul Shale from JP-WT-02 to D15	Jul-94			S			1B	
2E3J29	Haul Shale from JP-WT-02 to D16	Sep-93			S			1B	

05000104

Used Marvin's Closeout Summary Table and Added entries from Monthly Report "Detail for PTD"		Marvin's Closeout Dates	Coded for Various Pile Categories					ROD Categories	Relate Draft EIS Piles to Work Units
			Protore	Waste	Shale	Topsoil	Contam.		
									EIS Protore, Waste & Topsoil Piles
North Paguate	N=North Paguate								
2E3N01	Haul Soil from NP-SB-61 to NP-D8	Sep-92				T		1B	
2E3N02	Haul Soil from NP-SB-26 to NP-D2	Sep-91				T		1B	
2E3N02	Soil Cover NP-D7	Sep-92						1B	
2E3N03	Haul Soil from NP-SB-27 to NP-D7	NC				T		1B	
2E3N04	Haul Soil from NP-SB-27 to D9	Feb-92				T		1B	
2E3N05	Haul Soil from NP-SB-27 to D6	Dec-92				T		1B	
2E3N06	Haul Soil from NP-SB-61 to NP-D9	Feb-92				T		1B	
2E3N07	Haul Soil from SP-DN-61 to NP-D4	Nov-91				T		1B	
2E3N08	Haul Soil from SP-DN-61 to NP-D1	Nov-91				T		1B	
2E3N09	Haul Soil from SP-DN-61 to NP-D3	Sep-91				T		1B	
2E3N10	Haul Soil from SP-DN-61 to NP-D5	Sep-91				T		1B	
2E3N11	Haul Soil from SP-DN-61 to NP-D10	Sep-92				T		1B	
2E3N12	Soil to NP-D6 (Benches)	Sep-92						1B	
2E3N13	Haul Shale Cover From NP-WS-31 to N P-D9	Feb-92			S			1B	Haul shale from T&S
2E3N14	Shale Borrow to N P-D4	Sep-91			S			1B	
2E3N15	Shale Borrow to NP-D5	Sep-91			S			1B	
2E3N16	Haul Shale from NP-WS-31 to NP-D8	Feb-92			S			1B	Haul shale from T&S
2E3N16	Shale Cover NP-D8	Sep-92			S			1B	
2E3N17	Haul Shale from NP-WS-31 to NP-D10	Sep-92			S			1B	Haul shale from T&S
2E3N18	Haul Shale From NP-WS-03 to NP-D3	Sep-91			S			1B	
2E3N19	Haul Shale From NP-WS-03 to NP-D3	Sep-91			S			1B	
2E3N20	No Work Package Assigned this WBS#								
2E3N21	Haul Shale from NP-WS-03 to NP-D1	NC						1B	
South Paguate	S=South Paguate								
2E3S01	Topsoil Soil Borrow SP-OP-35 (SP-D1) from SP-SB	Sep-91				T		1B	
2E3S02	Topsoil Soil Borrow SP=WS-17(SP-D2) from SP-SB	Dec-91				T		1B	
2E3S03	Topsoil Soil Borrow to SP-D3 from SP-SB-44	Dec-91				T		1B	
2E3S04	Haul Soil from SP-SB-42 to SP-D4	Feb-92				T		1B	
2E3S05	Haul Soil from SP-SB-42 to SP-D5	Feb-92				T		1B	
2E3S06	Haul Soil from SP-SB-42 to SP-D6	Feb-92				T		1B	
2E3S07	Haul Soil from SP-SB-42 to SP-D7	Feb-92				T		1B	
2E3S08	Topsoil to SP-D8 from SP-SB-44	Dec-91				T		1B	
2E3S09	Topsoil to SP-D9 from SP-SB-42	Dec-91				T		1B	
2E3S10	Haul Soil fom SP-SB-42 to SP-D10	Not Used						1B	
2E3S11	Topsoil to SP-D11 from SP-SB-42	Dec-91				T		1B	
2E3S12	Soil Cover to SP-D12 from SP-SB-43	Feb-92				T		1B	
2E3S13	Topsoil to SP-D1B from SP-SB-50	Nov-91				T		1B	
2E3S14	Shale Cover SP-WO-13A from SP-WS-17	Sep-91			S			1B	
2E3S15	Shale Borrow (SP-13B) from SP-WS-15	Not Used						1B	
2E3S16	Shale Borrow for SP-PS-01 from SP-WS-07	Sep-91			S			1B	Remove shale from SPPit Waste for Cover
2E3S17	Shale Cover to SP-14 from SP-WS-07	Dec-91			S			1B	Remove shale from SPPit Waste for Cover
2E3S18	Haul Shale Borrow from SP-WS-07 to SP-WO-04	Sep-91			S			1B	Cover Q.R with shale from SP Pit Waste
2E3S19	Haul Shale from Sp-WS-07 to SP-D10	Nov-91				T		1B	Remove shale from SPPit Waste for Cover
2E3S20	Haul Shale to SP-38 Shale from SP-WS-07	Sep-91			S			1B	Remove shale from SPPit Waste for Cover
2E3S21	Haul Shale Cover from SP-WS-07 to SP- WO-10	Sep-91			S			1B	Remove shale from SPPit Waste for Cover
	CONTAMINATED SOIL EXCAVATION								
Jackpile	J = Jackpile								
2E4J01	HaulJP-CS-36 to JP-OP-41 for Backfill	Feb-92					C		
2E4J02	Haul JP-CS-37/38 to JP-OP-41 Backfill	Dec-92					C		
2E4J03	No work Package assigned this WBS								
2E4J04	Combined into 2E4J02								

05000105

Used Marvin's Closeout Summary Table and Added entries from Monthly Report "Detail for PTD"		Marvin's Closeout Dates	Coded for Various Pile Categories					ROD Categories	Relate Draft EIS Piles to Work Units
			Protore	Waste	Shale	Topsoil	Contam.		
									EIS Protore, Waste & Topsoil Piles
North Paguate	N=North Paguate								
2E4N01	Haul Pit Backfill from NP-CS-24/23 to NP-OP-20	Sep-91					c		
2E4N01 A	N. Rio Paguate Backfill-East	Dec-91					c		
2E4N01 B	N. Rio Paguate Backfill-West	Dec-91					c		
South Paguate	S=South Paguate								
2E4S01	SP-SS-27/28, CS	NC							
2E4S01	FM S-CS-27/28/31/33/53 to SP-OP-34								
2E4S02	No work Package assigned this WBS								
2E4S03	No work Package assigned this WBS								
2E4S04	SP-CS-33						c		
2E4S05	No work Package assigned this WBS								
2E4S06	No work Package assigned this WBS								
2E4S07	Completed 1990 SP-CS-62/33 32 to SP-OP-35	Nov-90					c		
	HIGHWALL RECLAMATION								
2E5J01	Trim JP Highwalls								
2E5J02	Scale JP Highwalls								
2E5N01	Scale N. Paguate Highwalls	Dec-91							
2E5N02	Trim N. Paguate Highwalls	Dec-91							
2E5S01	Scale S. paguate Highwalls	Dec-91							
2E5S02	Trim S. Paguate Highwalls	Dec-91							
	EROSION CONTROL								
2E6N01A	Rio Moquino Erosion Control	Nov-94							
2E6N02	Delete Rio Moquino Channel								
2E6N03	Deleted 1990 Bedding Material								
2E6X01	Deleted 1990 Quarry Rock								
2E6X02	Deleted 1990 Process Rock								
2R1N01	Reseed N P Flat Areas	Nov-94							
2R1N02	Reseed N P Slope Areas	Nov-94							
	UNDERGROUND ENTRIES ABANDONMENT								
2S1J01	Seal JP-SS-50 Entries								
2S1J02	Seal JP-PS-46 Entries								
2S1N01	Seal PW-2/3 Adit	Feb-90							
2S1S01	Seal P-13 Adit	Dec-91							
2S1S02	P-10 Decline Closure	Feb-92							
2S1S03	Seal H-1 Adit	Feb-90							
2S1S04	Seal Vent Holes	Feb-92							
2S1S05	Plug Drill Holes	Feb-90							
	PIT WATER								
2S2J01	Dewater Jackpile Pit PY-91 92 93	Dec-91							
2S2N01	Dewater No. Paguate Pit	Jul-90							
2S2S01	Dewater So. Paguate Pit	Nov-90							

05000106

Used Marvin's Closeout Summary Table and Added entries from Monthly Report "Detail for PTD"		Marvin's Closeout Dates	Coded for Various Pile Categories					ROD Categories	Relate Draft EIS Piles to Work Units
			Protore	Waste	Shale	Topsoil	Contam.		
									EIS Protore, Waste & Topsoil Piles
	SURFACE STRUCTURE DEMOLITION								
2S3J01	Demolish Jackpile Surface Structures								
2S3N01	Demolish No. Paguate Structures	Feb-90							
2S3S01	Demolish South Paguate Surface Structures								
2S4XY	Not Assigned								
	PERMANENT STRUCTURE								
2S5J01	Construct Permanent Access Roads JP								
2S5J02A	Rio Moquino Drop Structure								
2S5J02	Construct Fences-Jackpile Area	Dec-91						1D	
2S5N01	Constr. Permanent Access Roads NP								
2S5N02	Construct Fences-N. paguate Area	Dec-91						1D	
2S5S01	Constr. Permanent Access Roads SP								
2S5S02	Construct Fences-S. paguate Area	Dec-91						1D	
2S5J09	Constr. Perm Fences All Areas								
	SEED BEDS								
2R1J01	Prepare Bed and Seed JP Flat Areas								
2R1J02	Prepared Bed and Seed JP Slope Areas								
2R1N01	Prepare Bed and Seed NP Flat Areas								
2R1N02	Prepared Bed and Seed NP Slope Areas								
2R1S01	Prepare Bed and Seed SP Flat Areas								
2R1S02	Prepared Bed and Seed SP Slope Areas								
2R1S03	Complete 1990 Reseed and Housing Area								
	IRRIGATION								
2R2J01	Deleted 1990 Irrigation								
2R2N01	Deleted 1990 Irrigation								
2R2S01	Tree Planting								
	BENCHES/TERRACING								
2T2J01	JP-WS-01 Slopes	Jul-94							Slope FD-2
2T2J02									
2T2J03	Cut JP-WO-03A /3B/4A/4B Slopes								Slope X,I,Y,Y2
2T2N01	Cut NP-WO-01 Rio Moquino Benches	Sep-92							
2T2S01	Cut SP-SW-06 Slopes Oak Canyon								
2T2PLR	Misc Repairs PY 93 Force Account								
2T1J01	Terracing JP Area 29000 lf								
2T1N01	Terracing NP Area 1200 lf								
2T1S01	Terracing SP Area 19100 lf								

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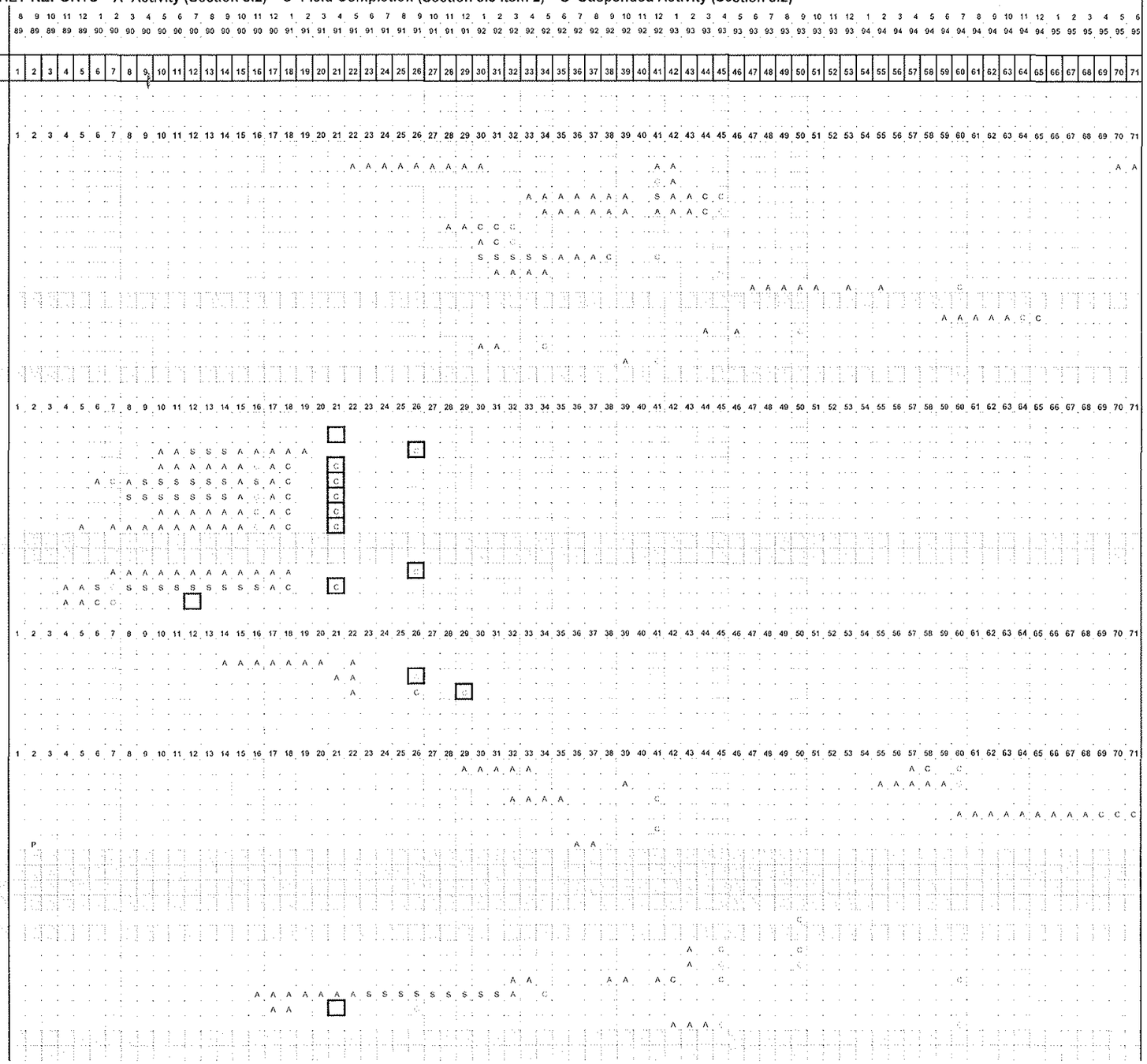
TABLE A-4 Work Packages vs. Monthly Report Activities

Activity in Work Units Based on Monthly Reports		Completion Dates	From Monthly Reports		
Work Unit Description.		Marvin's Table Completion Dates	Construction Report Vol.	Completion Date	POL Signature Certified
BACKFILLING = Moving Waste and Protore to Open Pits					
Jackpile	J = Jackpile				
2E1J01/01B	Haul Roads and Ramps thru PY93				
2E1J02	JP-PS-23 to Backfill (JP-OP-41)	Dec-92			
2E1J03	JP-PS-24 Pit Backfill (JP-OP-41)	Apr-93			
2E1J04	JP-PS-25 Pit Backfill (JP-OP-41)	Apr-93			
2E1J05	Pit Backfill JP-PS-26 (JP-OP-41)	Feb-92			
2E1J06	Pit Backfill JP-WO-10 (JP-OP-41)	Feb-92			
2E1J07	JP-PS-27 to Backfill (JP-OP-41)	Dec-92			
2E1J08	JP-WO-07 Pit Backfill (JP-OP-41)	Apr-93			
2E1J09	JP-WO-12 to Pit Backfill (JP-OP-41)	Jul-94			
2E1J10	JP-WS-08 to JP-OP-41	Not Used			
2E1J11	JP-WS-15 Pit Backfill (JP-OP-41)	Nov-94			
2E1J12	JP-WO-71 Pit Backfill (JP-OP-41)	Sep-93			
2E1J13	JP-WO-03 Pit Backfill (JP-OP-41)	Feb-92			
2E1J14	JP-WS-13 & WO-20 Backfill (JP-OP-42)	Dec-92			
2E1J15	Jackpile Haul Roads- Force Account	NA			
North Paguate	N=North Paguate				
2E1N01	Build No Paguate Haul Roads	Nov-90	1.0	11-Apr-91	Olsen
2E1N02	Haul toPit NP-PS-17	Sep-91	1.0	4-Sep-91	Olsen
2E1N03	NP-PS-18 to No.Paguate Pit	Nov-90	1.0	11-Apr-91	Harrison
2E1N04	Haul NP-PS-14 to Pit	Feb-90	1.0	11-Apr-91	Harrison
2E1N05	NP-PS-15 to No.Paguate Pit	Nov-90	1.0	11-Apr-91	Harrison
2E1N06	NP-PS-16 to No. Paguate Pit	Nov-90	1.0	11-Apr-91	Harrison
2E1N07	SP-PS-01 to No. Paguate Pit	Nov-90	1.0	11-Apr-91	Harrison
2E1N08	No Work Unit Assigned this WBS	Not Used			
2E1N09	No Work Unit Assigned this WBS	Not Used			
2E1N10	NP-WT-10 Pit Backfill	Sep-91	1.0	4-Sep-91	Olsen
2E1N11	Relocate NP-PS-13 to Pit	Feb-90	1.0	11-Apr-91	Harrison
2E1N12	Cut Slopes NP-OP-19	Feb-90	1.0	4-Jul-90	Harrison
South Paguate	S=South Paguate				
2E1S01	Construct SP Haul Roads				
2E1S02	Pit Backfill SP-PS-02	Sep-91	1.0	4-Sep-91	Olsen
2E1S03	SP-PS-02 Additional Volume	Dec-91	1.0	16-Dec-91	Olsen
	DUMP SLOPING				
Jackpile	J = Jackpile				
2E2J01	JP-WO-11 Backfill	Jul-94			
2E2J02	JP-WT-16 Backfill	Jul-94			
2E2J03	JP-WS-17 to Backfill (Dozers)	Dec-92			
2E2J03A	JP-WS-17 Backfill				
2E2J04	JP-PS-22 Cut Slopes	Dec-92			
2E2J05	Cut JP-WO-72 Slopes	Sep-92			
2E2J06	No Work Unit Assigned this WBS	Not Used			
2E2J07	No Work Unit Assigned this WBS	Not Used			
2E2J08	Cut JP-WS-01 Slopes	NC			
2E2J09	Deleted (JP-WT-02A/02B/02C)	Not Used			
2E2J10	JP-WO-73 Pit Backfill	Sep-93			
2E2J11	No Work Unit Assigned this WBS				
2E2J12	JP-WO-06 Cut Slopes	Apr-93			
2E2J12	JP-WO-06 Cut Slopes	Sep-93			
2E2J13	JP-WO-08 / WO-12 Cut Slopes	Apr-93			
2E2J14	JP-WO-11 Cut Slopes	Feb-92			
2E2J15	Cut Slopes JP-WS-15 (15A/15B Slopes)	Sep-91	1.0	9-Apr-91	Olsen
2E2J16	JP-WO-05 Cut Slopes	Apr-93			
2E2J17	Cut JP-WT-16A/16B/16C/Slopes	NC			
2E2J18	Shale to JP-D4				

From Monthly Reports
C = Closeouts from Section 5.3

MONTHLY REPORTS A=Activity (Section 5.2) C=Field Completion (Section 5.3 Item 2) S=Suspended Activity (Section 5.2)



Activity in Work Units Based on Monthly Reports		Completion Dates	From Monthly Reports		
Work Unit	Description.	Marvin's Table Completion Dates	Construction Report Vol.	Completion Date	POL Signature Certified
2E2J19	JP-WO-73 Pit Backfill	Apr-93			
2E2J20	Cut Slope JP-WO-14	Dec-91	1.0	16-Dec-91	Olsen
2E2J21	JP-WS-15A Cut Slopes	Feb-92			
2E2J22	JP-WS-19 B & C	Sep-92			
2E2J23	Cut JP-WS-19C Slopes				
2E2J24	Cut Slopes JP-WO-66	Sep-91			
2E2J25	Deleted (JP-WO-70)				
2E2J26	JP-WO-18A / 66A Cut Slopes	Dec-92			
2E2J27	Cut Slopes JP-WO-18B & 66C	Sep-92			
2E2J28	JP-WO-18C / 66C	Dec-92			
2E2J29	JP-WO-03A Cut Slopes	Jul-94			
2E2J30	JP-WO-03B Cut Slopes	Sep-93			
2E2J31	JP-WO-04A Cut Slopes	Sep-93			
2E2J32	JP-WO-04B Cut Slopes	Sep-93			
North Paguate	N=North Paguate				
2E2N01	Cut Bench NP-WO-01	Feb-92			
2E2N02	Cut Slopes NP-WO-02	Sep-91	1.0	9-Apr-91	Olsen
2E2N03	Cut Slopes N P- WS-03	Sep-91	1.0	9-Apr-91	Olsen
2E2N04	Slope NP-WO-04	Nov-90	1.0	11-Apr-91	Harrison
2E2N05	Cut NP-WO-06 Slopes	NC			
2E2N06	Cut NP-WT-09 Slopes	NC			
2E2N07	Regrade NP-DN-22	Dec-91	1.0	16-Dec-91	Olsen
2E2N08	Cut Slopes NP-WM-12	Sep-91	1.0	4-Sep-91	Olsen
2E2N09	Slope NP-HW-25	Nov-90	1.0	11-Apr-91	Harrison
South Paguate	S=South Paguate				
2E2S01	Slope SP-13A / WO-10	Nov-90	1.0	11-Apr-91	Harrison
2E2S02	Cut Slopes SP-WS-17	Dec-91	1.0	16-Dec-91	Olsen
2E2S03	Cut Slope SP-WO-13B & WS-18A	Dec-91	1.0	16-Dec-91	Olsen
2E2S04	Cut SP-WO-14 Slopes	Feb-90	1.0	11-Apr-91	Harrison
2E2S05	Cut SP-WS-18B Slopes	NC			
2E2S06	Slope SP-WS-18C / WT-19	Nov-90	1.0	11-Apr-91	Harrison
2E2S07	Slope SP-WT -03	Nov-90	1.0	11-Apr-91	Harrison
2E2S08A	SP-OP-34 Backfill (Force Account) SP-WT-06	NC			
2E2S09	Cut SP-WO-38 Slopes	Feb-90	1.0	11-Apr-91	Harrison
2E2S10	SP-WS-06	Deleted			
2E2S11	Slope SP-WT-19A	Nov-90	1.0	11-Apr-91	Harrison
2E2S12	Slope WS-WM-12	Nov-90	1.0	11-Apr-91	Harrison
2E2S13	SP-WT-15A,B	Deleted			
2E2S14	Backfill SP-OP-34 (D4-West)	Dec-91	1.0	16-Dec-91	Olsen
2E2S15	Slope SP-WT -16/37	Nov-90	1.0	11-Apr-91	Harrison
2E2S16	Backfill SP-OP-34 (D4-East)	Dec-91	1.0	16-Dec-91	Olsen
2E2S17	Backfill SP-OP-34 (SP-14)	Dec-91	1.0	16-Dec-91	Olsen
2E2S18	Backfill SP-OP-34(Sh-2)	Dec-91	1.0	16-Dec-91	Olsen
2E2S19	Misc. So. Paguate Sloping	Nov-90	1.0	11-Apr-91	Harrison
	COVER PLACEMENT				
Jackpile	J = Jackpile				
2E3J01	Haul Soil from JP-SB-53 to D4 Soil Cover	Apr-93			
2E3J02	Haul Soil from JP-SB-53 to D5 Soil Cover	Apr-93			
2E3J03	Haul Soil from JP-SB-53 to D6 Soil Cover				
2E3J04	Haul Soil from JP-SB-53 to D9A	Jul-94			
2E3J05	Haul Soil from JP-SB-53 to D1	Nov-94			
2E3J06	Haul Soil from JP-SB-53 to D3				
2E3J07	Haul Soil from JP-SB-53 to D2				
2E3J08	Haul Soil from JP-SB-64 to D7				
2E3J08A	JP-WO-07 Pit Backfill	Sep-93			
2E3J09	Haul Soil from JP-SB-64 to D11	Nov-94			
2E3J10	Haul Soil from JP-SB-64 to D12 or D12A	Sep-93			
2E3J11	Haul Soil from JP-SB-54 to D16	Sep-93			
2E3J12	Haul Soil from JP-SB-54 to D15	Jul-94			
2E3J12	Soil JP-D15	Sep-93			
2E3J13	Soil to JP-D4	Jul-94			
2E3J14	1990 (JP-SB-54)	Deleted			
2E3J15	Topsoil to H-1 mine area	Dec-91	1.0	16-Dec-91	Olsen
2E3J16	Soil to JP-D13	Jul-94			
2E3J17	Soil JP-D8B				
2E3J18	Haul Shale from JP-WS-19 to D4	NC			

From Monthly Reports
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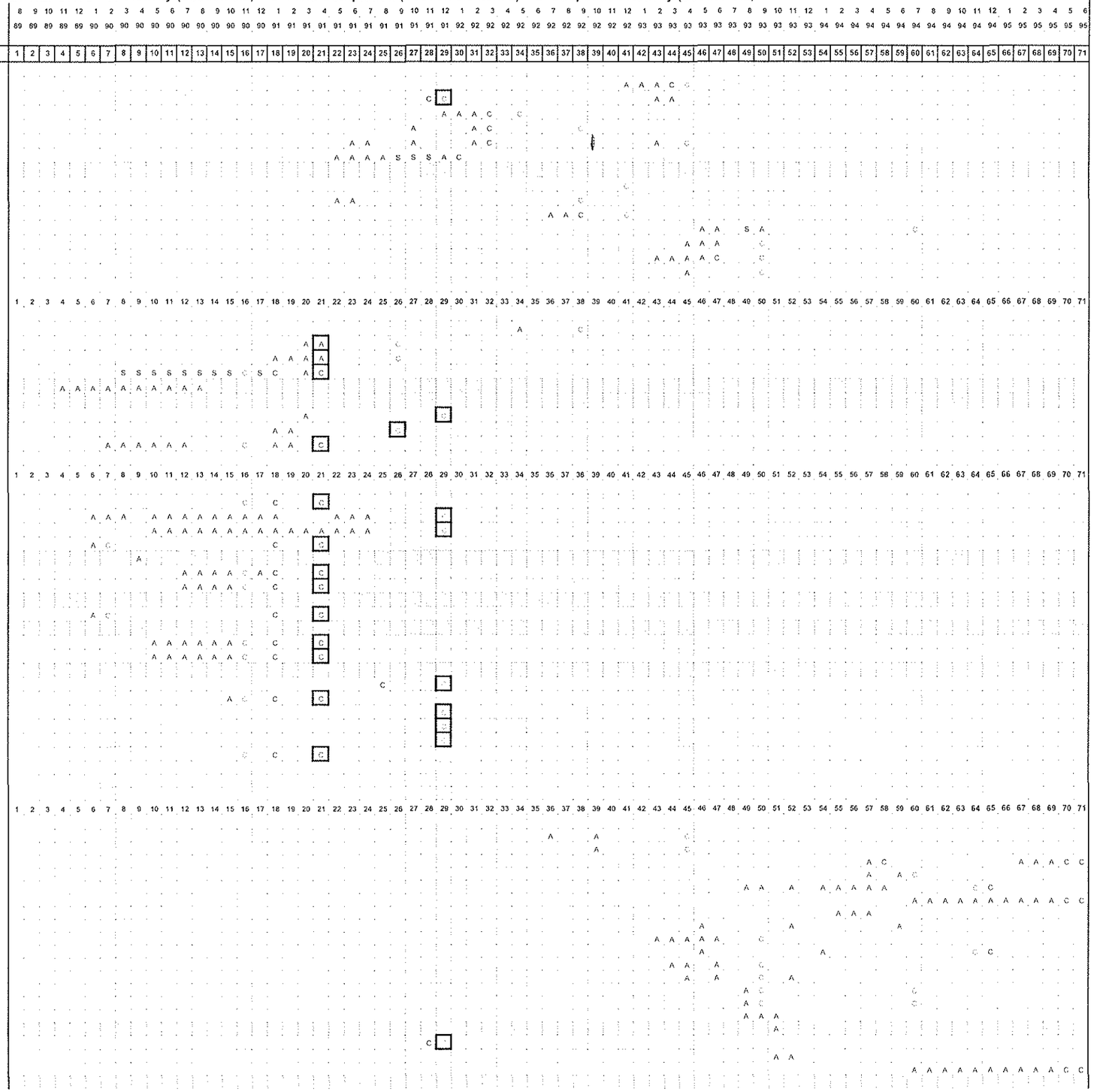

Activity in Work Units Based on Monthly Reports		Completion Dates	From Monthly Reports			
	Work Unit Description.	Marvin's Table Completion Dates	Construction Report Vol.	Completion Date	POL Signature Certified	
2E3J19	Haul Shale from JP-WS-15 to D1	NC				
2E3J20	Haul Shale from JP-WS-15 to D2 Shale Cover	Apr-93				
2E3J21	Haul Shale from JP-WS-15 to D7	NC				
2E3J22	Haul Shale from JP-WS-15 to D11	NC				
2E3J23	Haul Shale from JP-WS-15 to D12	Apr-93				
2E3J23	Shale JP-D15	Sep-93				
2E3J24	Haul Shale from JP-WT-02 TO D8A	Nov-94				
2E3J24	JP-WO-02	NC				
2E3J25						
2E3J26	Shale Cover JP-D13	Jul-94				
2E3J27	Shale JP-D14 or D4	Sep-93				
2E3J28	Haul Shale from JP-WT-02 to D15	Jul-94				
2E3J29	Haul Shale from JP-WT-02 to D16	Sep-93				
North Paguate	N=North Paguate					
2E3N01	Haul Soil from NP-SB-61 to NP-D8	Sep-92				
2E3N02	Haul Soil from NP-SB-26 to NP-D2	Sep-91	1.0	04-Sep-91	Olsen	
2E3N02	Soil Cover NP-D7	Sep-92				
2E3N03	Haul Soil from NP-SB-27 to NP-D7	NC				
2E3N04	Haul Soil from NP-SB-27 to D9	Feb-92				
2E3N05	Haul Soil from NP-SB-27 to D6	Dec-92				
2E3N06	Haul Soil from NP-SB-61 to NP-D9	Feb-92				
2E3N07 Topsoil	Haul Soil from SP-DN-61 to NP-D4	Nov-91	1.0	13-Nov-91	Olsen	
2E3N07 Shale	Haul Soil from SP-DN-61 to NP-D4		1.0	16-Dec-91	Olsen	
2E3N08 Topsoil	Haul Soil from SP-DN-61 to NP-D1	Nov-91	1.0	13-Nov-91	Olsen	
2E3N08 Shale	Haul Soil from SP-DN-61 to NP-D1		1.0	16-Dec-91	Olsen	
2E3N09	Haul Soil from SP-DN-61 to NP-D3	Sep-91	1.0	4-Sep-91	Olsen	
2E3N10	Haul Soil from SP-DN-61 to NP-D5	Sep-91	1.0	4-Sep-91	Olsen	
2E3N11	Haul Soil from SP-DN-61 to NP-D10	Sep-92				
2E3N12	Soil to NP-D6 (Benches)	Sep-92				
2E3N13	Haul Shale Cover From NP-WS-31 to N P-D9	Feb-92				
2E3N14	Shale Borrow to N P-D4	Sep-91	1.0	9-Apr-91	Olsen	
2E3N15	Shale Borrow to NP-D5	Sep-91	1.0	4-Sep-91	Olsen	
2E3N16	Haul Shale from NP-WS-31 to NP-D8	Feb-92				
2E3N16	Shale Cover NP-D8	Sep-92				
2E3N17	Haul Shale from NP-WS-31 to NP-D10	Sep-92				
2E3N18	Haul Shale From NP-WS-03 to NP-D3	Sep-91	1.0	4-Sep-91	Olsen	
2E3N19	Haul Shale From NP-WS-03 to NP-D3	Sep-91	1.0	14-Sep-91	Olsen	
2E3N20	No Work Package Assigned this WBS#					
2E3N21	Haul Shale from NP-WS-03 to NP-D1	NC				
South Paguate	S=South Paguate					
2E3S01	Topsoil Soil Borrow SP-OP-35 (SP-D1) from SP-SB	Sep-91				
2E3S02	Topsoil Soil Borrow SP=WS-17(SP-D2) from SP-SB	Dec-91	1.0	16-Dec-91	Olsen	
2E3S03	Topsoil Soil Borrow to SP-D3 from SP-SB-44	Dec-91	1.0	16-Dec-91	Olsen	
2E3S04	Haul Soil from SP-SB-42 to SP-D4	Feb-92				
2E3S05	Haul Soil from SP-SB-42 to SP-D5	Feb-92				
2E3S06	Haul Soil from SP-SB-42 to SP-D6	Feb-92				
2E3S07	Haul Soil from SP-SB-42 to SP-D7	Feb-92				
2E3S08	Topsoil to SP-D8 from SP-SB-44	Dec-91	1.0	16-Dec-91	Olsen	
2E3S09	Topsoil to SP-D9 from SP-SB-42	Dec-91	1.0	16-Dec-91	Olsen	
2E3S10	Haul Soil fom SP-SB-42 to SP-D10	Not Used				
2E3S11	Topsoil to SP-D11 from SP-SB-42	Dec-91	1.0	16-Dec-91	Olsen	
2E3S12	Soil Cover to SP-D12 from SP-SB-43	Feb-92				
2E3S13	Topsoil to SP-D1B from SP-SB-50	Nov-91	1.0	13-Nov-91	Olsen	
2E3S14	Shale Cover SP-WO-13A from SP-WS-17	Sep-91				
2E3S15	Shale Borrow (SP-13B) from SP-WS-15	Not Used				
2E3S16	Shale Borrow for SP-PS-01 from SP-WS-07	Sep-91	1.0	9-Apr-91	Olsen	
2E3S17	Shale Cover to SP-14 from SP-WS-07	Dec-91	1.0	16-Dec-91	Olsen	
2E3S18	Haul Shale Borrow from SP-WS-07 to SP-WO-04	Sep-91	1.0	9-Apr-91	Olsen	
2E3S19	Haul Shale from Sp-WS-07 to SP-D10	Nov-91	1.0	13-Nov-91	Olsen	
2E3S20	Haul Shale to SP-38 Shale from SP-WS-07	Sep-91	1.0	4-Sep-91	Olsen	
2E3S21	Haul Shale Cover from SP-WS-07 to SP- WO-10	Sep-91				
	CONTAMINATED SOIL EXCAVATION					
Jackpile	J = Jackpile					
2E4J01	HaulJP-CS-36 to JP-OP-41 for Backfill	Feb-92				
2E4J02	Haul JP-CS-37/38 to JP-OP-41 Backfill	Dec-92				
2E4J03	No work Package assigned this WBS					
2E4J04	Combined into 2E4J02					

From Monthly Reports
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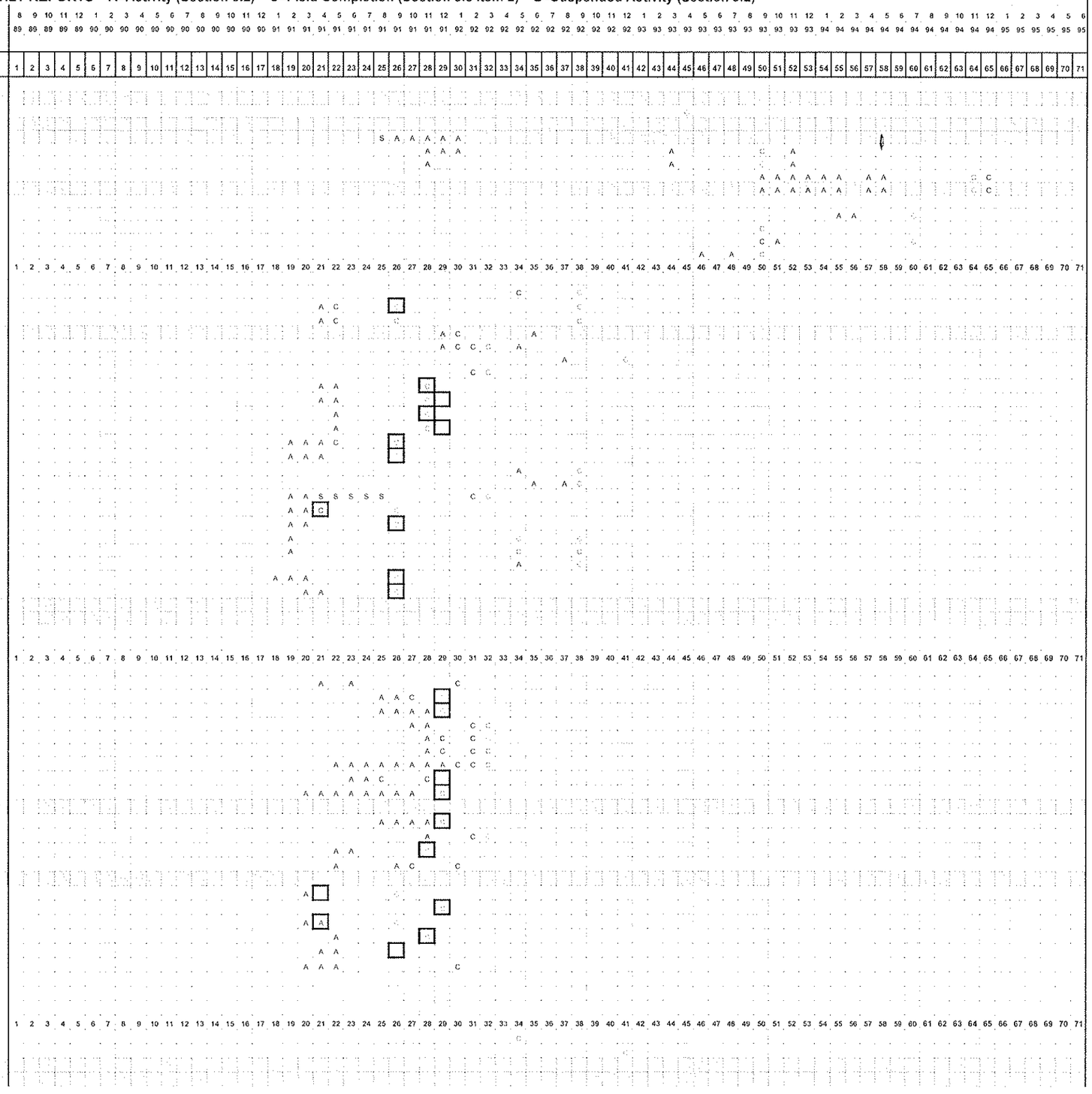

Activity in Work Units Based on Monthly Reports		Completion Dates	From Monthly Reports		
	Work Unit Description.	Marvin's Table Completion Dates	Construction Report Vol.	Completion Date	POL Signature Certified
North Paguate	N=North Paguate				
2E4N01	Haul Pit Backfill from NP-CS-24/23 to NP-OP-20	Sep-91			
2E4N01 A	N. Rio Paguate Backfill-East	Dec-91	1.0	16-Dec-91	Olsen
2E4N01 B	N. Rio Paguate Backfill-West	Dec-91	1.0	16-Dec-91	Olsen
South Paguate	S=South Paguate				
2E4S01	SP-SS-27/28, CS	NC			
2E4S01	FM S-CS-27/28/31/33/53 to SP-OP-34				
2E4S02	No work Package assigned this WBS				
2E4S03	No work Package assigned this WBS				
2E4S04	SP-CS-33				
2E4S05	No work Package assigned this WBS				
2E4S06	No work Package assigned this WBS				
2E4S07	Completed 1990 SP-CS-62/33 32 to SP-OP-35	Nov-90	1.0	11-Apr-91	Harrison
	HIGHWALL RECLAMATION				
2E5J01	Trim JP Highwalls				
2E5J02	Scale JP Highwalls				
2E5N01	Scale N. Paguate Highwalls	Dec-91	1.0	16-Dec-91	Olsen
2E5N02	Trim N. Paguate Highwalls	Dec-91	1.0	16-Dec-91	Olsen
2E5S01	Scale S. paguate Highwalls	Dec-91	1.0	16-Dec-91	Olsen
2E5S02	Trim S. Paguate Highwalls	Dec-91	1.0	16-Dec-91	Olsen
	EROSION CONTROL				
2E6N01A	Rio Moquino Erosion Control	Nov-94			
2E6N02	Delete Rio Moquino Channel				
2E6N03	Deleted 1990 Bedding Material				
2E6X01	Deleted 1990 Quarry Rock				
2E6X02	Deleted 1990 Process Rock				
	UNDERGROUND ENTRIES ABANDONMENT				
2S1J01	Seal JP-SS-50 Entries				
2S1J02	Seal JP-PS-46 Entries				
2S1N01	Seal PW-2/3 Adit	Feb-90	1.0	30-Mar-90	Harrison
2S1S01	Seal P-13 Adit	Dec-91	1.0	16-Dec-91	Olsen
2S1S02	P-10 Decline Closure	Feb-92			
2S1S03	Seal H-1 Adit	Feb-90	1.0	1-Feb-90	Olsen
2S1S04	Seal Vent Holes	Feb-92			
2S1S05	Plug Drill Holes	Feb-90	1.0	30-Mar-90	Harrison
	Pit Water				
2S2J01	Dewater Jackpile Pit PY-91 92 93	Dec-91	1.0	16-Dec-91	Olsen
2S2N01	Dewater No. Paguate Pit	Jul-90	1.0	20-Jun-90	Harrison
2S2S01	Dewater So. Paguate Pit	Nov-90	1.0	11-Apr-91	Harrison
	Surface Structure Demolition				
2S3J01	Demolish Jackpile Surface Structures				
2S3N01	Demolish No. Paguate Structures	Feb-90	1.0	20-Jun-90	Harrison
2S3S01	Demolish South Paguate Surface Structures				
2S4XY	Not Assigned				
	Permanent Structure				
2S5J01	Construct Permanent Access Roads JP				
2S5J02A	Rio Moquino Drop Structure				
2S5J02	Construct Fences-Jackpile Area	Dec-91	1.0	16-Dec-91	Olsen
2S5N01	Constr. Permanent Access Roads NP				
2S5N02	Construct Fences-N. paguate Area	Dec-91	1.0	16-Dec-91	Olsen
2S5S01	Constr. Permanent Access Roads SP				
2S5S02	Construct Fences-S. paguate Area	Dec-91	1.0	16-Dec-91	Olsen
2S5J09	Constr. Perm Fences All Areas				
2S5S10	Site fencing				

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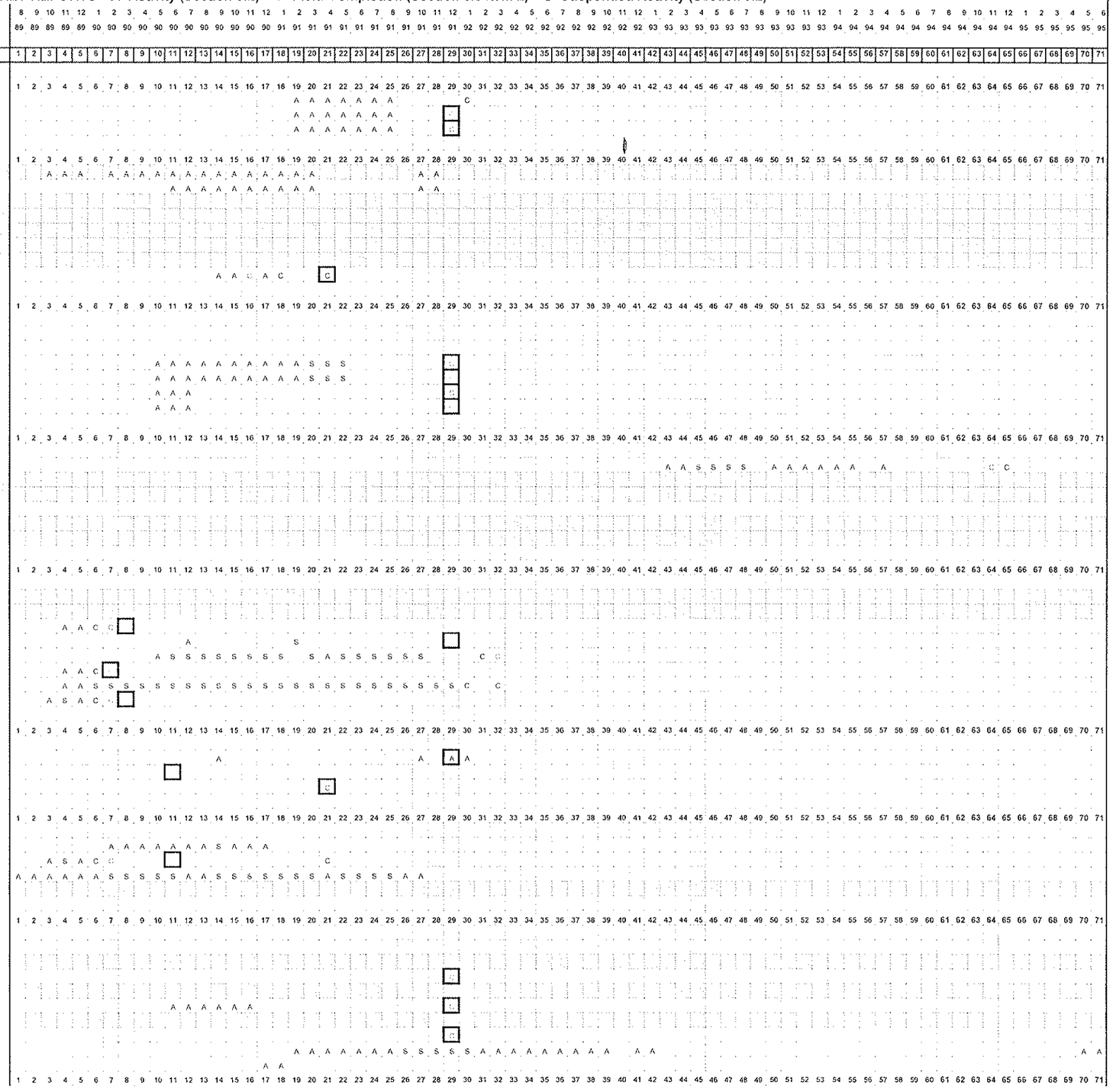
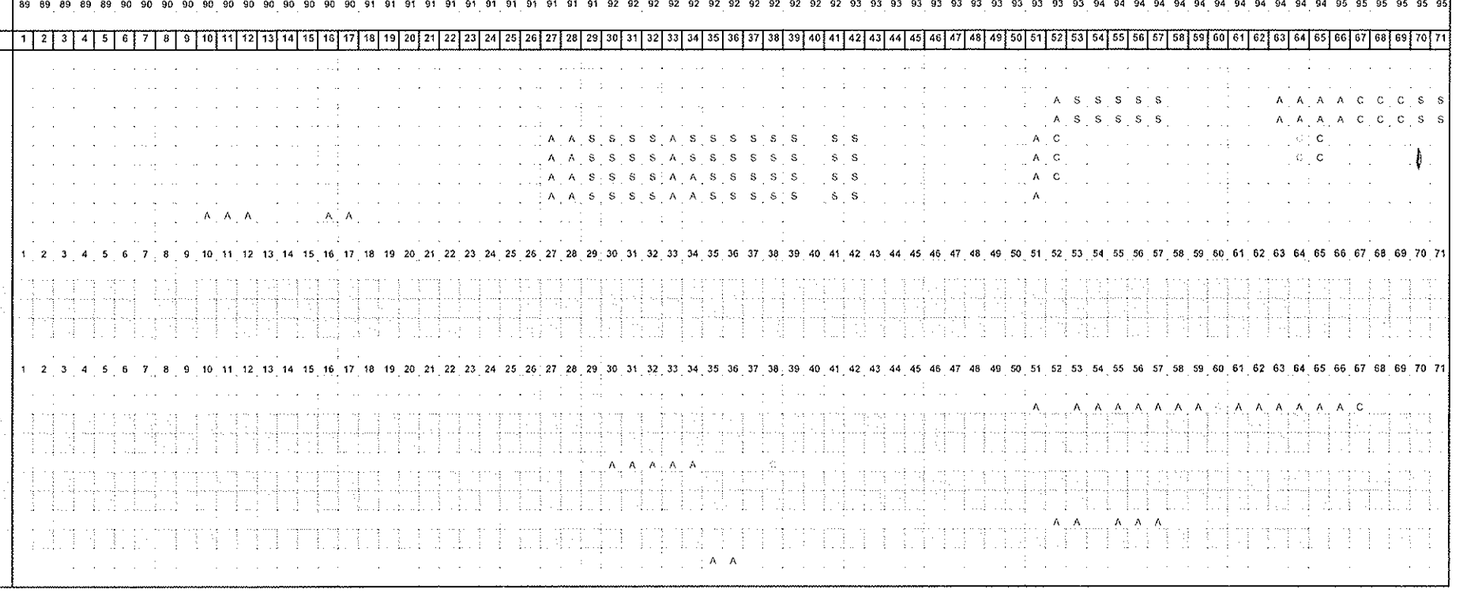


Activity in Work Units Based on Monthly Reports		Completion Dates	From Monthly Reports		
	Work Unit Description.	Marvin's Table Completion Dates	Construction Report Vol.	Completion Date	POL Signature Certified
	Seed Beds				
2R1J01	Prepare Bed and Seed JP Flat Areas				
2R1J02	Prepared Bed and Seed JP Slope Areas				
2R1N01	Prepare Bed and Seed NP Flat Areas				
2R1N02	Prepared Bed and Seed NP Slope Areas				
2R1S01	Prepare Bed and Seed SP Flat Areas				
2R1S02	Prepared Bed and Seed SP Slope Areas				
2R1S03	Complete 1990 Reseed and Housing Area				
	Irrigation				
2R2J01	Deleted 1990 Irrigation				
2R2N01	Deleted 1990 Irrigation				
2R2S01	Tree Planting				
	BENCHES/Terracing				
2T2J01	JP-WS-01 Slopes	Jul-94			
2T2J02					
2T2J03	Cutr JP-WO-03A /3B/4A/4B Slopes				
2T2N01	Cut NP-Wo-01 Rio Moquino Benches	Sep-92			
2T2S01	Cut SP-SW-06 Slopes Oak Canyon				
2T2PLR	Misc Repairs PY 93 Force Account				
2T1J01	Terracing JP Area 29000 lf				
2T1N01	Terracing NP Area 1200 lf				
2T1S01	Terracing SP Area 19100 lf				

From Monthly Reports
C = Closeouts from Section 5.3

MONTHLY REPORTS A=Activity (Section 5.2) C=Field Completion (Section 5.3 Item 2) S=Suspended Activity (Section 5.2)

Month / Year / Report Number



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APPENDIX B

Photographic Documentation

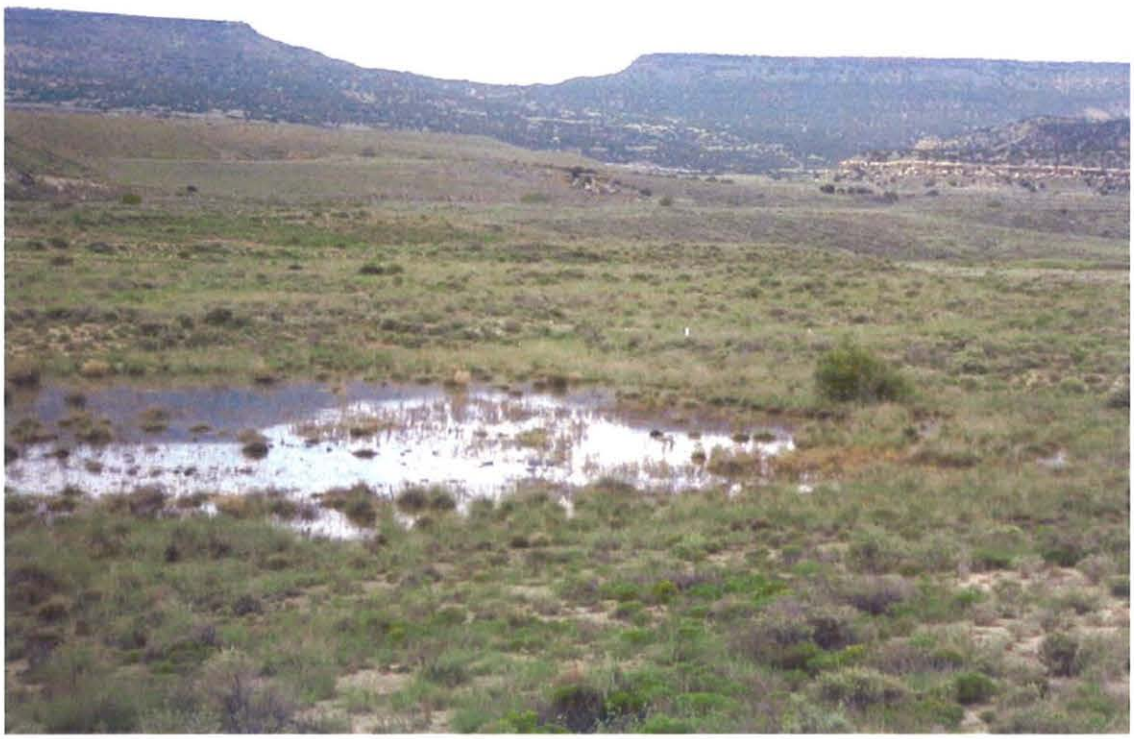

Photo B-1: Permanent Pond in NP-OP-20 near MW 20 W OAS Photo August 2006

Photo B-2: North Side of Waste Pile "H" OAS Photo August 2006

Photo B-3: Waste Pile "J" - Sloped and Seeded OAS Photo August 2006

Photo B-4: Fencing Photo from Monthly Report No. 14, Figure 3

Photo B-5: SP-OP-34 SW Highwall, Naturally Sloughing OAS Photo, August 2006

Photo B-6: SP-OP-35 Highwall OAS Photo August 2006

Photo B-7: Jackpile Highwall along Gavilan Mesa OAS Photo, August 2006

Photo B-8: Photo from Monthly Report No. 14 Figure 6 Terrace and Berm after unusually large rainfall

Photo B-9: Berm in South Paguate Pit, holding water as designed OAS Photo August 2006

Photo B-10: Additional view of Berms in South Paguate Pit OAS Photo August 2006

Photo B-11: South End of "I" above Road OAS Photo August 2006

Photo B-12: Blowout in Pile "A" Lower Terrace OAS Photo August 2006

Photo B-13: Roadway Erosion East Side of Wastepile "I" OAS Photo August 2006

Photo B14: Location of former protore piles along the Rio Paguate OAS Photo August 2006

Photo B-15: Armored Toe of Pile "T" along the Rio Moquino. POL Archived Photo taken sometime after Armoring was completed (late 1994).

Photo B-16: Armored Toe of Pile "T" along the Rio Moquino, the former road area is almost completely eroded. OAS Photo August 2007

Photo B-17: Rip Rapped Toe of Pile "N" and "N2" along the Rio Moquino, Close up of Erosion of most of the former roadway.

Photo B-18: Former road crossing of Rio Moquino OAS Photo August 2006

Photo B-19: End of Headcutting , Area of Exposed Sandstone OAS Photo August 2006

Photo B-20: In the background is Waste Pile "J" which was left in place, the area in front is the east side of "J" and contained the former protore piles "SP-6B and SP-17B C".
OAS Photo August 2006

Photo B-21: Blocked Drainage North of FD-1 OAS Photo August 2006

Photo B-22: P-10 Well and Tank. OAS Photo August 2006

Photo B-23: New Shop Well and Tank. OAS Photo August 2007

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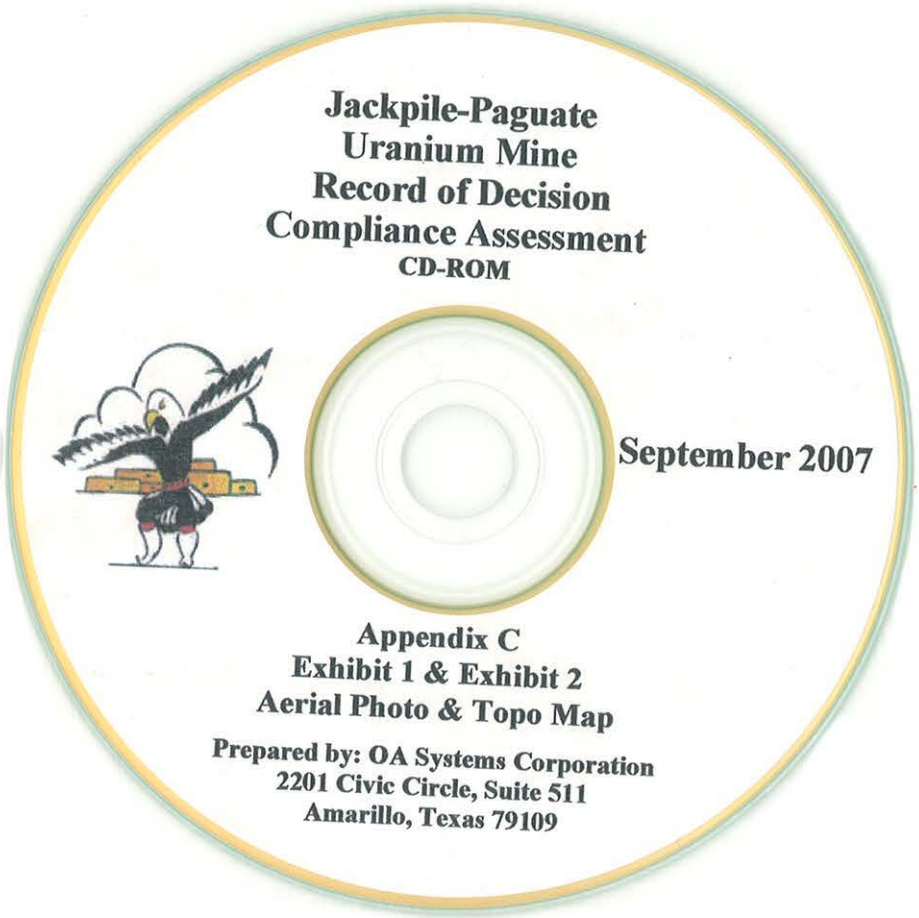
APPENDIX C

JACKPILE-PAGUATE URANIUM MINE
SITE MAPS (on CD-ROM)

EXHIBIT 1 – 2003 AERIAL PHOTOGRAPH – WITH SITE FEATURES OF THE JACKPILE-PAGUATE URANIUM MINE

EXHIBIT 2 – 1995 TOPOGRAPHIC BASE MAP – WITH SITE FEATURES OF THE JACKPILE-PAGUATE URANIUM MINE


Jackpile-Paguate
Uranium Mine
Record of Decision
Compliance Assessment
CD-ROM
September 2007
Appendix C
Exhibit 1 & Exhibit 2
Aerial Photo & Topo Map
Prepared by: OA Systems Corporation
2201 Civic Circle, Suite 511
Amarillo, Texas 79109

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APPENDIX D

ANALYSIS AND REVIEW OF:
RE-VEGETATION,
CEDAR CREEK VEGETATION SURVEY,
GAMMA RAD-RADON GAS,
SOILS AND UPTAKE,
WATER QUALITY AND WATER QUALITY ADDENDUM
(Monitoring Results, Water Quality and Water Quality Addendum also on CD-ROM)

JACKPILE-PAGUATE URANIUM MINE
POST-RECLAMATION
RE-VEGETATION SUCCESS ANALYSIS

05000132

TABLE OF CONTENTS

Section	Title	Page
1.0	Introduction	1
2.0	Background	1
3.0	Requirements of the ROD and EIS	3
4.0	Vegetation Parameters Monitored and Methods	4
5.0	Results	4
6.0	Discussion of Results	7
	6.1 Data Condition	8
	6.2 Vegetation Conditions	8
7.0	Conclusions and Recommendation	9
8.0	References	10

List of Tables

Tabel 3-1	Proposed Vegetation Monitoring Program in the EIS (DOI_1, 1986)	3
Table 5-1	Specific Vegetation Ranking Criteria for Reclaimed Land, Composite ranking Value and Monitoring Requirements	5
Table 5-2	Results of the Vegetation Monitoring, Pit Bottoms - Jackpile Reclamation	6
Table 6-1	Evaluation of Concurrent and Post Reclamation Vegetation Monitoring Data	8

1.0 INTRODUCTION

This report presents a review of post-reclamation vegetation monitoring data and an analysis of vegetation success for the reclaimed Jackpile-Paguate Uranium Mine.

The objectives of this report are to:

1. Determine if the post-reclamation vegetation monitoring has met the requirements of the Jackpile-Paguate Reclamation Project Record of Decision (ROD) (DOI_2, 1986) as defined in the Environmental Impact Statement (DOI_1, 1986)
2. Analyze the vegetation survey data collected to determine if the vegetation parameters met the requirements established in the ROD.
3. Determine if the revegetation on the reclaimed mine is stable and self-sustaining.
4. Make recommendations on how to overcome any ROD deficiencies.

The following provides an overview of the reclamation and revegetation on and around the mine site, previous studies on reclamation, and the basis for making decisions on the mine reclamation status.

2.0 BACKGROUND

The area of the mine and surrounding landscape is a region of broad mesas and plateaus separated by deep canyon, dry washes, and broad alluvial valleys on the southeastern edge Colorado Plateau province. This is a semi-arid region that supports grasslands dominated by blue grama/galleta on the mesas and uplands, and alkali sacaton in the valleys.

This project involved the reclamation of the three open pits, 32 waste dumps, 23 protore (sub-grade ore) stockpiles, four topsoil stockpiles, as well as roads and buildings on the remaining 2,656 acres of disturbed land.

As defined in the ROD, the objectives of the reclamation are:

1) To ensure human health and safety.
2) To reduce the release of radioactive elements and radionuclei to as low as reasonably achievable.
3) To ensure the integrity of all existing cultural, religious and archeological sites.
4) To return the vegetative cover to a productive condition compatible with the surrounding area.
5) Provide for additional land uses that are compatible with other reclamation objectives and that are desired by the Pueblo of Laguna.
6) Eliminate the need for post-reclamation maintenance.
7) Blend the visual characteristics of the mine with the surrounding terrain.
8) Employ the Pueblo of Laguna people in efforts that afford them opportunities to utilize the skills or train them as appropriate.

05000134

In addition, it was also important to determine if the EIS and the ROD requirements are still applicable to the mine site after 20 years because reclamation techniques have improved and the knowledge base has been enhanced. To perform this evaluation, the following reports and surveys were reviewed and analyzed:

1. Jacobs Engineering Group, Inc., *"Jackpile Project, Final Environmental Monitoring Plan"*, 1989.
2. United States Government, Soil Conservation Service-Memorandum, Noel Marsh, Area Range Conservationist, *"Trip report-review current plans, specifications and problems pertaining to revegetation of the Jackpile mine reclamation area"*, March 13, 1990.
3. United States Government, Soil Conservation Service-Memorandum, Allan Ardoin, Area Soil Scientist, *"Trip report-Review of Jack Pile Mine Reclamation by Area Soil Scientist and Area Range Conservationist"*, March 23, 1990.
4. Landmark Reclamation/Weston, *"Jackpile Reclamation Project, Pueblo of Laguna, New Mexico, Soils and Vegetation Evaluation for Final Reclamation"*, Final, April 1991
5. Munk, Lewis P. and Boden, Paul, Soils and Biogeochemistry, *"Interim Reclamation Success Analysis, North and South Paguate Open Pits, Jackpile-Paguate Uranium Mine"*, December 1996.
6. USDA, Natural Resources Conservation Service, National Range and Pasture Handbook-*Inventorying and Monitoring Grazing Land Resources*, Chapter 4, 1997.
7. USDA, Natural Resources Conservation Service, Paguate-Jackpile Mine 1998 Vegetative Inventory [Production Surveys], 1998
8. USDA, Natural Resources Conservation Service, Vegetation Inventory, Production Surveys, August 16, 2000.
9. USDA, Natural Resources Conservation Service, Vegetation Inventory, Production Surveys, September 7, 2006
10. Cedar Creek Associates, Inc. & S. Lynn Bamberg, LLC, *"2006 Vegetation Monitoring, Jackpile Paguate Reclamation Project"*, November 2006.

Reclamation and revegetation techniques were first tested by the Anaconda Mining Company (AMC) starting in 1976 on a mining waste pile of 50 acres, and continued on 11 additional waste piles in 1977, 1979, and 1980-1981 (Weston, 1991). The techniques AMC tested included the development topsoiling procedures based on soils analysis, seed mixtures, fertilization, and straw mulching. The results of the revegetation testing showed abundant vegetation on some waste piles and poor results on others.

There was no site activity from 1982 to 1989. Final reclamation of the entire mine site started in 1990, and was completed at the end of 1996. The 10-year ROD compliance monitoring requirement for vegetation started in January 1996, and was completed in November 2006.

The basic reclamation techniques used in the final reclamation from 1990-1996 were to fill in the pits with protore and mine wastes, slope and grade areas to be reclaimed, cover

05000135

with up to 24 inches of topsoil, fertilize and seed the prepared surfaces. Site stability and erosion was controlled by sloping and armoring waste dumps and pit slopes.

3.0 REQUIREMENTS OF THE ROD AND EIS

Several of the requirements of the ROD and EIS address the revegetation and topsoiling procedures to be followed, the monitoring period, and success criteria for vegetation. Revegetation methods are given in Section 9 of the ROD, and state that:

- Topsoil (Tres Hermanos sandstone) will be placed in the pit bottoms, waste piles, and other areas of the mine,
- Surface preparation using fertilizer, discing, and contour furrowing,
- Seeding and seed mixtures consisting of native plant species compatible with post-mining grazing and local environmental, and
- Plant establishment will be considered successful when revegetated areas reach 90% of the density, frequency, foliar cover, basal cover, and production of undisturbed reference areas (but not sooner than 10 years following seeding).

The monitoring period for vegetation success was therefore established to be 10 years with the frequency and type of monitoring surveys not specified. Table 1-5 in the EIS specifies annual monitoring on pit bottoms, waste dumps, and reference areas for density, frequency, foliar cover, basal cover, and production using a Community Structure Analysis (CSA) method. The proposed monitoring program is presented in Table 3-1.

Table 3-1
Proposed Vegetation Monitoring Program in the EIS (DOI$_1$, 1986)

Item	Proposed Vegetation Monitoring for Proposed Alternative	
Vegetation success	Stations	Waste dumps, pit bottoms, off-site reference areas
	Parameters	Density, frequency, foliar cover, basal cover, and production
	Frequency	Annually
	Duration	10 years after seeding.

Several interim documents deal with the sampling type and frequency, and success criteria for vegetation. The monitoring plan proposed by Jacobs Engineering (Jacobs 1989), describes a program of vegetation surveys that presents methodology and frequency of sampling that is virtually identical to the ROD and EIS requirements. The Soils and Vegetation Evaluation for Final Reclamation, Jackpile Reclamation Project (Landmark/Weston 1991) suggests a single set of vegetation standards was needed rather than using multiple reference areas, and presents a vegetation ranking system to determine monitoring and successful release for post-mining land uses. The specific criteria are an average of values from literature and surveys on and adjacent to, the Jackpile mine. The monitoring report for interim reclamation success (Munk and Boden, 1996) states that the use of reference areas as a reclamation standard is complicated by the lack of a model reference with ideal site characteristics. The report also states, "*...the reclamation success is obscured by these simple single parameter statistical comparisons*

05000136

because of differences in the vegetative composition among the reclaimed and reference areas."

4.0 VEGETATION PARAMETERS MONITORED AND METHODS

Most of the required vegetation parameters were monitored during the three periods referenced below.

1. In October 1990 (Weston 1991) both reclaimed mine areas and undisturbed reference areas were surveyed for foliar cover, basal cover, frequency, density and production. Vegetative data was collected using line intercept and the quadrat methods at twelve locations on and off the site.

2. In September/October 1996 (Munk and Boden 1996), the reclaimed mine sites were surveyed for vegetation in the North and South Paguate pits and two reference areas for all the required parameters. Plant production was for perennial grasses only, without shrubs or forbs. They monitored a total of 40 plots in three pits, and 30 plots in the two reference areas using a transect/quadrat system.

3. In November 2006 (Cedar Creek, 2006) the North and South Paguate Pits were surveyed for vegetation for foliar cover and plant production using a transect/production plot method. After an initial reconnaissance of the entire pit area, three representative "sites" were selected. At each of the three sites, five cover transects were sampled in a spoke-like manner radiating from the center of the site and five production samples were placed at the end of each transect. In addition, a qualitative rating of six specific parameters (wind erosion, water erosion, soil crust, plant vigor, seedlings, and seed reproduction) was conducted along each transect. The final evaluation at each site was a qualitative assessment of the rangeland health using indicators and rating categories developed by the Natural Resource Conservation Service (NRCS).

In order to determine trends in vegetation progress the NRCS (NRCS 1998, 2000, 2006) sampled the vegetation for plant production at various locations in the pit bottoms. The vegetation was sampled using a clipped quadrat and estimation method to determine pounds per acre of current production.

5.0 RESULTS

The results of the monitoring indicate that the revegetation across the reclaimed mine areas has been successful based on the criteria developed by Landmark/Weston after the monitoring of 1990. After the monitoring of 1990, Landmark/Weston determined that basal area data were inconsistent, and of little comparative value. The performance criteria in the ROD are not applicable to the Jackpile reclaimed lands, since no comparable reference areas area available. The other values of cover, density, and

05000137

production varied greatly depending on the year and area surveyed. It was recommended that the specific vegetation ranking criteria be developed based on acceptable values rather than specific reference sites. Using these criteria, the report stated "*All of the reclaimed sites except one (vegetation survey site V-4) could be released for post-reclamation land uses without further monitoring.*" The 1991 report also suggested that monitoring frequency be determined by the ranking based on acceptable vegetation criteria presented in Table 3.6. The NRCS methodology document (NRCS 1997) described trends and rangeland ecological health attributes, but provided no health rating system.

The vegetation ranking criteria proposed in Tables 3.5, 3.6 and 5.6 from the Landmark/Weston 1991 report has been combined for this report and is presented in Table 5-1 below. As proposed in Table 5.6 of the Landmark/Weston 1991 report, and shown in the right hand column in Table 5-1 below, final release of the vegetation requirement could be made if, after 10 years, the composite vegetation ranking was good to excellent and the trend was stable.

Table 5-1
Specific Vegetation Ranking Criteria for Reclaimed Land, Composite Ranking Value and Monitoring Requirements
(compiled from Tables 3.5, 3.6 and 5.6 – Landmark/Weston 1991)

Specific Vegetation Ranking	Ranking Value	Foliar Cover* (%)	Basal Cover* (%)	Production* (lbs/acre)	No. of Species Present*	Composite Ranking Value	Final Release
Excellent	10	≥ 18.0	≥ 8.0	≥ 1000	4	X[b] ≥ 36	After 10 years
Very good	8	≥ 14.0	≥ 7.0	≥ 750	4	28 ≤ x < 36	After 10 years, and stable or inclining trend
Good	6	≥ 12.0	≥ 6.0	≥ 650	3	20 ≤ x < 28	After 10 years, and stable trend
Fair	4	≥ 10.0	≥ 4.0	≥ 450	2	12 ≤ x < 20	Not allowed
Poor	2	≥ 5.0	≥ 3.0	≥ 250	1	4 ≤ x < 12	Not allowed
Failure	0	< 5.0	< 3.0	< 250	1	x < 4	Not allowed

*Based on desirable species of grass
[b]X is equal to the summation of specific ranking values assigned to the four criteria in Table 3.4.

Data from the detailed monitoring reports in 1990 (Landmark/Weston 1991), 1996 (Munk and Boden 1996), 2006 (Cedar Creek 2006) and NRCS (1998, 2000, 2006) show a consistent inclining trend and pattern of good to excellent plant communities and vegetation based on cover, diversity, density, and plant production.

Data from the Landmark/Weston 1991, Munk and Boden 1996, Cedar Creek 2006 and NRCS 1998, 2000, 2006 reports is summarized below in Table 5-2.

05000138

Table 5-2
Results of the Vegetation Monitoring, Pit Bottoms

Year	[1]Ref.	Foliar cover %		Basal cover %		[3]Diversity #/plot		Density #/m^2		Production lbs/ac	
		Mine	Ref	Mine	Ref	Mine	Ref	Mine	Ref	Mine	Ref
1990	1	48.4	25.3	11.9	9.9	9.2	14.8	30.3	59.5	[2]1043	[2]1343
1996	2	42.6	50.4	6.4	7.4	10.0	11.0	20.0	38	[2]603	[2]328
1998	3	-	-	-	-	17.0	12.3	-	-	[4]884	[4]573
2000	3	-	-	-	-	11.0	-	-	-	[4]523	-
2006	3	-	-	-		10.0	-	-	-	[4]938	-
2006	4	49.4	-	-	-	13.0			-	[4]825	-

[1]References: 1-Weston 1991: 2- Munk and Boden 1996: 3- NRCS 1998, 2000, 2006: 4- Cedar Creek 2006
[2]perennial grasses only, wet weight
[3]Numbers of species recorded per plot, also called species richness
[4]Total vegetative production, dry weight

Information provided in the 1990, 1996 and 2006 monitoring reports consistently indicated that vegetation on the reclaimed mine areas could be considered successful in meeting the primary goals of landscape stability, productivity, and well established plant communities. According to the cover and productivity, two of the important parameters for determining vegetation trends, the reclaimed mine areas showed good to excellent vegetation from 1990 until late 2006. Frequency (percentage that a plant species occurs in sample plots) was not a good measure of plant success; however, diversity of the reclaimed plots surveyed was as good, or better, than the natural vegetation indicating good vegetation structure. Plant production varied greatly between years measured due to differences in timing and amounts of rainfall. The years from 1999 to 2005 were drought years in this region with poor plant growth.

The 1996 monitoring activities were conducted, and the monitoring report prepared (Munk and Boden 1996), at the end of the active reclamation program during a season of good rainfall. The results of this interim monitoring indicate that, *"In general, reclamation in the pit bottoms can be considered successful in meeting the goals of landscape stability, productivity, and containment of the protore."* (Munk and Boden 1996). The reclaimed areas did not meet the strict numerical standards of the ROD requirements, but had vigorous and productive plant communities with desirable perennial grasses and shrubs. There were less desirable annual grasses in the reference areas due to past grazing and land use practices.

Monitoring activities in the 2006 monitoring report (Cedar Creek 2006), in addition to assessing cover and productivity, followed suggested protocol based on NRCS methods for evaluating and rating ecological sites for health and stability in Chapter 4 of the National Range and Pasture Handbook for inventorying and monitoring land resources. The sampling and monitoring results compared these naturalized plant communities (on the reclaimed mine site) to the desired plant community based on the reclamation and revegetation techniques (grading, topographic and water control, and seed mix) used on the Jackpile mine. The trends and ecological health of the plant communities, and other physical attributes, showed excellent balance and sustainability of the reclaimed areas for

05000139

physical structure (topography, soils), hydrology (streams, runoff, watersheds, pools, springs and seeps), and ecology (vegetation, animals, and habitats).

In summary, plant productivity surveys conducted by NRCS (NRCS 1998, 2000, and 2006) confirmed the stability and trend in the vegetation on reclaimed areas. Productivity of the vegetation was consistent and was influenced by the local weather patterns. For example, productivity was lower in the drought year of 2000, but had recovered and was very productive in 2006. The summer and fall of 2006 had abundant and well-spaced rains and the vegetation responded with good productivity. Perennial grasses were tall and produced abundant seed. Vegetation and surface stability was observed in early fall after a record amount of rainfall during the "monsoon" season in mid to late summer. There was excellent growth and productivity of the vegetation due to the abundant soil moisture. There was a diversity of desirable perennial grasses, shrubs, and forbs in the pits, side slopes, and level areas that formed stable vegetation communities. Some minor surface gullies formed, which were repaired, and had started revegetating naturally from the abundant seed bank in the soils. Some low depressions in the filled mine pits still had standing water from runoff,

6.0 DISCUSSION OF RESULTS

The results of the vegetation monitoring show good to excellent plant communities with total foliar cover values of 43-50%; according to Landmark/Weston (1991) regional values are 10.3% to 26.5%, so the cover values far exceed the 90% specified in the ROD; and plant production of 523-1043 lbs/ac on the reclaimed areas. The trends in vegetation are stable for plant diversity and health. The reclaimed mine areas can be considered successfully revegetated based on the available monitoring data. The reclaimed mine has a stable and self-sustaining diverse ecosystems with very good to excellent vegetative cover and productivity of desirable plant species, and good habitat for local wildlife. There are no comparable reference sites for determining the success standards of these ecosystems as required by the ROD. However, not meeting the ROD requirements is acceptable because there are no suitable or comparable reference sites available. It should be noted, however, that the ROD has been more than adequately met. The recommendations of the monitoring reports and this summary are that the mine has successful vegetation based on plant cover, production and other criteria of stability and sustainability.

The reclaimed mine can be released from the 10-year monitoring period based on revegetation success. Post-reclamation land uses can be instituted based on future management decisions. These land uses were listed in the ROD as grazing, light manufacturing, office space, mining, and major equipment storage. There was concern expressed by allowing livestock grazing in the pit bottoms because of potential uptake of metals and radionuclides. This is discussed in the plant uptake evaluation (OA Systems Corporation, *Jackpile-Paguate Uranium Mine Record of Decision Compliance Assessment*, Appendix A, 2007).

05000140

6.1 Data Condition

The available data from the vegetation surveys were evaluated for applicability to the revegetation monitoring. The sampling periods were adjusted based on vegetative growth and drought years. An evaluation of the concurrent and post reclamation vegetation monitoring data is presented in Table 6-1. The lack of vegetation monitoring during the period of 2000 until fall of 2006 was the most significant problem.

Table 6-1
Evaluation of Concurrent and Post Reclamation Vegetation Monitoring Data

Positives	Negatives
• Reports were clear and concise. • Survey methods were adequately explained. • Reports were consistent for vegetation success • Protocol for determining ecological health and stability were positive. • Overall, vegetation was good to excellent over the entire mine site. • Procedures for reestablishing vegetation were followed and produced good results.	• Not all vegetation parameters were measured during each period. • Methods were not standardized for yearly comparisons. • Vegetative trends were inferred from incomplete surveys. • Several years from 1996 to 2006 had no data or surveys. • Not all parameters suggested by the Environmental Monitoring program were analyzed for each year

6.2 Vegetation Conditions

Overall, revegetation in the pit bottoms and slopes that were sampled was excellent and especially robust in the above-average precipitation year 2006. The blue grama seed heads were nearly hip high, and other grasses were tall and produced an excellent seed crop. Plant diversity within the revegetation was better than expected given the seed mixtures used or 7-9 species, however 72 plant species (Munk and Boden, 1996) were noted in the reclaimed areas mostly from natural seed dispersal processes. With the exception of low forb species and lack of biological crusts, all the rangeland health indicators were rated as having little or no departure from the ecological site descriptions. With respect to the key qualitative parameters, all were rated in the highest or next-to highest category except for soil crusts (Cedar Creek 2006). Soil crusts are more common with longer soil development.

The reclaimed vegetation is a grassland/shrub community dominated by native grass species, and a sub-component of shrubs. Grasses are dominant in most areas followed by forbs and shrubs. The pit bottoms had two types of vegetation: 1) drier sites in these areas had dominant taxa of blue grama (*Bouteloua gracilis*), side-oats grama (*Bouteloua curtipendula*), four-wing saltbush (*Atriplex canescens*), and alkali sacaton (*Sporobolus airoides*) with 27.1%, 12.7%, 9.1%, and 3.5% cover, respectively; and 2) in moist areas the dominant taxa were alkali sacaton, four-wing saltbush, galleta (*Hilaria jamesii*), and

05000141

blue grama with 22.5%, 3.8%, 2.2%, and 1.5% cover, respectively. Slopes and tops of reclaimed areas have different dominant species in addition to blue grama and galleta with side-oats grama, Indian ricegrass, and yellow sweet clover dominant in some areas. Vegetation on reclaimed sites is diverse, vigorous, and well established.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on this vegetation review, the following conclusions can be drawn:

1. The Jackpile Reclamation Project post reclamation vegetation monitoring program deviated from the requirement of the Record of Decision. This was due to modifications in determining vegetative success that was the result of a prolonged drought, as documented in local reports. The monitoring met the intent of the ROD in determining vegetation success, in that the mine was very successfully revegetated based on important vegetation parameters of cover and productivity. The revegetation results did not meet the strict numerical standards of the ROD, but there were vigorous and productive plant communities with desirable perennial grasses and shrubs throughout.
2. As presented in Table 5-1, and discussed in Section 6.2, the condition of post-reclamation vegetation is very good to excellent, and the reclaimed mine has stable and self-sustaining diverse ecosystems, and good habitat for local wildlife.
3. Trends in vegetation are stable for plant diversity and health.
4. The reclaimed mine can be released from the 10-year monitoring period based on revegetation success.
5. Some minor surface gullies formed from record rainfall in 2006 that were repaired and revegetated naturally from the abundant seed bank in the soils.
6. There are no hazards to human health and safety from the current vegetation conditions on the reclaimed mine. The potential for hazards to livestock is discussed in the plant uptake evaluation (OA Systems Corporation, *Jackpile-Paguate Uranium Mine Record of Decision Compliance Assessment*, Appendix A, 2007).

Based on these conclusions, the following recommendations can be made:

1. Vegetation on the reclaimed mine is currently stable and successful.
2. The 10-year monitoring period appears to be sufficient to assess the revegetation and future formal monitoring does not appear to be warranted.
3. Management practices should consider the entire mine site as a resource unit and develop a future management plan along with other units on the Pueblo of Laguna. Future access, roads, and fences should be designed for the management unit.
4. Surface water management plans may need to review the surface runoff options for controlling rills and erosion as it relates to vegetation. Water is concentrated off the faces of the reclaimed waste dumps into long contours that need to be reduced in length. Runoff and water drainage on the reclaimed surfaces should be

05000142

allowed to develop channels that will not need to be managed or repaired in the future.

5. Ponds and wetlands are developing in some of the depressions of the mine pits, and are a desirable and productive type ecosystem that should be retained.

8.0. REFERENCES

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05000143

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05000144

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2006 Vegetation Monitoring
Jackpile Paguate Reclamation Project
Cedar Creek Associates,
November 2006

1.0 Introduction

The Jackpile Paguate reclaimed mine was monitored for vegetation success during November 2006 for the 10-year monitoring requirement according to the Record of Decision (ROD 1986). This vegetation monitoring event was conducted by Cedar Creek Associates, Inc. using standard and up-to-date methodology.

The two pits in the South Pit area (SP-34 and SP-35) and the one pit in the North Pit area (NP-20) were sampled. The Jackpile Pit was sampled in September 2006 for production by NRCS. Three sites within each pit were selected for sampling. The SP-35 pit had developed three fairly distinct communities and one sampling site was placed in each of these. The SP-34 pit was fairly homogeneous (besides the ponds / wet areas) and the sites were equidistantly placed. The NP-20 pit exhibited two communities / soil types, and two sites were located in the larger galleta community while one was placed in the smaller rockier soil area. At each site, five representative cover transects and production quadrats were placed in the area. The six specific parameter were rated at each cover transect and then the 18 NRCS rangeland heath indicators were estimated for the entire site area.

All the specific parameter ratings, NRCS ratings, cover data summary, production data summary, and notes for each site were organized onto Excel worksheets (Jackpile Qualitative, which are available on a CD upon request.). Other summary cover tables and charts, as well as raw data tables are on two files (Jackpile Cover and Jackpile Prod, available on CD). Landscape and ground photographs of each sample site, as well as overview shots of the pits are provided individually and in a four-per-page presentation format (also available on CD upon request). A map of each of the pits with sample site locations and miscellaneous notes are provided in a JPEG format. The following presents the methodology for the cover and production portions of this evaluation as well as a brief synopsis of each pit area.

Overall, the revegetation effort in the pit bottoms that were sampled was excellent and especially robust in this above-average precipitation year. It was difficult to find any major faults with the

reclamation effort, except that plant diversity within the revegetation was lower than expected given the seed mixes used. With the exception of low forb diversity and lack of biological crusts, all the rangeland health indicators were rated as excellent and having little or no departure from the ecological site descriptions. With respect to the key qualitative parameters, all were rated in the highest or next-to highest category except for soil crusts.

2.0 Methodology for Quantitative and Qualitative Vegetation Sampling

2.1 Sample Site Selection and Evaluations

The sample layout protocol for revegetation evaluations in 2006 largely followed procedures developed by Cedar Creek Associates, Inc. to provide representative and cost-effective data for evaluation of revegetation. After an initial reconnaissance of the entire pit area, three representative "sites" were selected (see Maps 1-3). Placement of these sites took into account factors such as dominant vegetation, topography, distance from other sites, and different seed mixes and/or years. At each site, five cover transects were sampled in a spoke-like manner radiating from the center of the site and five production samples were placed at the end of each transect (Note: Figure 1 shows the production quadrat at the beginning of each transect). In addition, a qualitative rating of six specific parameters (wind erosion, water erosion, soil crust, plant vigor, seedlings, and seed reproduction) was conducted along each transect. The final evaluation at each site involved a qualitative assessment of the rangeland health using indicators and rating categories developed by the National Resources Conservation Service (NRCS).

2.2 Determination of Ground Cover

Ground cover at each sample point was determined utilizing the point-intercept methodology as illustrated on Figure 1. As indicated on this figure, Cedar Creek utilizes new state-of-the-art instrumentation it has pioneered to facilitate much more rapid and accurate collection of data. A transect of 10 meters length was extended in the direction of the next sampling location from the flagged center of each systematically located sample point. At each one-meter interval along the transect, a "laser point bar" was situated parallel to, and approximately 4.5 to 5.0 feet vertically above the ground surface. A set of 10 readings was recorded as to hits on vegetation (by species), litter, rock (>2mm), or bare soil. Hits were determined at each meter interval by activating a battery of 10 low-energy specialized lasers** situated along the bar at 10 centimeter intervals and

** Lasers utilized for this instrument are state-of-the-art and are a specialized design to emit a unique electro-magnetic wavelength visible under full sunlight, a condition previously not possible with portable low-energy lasers.

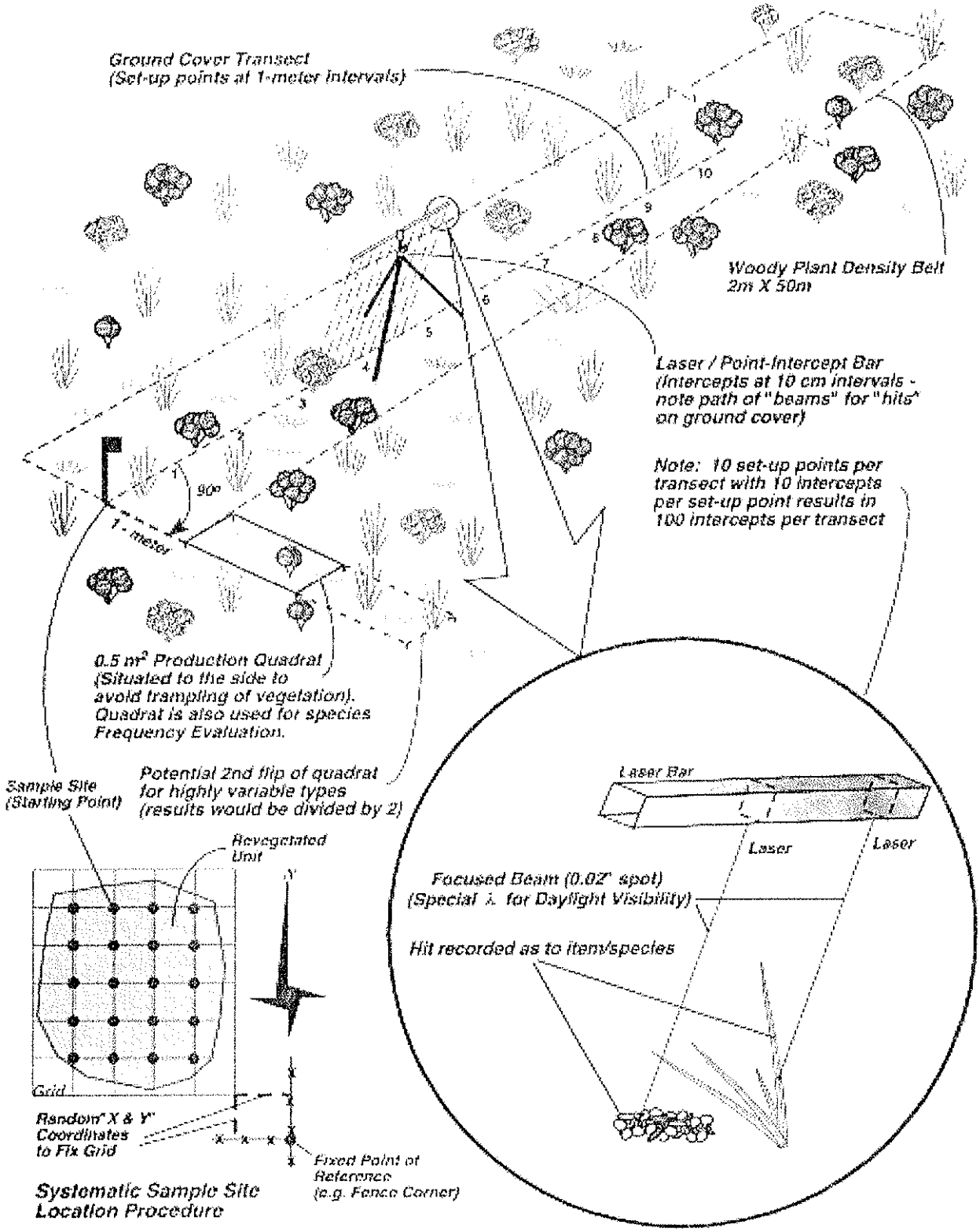

Figure 1

Sampling Procedure at a Systematic Sample Site Location

recording the variable intercepted by each of the narrowly focused (0.02") beams (see Figure 1). In this manner, a total of 100 intercepts per transect were recorded resulting in 1 percent cover per intercept. This methodology and instrumentation facilitates the collection of the most unbiased, repeatable, and precise ground cover data possible.

2.3 Determination of Current Annual Production

At the end of each cover transect, current annual production was collected from a $^1/_2$ m^2 quadrat frame placed one meter and 90° to the right (clockwise) of the ground cover transect to facilitate avoidance of vegetation trampled by investigators during sample site location (see Figure 1). From within each quadrat, all above ground current annual vegetation within the vertical boundaries of the frame were clipped and bagged separately by life form as follows:

Perennial Grass	Perennial Forb
Annual Grass	Annual Forb
Shrub	Sub-shrub

In addition, the percentage of warm-season grasses that made up the perennial grass total was estimated to the nearest 5%. All production samples were weighed in the field (wet weights) and then returned to the lab for drying and weighing. Samples were air-dried until a stable weight was achieved (7 days). Samples were then re-weighed to the nearest 0.1 gram.

2.4 Sample Adequacy Determination

Fifteen cover samples within each pit area were collected (five from each site). From these preliminary efforts, sample means and standard deviations for total non-overlapping vegetation ground cover were calculated. For non-monitoring applications, the typical procedure is that sampling continues until an adequate sample, $\mathbf{n_{min}}$, has been collected in accordance with the Cochran formula (below) for determining sample adequacy, whereby the population is estimated to within 10% of the true mean (μ) with 90% confidence.

When the inequality ($\mathbf{n_{min} \leq n}$) is true, sampling is deemed adequate; and $\mathbf{n_{min}}$ is determined as follows:

$$\mathbf{n_{min}} = (t^2 s^2) / (0.1 \bar{x})^2$$

where: n = the number of actual samples collected (initial size = 15 or 20)

t = the value from the two-tailed t distribution for 90% confidence with n-1 degrees of freedom;

s^2 = the variance of the estimate as calculated from the initial samples;

$\bar{x}$ = the mean of the estimate as calculated from the initial samples.

If the initial samples do not provide a suitable estimate of the mean (i.e., the inequality is false), additional samples would be collected until the inequality ($\mathbf{n_{min} \leq n}$) becomes true. However, because sampling is for managerial (monitoring) information, adequacy is not necessary and is calculated for informational purposes only.

2.5 NRCS Rangeland Health

This suggested protocol is based on NRCS methods for evaluating and rating ecological sites for health and stability as given in Chapter 4 of the National Range and Pasture Handbook for inventorying and monitoring land resources. Sampling and monitoring results will be used to compare these naturalized plant communities (on the reclaimed mine site) to the desired plant community based on the reclamation and revegetation techniques (grading, topographic and water control, and seed mix) used on the Jackpile mine. Trends and ecological health of the plant communities and other physical attributes will be used to determine balance and sustainability of the reclaimed areas. The NRCS also mentions history (when reclaimed) and yearly or other monitoring results to determine trends

The characterization of the reclaimed site has three basic parameters:

Physical structure - topography, soils

Hydrology - streams, runoff, watersheds, pools, springs and seeps

Ecology – vegetation, animals, and habitats.

To determine ecological health and stability, NRCS uses the following attributes

1. Rills
2. Gullies
3. Water flow patterns, channels, streams
4. Wind erosion
5. Bare soil
6. Soil pedestals

7. Soil surface features
8. Cryptobiotic crusts
9. Water infiltration and runoff
10. Plant species composition
11. Functional plant groups – life forms, seasonality, layering
12. Annual productivity and total biomass
13. Plant vigor
14. Recruitment, reproduction, seed production, seedlings
15. Plant mortality
16. Plant stress
17. Litter and plant residues
18. Invasive species (exotics, aliens, "weeds", noxious)

In addition to ground cover and annual production, the following parameters can be measured or estimated using a plotless technique:

plant species composition to determine functional groups and layering (list all plant species observed in the area.

-

wind and water erosion (on a scale: 1=severe, to 5=none)

soil crusts (scale: 1=none, 5=good microbiotic crust)

plant vigor/stress (scale: 1=stressed, some mortality, to 5=vigorous)

seed or propagules production, seedlings (scale 1=none, to 5=excellent seeds/reproduction)

3.0 Results of the Monitoring

Overall, the revegetation effort in the pit bottoms that were sampled was excellent and especially robust in this above-average precipitation year (the blue grama seedheads were nearly hip high). It was difficult to find any major faults with the reclamation effort besides the obvious high water table/ponding issues and lack of any biological crusts. During these late fall surveys the plant diversity within the revegetation was low and forbs were not observed. Grass diversity decreased

as the water table neared the surface (the wetter and more alkaline locations). Nearly all soil surfaces in the pit exhibited varying degrees of "plate" formation which is typically associated with drying mudflats. It appears that nearly all of these pit bottoms experienced standing water for some period of time this past monsoon season. Most vegetation seems to have withstood this inundation and benefited, but some saltbush and snakeweed may have died. It was difficult to tell whether many of these plants were decadent, senescent or dead. This was especially hard at sample site #2 in the SP-35 pit.

South Pit – SP-34

The SP-34 Pit was sampled with 15 transects in 2006 and is exhibiting excellent revegetation. Perusal of Table 3.1 indicates that the total cover in this area was 58.1% with an average perennial cover of 57.5%. Dominant taxa in this area were blue grama (*Bouteloua gracilis*), side-oats grama (*Bouteloua curtipendula*), four-wing saltbush (*Atriplex canescens*), and alkali sacaton (*Sporobolus airoides*) with 27.1%, 12.7%, 9.1%, and 3.5% cover, respectively. Air-dry production averaged 923 pounds per acre with warm-season grasses averaging 723 pounds per acre and shrubs averaging 194 pounds per acre. The three sample sites were very similar with respect to cover and production with only slight variations in plant composition, bare ground and litter values. With the exception of low forb diversity and lack of biological crusts, all the rangeland health indicators were rated as having little or no departure from the ecological site descriptions. With respect to the key qualitative parameters, all were rated in the highest or next-to highest category except for soil crusts.

Table 3-1. Results of the Vegetation Monitoring at the Jackpile Mine. November 2006

Plant Canopy Cover - %			
	South Pit – SP-34	South Pit – SP35	North Pit – OP20
Total Plant Cover	58.13	34.33	55.67
Rock	1.27	0.07	3.80
Litter	12.93	17.13	13.47

Bare ground	27.67	49.47	27.07
Plant Production – lbs/acre (air dry)			
	South Pit – SP-34	South Pit – SP35	North Pit – OP20
Perennial Grass	722.78	466.07	783.81
Annual Forbs	12.14	7.61	28.84
Subshrubs	0.00	0.00	65.05
Shrubs	193.74	77.68	122.95
TOTALS	923	551	1002

South Pit – SP-35

The SP-35 Pit was sampled with 15 transects in 2006 and is exhibiting very good revegetation. Perusal of Table 11 indicates that the total cover in this area was 34.3% with an average perennial cover of 33.3%. Dominant taxa in this area were alkali sacaton, four-wing saltbush, galleta (*Hilaria jamesii*), and blue grama with 22.5%, 3.8%, 2.2%, and 1.5% cover, respectively. Air-dry production averaged 551 pounds per acre with warm-season grasses averaging 466 pounds per acre and shrubs averaging 77 pounds per acre. Three vegetation communities were apparent within the pit bottom with transitional ecotypes between each one (see Map 2). Along the eastern edge of the pit, deposition from the reclaimed slopes has produced a slightly sloped narrow strip of land where many of the more xeric seeded species are prevalent. This is the only site in this evaluation where any soil movement was observed. The second site within this pit was located in the central portion where four-wing saltbush and alkali sacaton dominate. This area is wetter and lacking in any grama species. As noted earlier, four-wing saltbush and snakeweed are mainly decadent and/or dead here, perhaps from too much standing water or for too long. The third community and site is located in a seasonally wet meadow that is dominated almost entirely by alkali sacaton. Cover and production values are lowest at this site. Rangeland health and key qualitative parameters are overwhelmingly positive at these three sites with a few exceptions (see Tables 4-6 for details).

North Pit – NP-20

The NP-20 Pit was sampled with 15 transects in 2006 and is exhibiting excellent revegetation. Perusal of Table 12 indicates that the total cover in this area was 55.7% with an average perennial cover of 51.5%. Dominant taxa in this area were galleta, snakeweed (*Gutierrezia sarothrae*), side-oats grama, yellow sweetclover (*Melilotus officinalis*), blue grama, and four-wing saltbush with 30.9%, 5.7%, 4.7%, 4.0%, 3.9%, and 3.3% cover, respectively. Air-dry production averaged 1,002 pounds per acre with warm-season grasses averaging 783 pounds per acre, sub-shrubs 65 pounds, and shrubs averaging 123 pounds per acre. The first two sample sites were very similar with respect to cover and production with only slight variations in plant composition, bare ground and litter values. Sample site #3 was located in the eastern third of the pit and apparently received a different growth medium than the rest of the pit. It appears that native topsoil was used due to the quantity and diversity of native taxa observed. In addition, the soil was rockier and little to no "shrink-swell" plates were noted (possibly due to elevated organic matter typical of topsoils). With the exception of low plant diversity, lack of seedlings, and no biological crusts, all the rangeland health indicators were rated as having little or no departure from the ecological site descriptions. With respect to the key qualitative parameters, all were rated in the highest or next-to highest category except for soil crusts.

4-0 Summary

Plant communities surveyed in the pit bottoms were vigorous and well established, and the rangeland health indicators were rated as having little or no departure from the ecological site descriptions. Plant cover and productivity in this year of abundant rain were high at 34 to 58% cover, and 551 to 1002 lbs per acre.

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POST-RECLAMATION
GAMMA RADIATION AND RADON GAS ANALYSIS
JACKPILE-PAGUATE URANIUM MINE

TABLE OF CONTENTS

Section	Title	Page
1.0	Introduction	1
2.0	Background	1
3.0	Requirements of the ROD and EIS	2
4.0	Parameters Monitored and Sampling Methods	3
5.0	Results	3
6.0	Discussion of Results	4
	6.1 Data Condition	5
	6.2 Data Evaluation	5
7.0	Conclusions and Recommendation	6
8.0	References	6

List of Tables

Tabel 3-1	Proposed Gamma Radiation and Radon Gas Monitoring Program in the EIS (DOI_1, 1986)	2
Table 5-1	Averages of Radon Gas Measurements in pCi/L at 15 Site Locations, Jackpile Reclamation Project, April 1990 to May 1997	4
Table 6-1	Evaluation of Gamma Radiation and Radon Gas Monitoring Data	5

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1.0 INTRODUCTION

This report presents an evaluation of gamma radiation and radon gas surveys conducted for the reclaimed Jackpile-Paguate Uranium Mine.

The objectives of this report are to:

1. Determine if the post-reclamation monitoring for gamma radiation and radon gas monitoring met the requirements in the Jackpile-Paguate Reclamation Project Record of Decision (ROD) (DOI, 1986) as defined in Table I-5 of the Environmental Impact Statement (EIS) (DOI, 1986)
2. Review the survey reports and concentrations measured for compliance with the requirements of the ROD.
3. Make recommendations for future monitoring programs and management practices to ensure that the current reclamation status poses no hazards to the environment or human health.

The following presents an overview of the survey procedures, the results of monitoring of gamma radiation and radon gas, and the basis for making decisions on the mine reclamation and future land use status.

2.0 BACKGROUND

The EIS presented several reclamation activities and proposed treatments that were designed to reduce the potential for release and exposure to gamma radiation and radon gas. The activities and treatments were carried out during active reclamation and included:

1. Moving stockpiled protore (Jackpile Sandstone) into the pits and covering with overburden (Mancos Shale) and topsoil (Tres Hermanos Sandstone) before revegetation.
2. Covering exposed surfaces of Jackpile Sandstone on waste dumps with shale overburden and topsoil.
3. Clearing and moving contaminated materials from facilities, roads, rail spur, and disturbed sites; and topsoiling all disturbed sites (old roads, etc.) before reclamation.
4. Stabilizing waste dumps at 3:1 slopes, moving some dumps from drainages, and reducing pit highwalls.
5. Pits were to remain as closed basins and fenced to prevent access of domestic cattle and human entry.

This evaluation used the following reports and monitoring results:

1. Jacobs Engineering Group, *Jackpile Project Environmental Monitoring Plan*, Final, 1989.
2. U.S. Department of the Interior (DOI), *Final Jackpile-Paguate – Uranium Mine Reclamation Project Environmental Impact Statement, Vol. 1*, 1986.

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3. U.S. Department of the Interior (DOI), Bureau of Land Management, Memorandum to Bureau of Indian Affairs (BIA), *Subject: Radiological Monitoring, Jackpile Reclamation Project*, May 20, 1994.
4. Pueblo of Laguna, Reclamation Project Manager, *"Jackpile Reclamation Project, Pueblo of Laguna, New Mexico"*, Annual Report, 1996
5. Gamma and radon measurements in data sheets (Excel or PDF) for field surveys 1990 to 1996

Monitoring for gamma radiation and radon gas started with active reclamation activities in 1990 and continued until 1997 at the completion of reclamation.

3.0 REQUIREMENTS OF THE ROD AND EIS

Requirements of the ROD and EIS for monitoring gamma radiation and radon gas were specified in Table 1-5 in the EIS. The proposed monitoring program is presented as Table 3-1 below.

Table 3-1
Proposed Gamma Radiation and Radon Gas
Monitoring Program in the EIS (DOI_1, 1986)

Item		
Gamma Radiation	Stations	Each waste dump and selected reclaimed areas
	Frequency	As needed
	Parameters	Ground survey plus final aerial survey
	Duration	Before seeding and once after reclamation is complete.
Radon Gas	Stations	5
	Frequency	Monthly
	Parameters	Rn-222 (pCi/L)
	Duration	A minimum of 3 years following reclamation.

The specified limit for gamma radiation levels following reclamation was twice the background level of 14 micro Roentgens per hour (14μR/hr). The specified limit for radon gas levels after reclamation was 3 picocuries per liter (pCi/L) above background of 0.5 for a total of 3.5 pCi/L.

One document addressed the proposed monitoring program after final reclamation was complete. That document, the gamma radiation monitoring plan proposed by Jacobs Engineering (Jacobs 1989), suggested modifications of the requirements of the EIS as follows:

1. Aerial survey should be replaced by an extensive ground survey at 3 feet above ground because it is more accurate and less expensive.
2. All waste dumps with exposed Jackpile Sandstone (protore) or construction areas should be surveyed in a grid pattern prior to placement of shale and topsoil cover.
3. After initial excavation of construction areas or placement of topsoil, the area should be surveyed to determine areas that were twice the background level.

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Radon gas surveys were to be modified as follows:

1. Radon was to be continuously monitored during construction at 15 locations on, and around the mine.
2. Radon was to be continuously monitored at 10 locations on and adjacent to the mine for four successive quarters after construction was complete.
3. Monitoring of radon flux was eliminated due to technical infeasibility, and because there was no standard for radon flux.

4.0 PARAMETERS MONITORED AND SAMPLING METHODS

Gamma radiation was measured using a TMA/Eberline gamma meter held three feet above the ground. The gamma surveys started during construction in 1990, and were concluded in 1993. There are no records of gamma radiation surveys after 1993. The following are the areas surveyed during the period of 1991 to 1993. They were selected based on recommendations from the EIS and monitoring reports.

1. Shops, construction buildings, and offices; housing area; Paguate townsite
2. Waste dumps and protore stockpile areas
3. Crusher areas; haul and access roads
4. Loading dock and rail spur from Quirk Station north to the project boundary (in 1990)
5. Three pits (North Paguate, South Paguate, and Jackpile) during backfilling and covering with shale and topsoil

Gamma radiation was measured using grids (100x100 feet or 200x100 feet) and recorded on field sheets, log and summary analytical sheets, and hand-drawn field maps. Measurements are recorded in micro Roentgens per hour (μR/hr).

Radon-222 gas was measured using Track Etch® cups (Barringer Alpha Track Detectors) at 15 predetermined locations on, and around, the mine as suggested by the monitoring report (Jacobs 1989). The cups were set up on posts three feet above ground at each location, and collected quarterly from April 1990 to May 1997. The monitoring station locations and time were recorded on Radon Test Detector log sheets or field forms, and the results listed on Radon Measurement Data sheets and Monitoring Reports for each quarterly testing period. The complete radon-222 survey results were tabulated and reported in the 1996 Annual Report for the Jackpile Reclamation Project. Measurements are reported in picocuries per liter (pCi/L).

5.0 RESULTS

Gamma Radiation: The results of the gamma surveys showed that open uncovered pits, protore (Jackpile Sandstone) stockpiles, and areas contaminated with ore (i.e., crusher areas, haul roads, etc.) averaged 62 to 173 μR/hr before reclamation activities. Waste dumps measurements varied depending on the surface materials from 19 to 48 μR/hr.

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Shops and buildings on site initially measured 0.9 to 52 µR/hr in 1991/1992, but were cleaned and reduced to 0.9 to 14 µR/hr in 1993.

During construction and reclamation activities, protore and contaminated areas were removed and placed in pits, which were then covered with shale and topsoil. Measurements of gamma radiation levels on the shale cover in pits and on waste dumps were reduced to 14 to 28 µR/hr, and after topsoil placement the readings were reduced further to less than 10 µR/hr. Covering the protore and pits with shale and topsoil reduced gamma radiation to acceptable levels. There were no gamma surveys after 1993 when the pits were covered and reclaimed.

Radon Gas: The results of the radon gas surveys were summarized in a table in the 1996 Annual Report, a portion of which is abstracted and presented in Table 5-1 below. The averages of radon gas were all less than 2 pCi/L, and the average for all sites was 1.0 pCi/L. There was no measurement of radon gas above 2.9 pCi/L, which was measured in the Old Shop in 1990. It was subsequently cleaned to reduce radiation. Radon gas was monitored for four quarters after reclamation was completed, in May 1997. None of the radon gas measurements exceeded the limit of 3.5 pCi/L.

Table 5-1
Averages of Radon Gas Measurements in pCi/L at 15 Site Locations
Jackpile Reclamation Project, April 1990 to May 1997

Location	Range	Average
P-10 area	0.4-2.1	0.7
N. Paguate	0.6-<2.0	1.0
OP-19	0.1-<2.0	0.8
Geo Bldg	0.7-1.9	1.2
HIWAY	0.7-2.0	1.2
New Shop	0.4-<2.0	0.6
W. Paguate	0.3-<2.0	0.9
Well-6	0.3-1.8	1.2
Paguate #1	0.3-1.2	0.7
Paguate #2	0.3-2.2	0.5
N. Jackpile	0.3-1.4	0.7
Old Shop	1.1-2.5	1.5
W. Jackpile	0.4-2.9	1.8
SW House	0.4-1.5	0.8
RMG-2	0.1-1.7	0.2

Average (all measurements) 1.0 pCi/L. Standard for the site is 3.5 pCi/L (3 pCi/L above background of 0.5 pCi/L)

6.0 DISCUSSION OF RESULTS

Gamma radiation on the mine reclamation areas was reduced by moving protore and surfaces of the contaminated areas into the pits and covering them with shale and topsoil. Waste dumps that had Jackpile Sandstone on the surface were also covered with topsoil.

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These activities effectively reduced measured gamma radiation to acceptable levels of less than 28 µR/hr on the mine areas up to, and during, 1993. There were no records of post-reclamation monitoring of gamma radiation after completion of reclamation in 1996.

All radon gas measurements were consistently below the standard limit of 3.5 pCi/L set by the ROD.

6.1 Data Condition

An evaluation of the gamma radiation and radon gas monitoring data is presented in Table 6-1.

Table 6-1
Evaluation of Gamma Radiation and Radon Gas Monitoring Data

Positives	Negatives
Gamma Radiation	
• Most of the sites selected and measured were at the appropriate locations. • The sample grids adequately covered the sites sampled. • Using hand-held gamma meters was an excellent method for sampling areas.	• Recommendations for time periods to sample gamma radiation were not followed. There was no post-reclamation monitoring. • Data was not summarized or presented in a form for analysis of results • Data collected was not analyzed for patterns to determine when or where to monitor. • Data was not in a well tabulated form and not checked for accuracy.
Radon Gas	
• Sampling periods and locations were adequate and followed the recommendations for monitoring and the EIS. • Data was well recorded and summarized in tables. • Data was easily analyzed for meeting standards.	• None

6.2 Data Evaluation

The gamma radiation surveys were difficult to interpret, and in some instances incomplete. The survey data could have also been plotted on maps or in tables for analysis of patterns or trends.

In contrast, the radon gas measurements were mostly complete, summarized in tables, and easily interpreted in order to analyze for patterns and trends.

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The Memorandum (dated May 20, 1994) from the BLM for a review of radiological monitoring stated that; 1) all reclamation personnel have received minimal dosages based on TLD badges, 2) results of the Track Etch® canisters for measuring radon are averaging 1.0 pCi/L, and 3) the gamma radiation in the revegetated North and South Paguate pit areas is equal to or less than background, and the gamma readings in backfilled and covered areas of the Jackpile pit are within the required reclamation limit of twice background.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on this radiological measurement review, the following conclusions can be drawn:

1. The Jackpile Reclamation Project gamma radiation monitoring program deviated from the requirement of the Record of Decision in that results were not tabulated or analyzed, and were not continued for the specified time periods.
2. Gamma radiation levels are probably below the 28 μR/hr limit on most areas of the reclaimed mine site, but there is uncertainty due to the lack of recommended post-reclamation monitoring.
3. Radon gas levels were consistently below the limit of 3.5 pCi/L at all locations measured.

Based on these conclusions, the following recommendations can be made:

1. Gamma radiation levels should be checked in specific locations at least one more time to verify that reclaimed areas are meeting the standard of 28 μR/hr.
2. The reclaimed mine can be released from any requirement for radon gas measurements, and should present no hazards for human health.
3. Post-reclamation land uses can be instituted based on this radiation data evaluation.

8.0. REFERENCES

Jacobs Engineering Group, *Jackpile Project Environmental Monitoring Plan*, Final, 1989.

U.S. Department of the Interior (DOI), *Final Jackpile-Paguate – Uranium Mine Reclamation Project Environmental Impact Statement, Vol. 1*, 1986.

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US Department of the Interior, Bureau of Land Management and Bureau of Indian Affairs, *"Jackpile-Paguate, Uranium Mine Reclamation Project, Record of Decision"*, December 1986.

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JACKPILE-PAGUATE URANIUM MINE
POST-RECLAMATION
SOILS ANALYSIS AND HEAVY METAL AND RADIONUCLIDE UPTAKE IN VEGETATION ANALYSIS

Table of Contents

Section	Title	Page
1.0	Introduction	1
2.0	Background	1
3.0	Soils Monitoring and Analysis	2
	3.1 Topsoil	3
	3.2 Salt Buildup	5
	3.3 Radiologicals and Heavy Metals in Soils	5
4.0	Plant Uptake Monitoring and Analysis	6
5.0	Data Condition	11
6.0	References	24

List of Tables

Table 3-1	Soils Testing Requirements Comparison	2
Table 4-1	Comparison of Monitoring Requirements for Radionuclide and Heavy Metal Uptake into Vegetation	7
Table 4-2	Summary of Results of the Heavy Metal and Radionuclide Vegetation Uptake Monitoring for the Jackpile Reclamation Project	9
Table 5-1	Evaluation of Soils Monitoring Data	10
Table 5-2	Evaluation of Vegetation Uptake Monitoring Data	11

1.0 INTRODUCTION

This report presents a soil evaluation and data review for the reclaimed Jackpile-Paguate Uranium Mine.

The objectives of this report are to:

1. Determine if the soils and vegetation testing met the requirements in the Jackpile-Paguate Reclamation Project Record of Decision (ROD) (DOI_2, 1986) as defined in the Environmental Impact Statement (DOI_1, 1986)
2. Review the soil and vegetations chemical and radiological data collected and applied topsoil depths during reclamation for requirements established in the ROD.
3. Make recommendations on how to overcome any ROD deficiencies.

2.0 BACKGROUND

The area of the mine and surrounding landscape is a region of broad mesas and plateaus separated by deep canyon, dry washes, and broad alluvial valleys on the southeastern edge Colorado Plateau province. This is a semi-arid region underlain by flat lying interbedded rock strata of Upper Cretaceous shale (Mancos) and associated sandstones (Tres Hermanos and Jackpile). Soils are predominantly shallow sandy loam to sandy clay loam on the mesas and slopes, and alluvial fine-grained deep soils in the valleys (DOI_1, 1986). Approximately 3.1 million cubic yards of topsoil materials (mostly crushed Tres Hermanos Sandstone) were stockpiled on the mine site and were used as topsoil during revegetation. In addition, a borrow area for topsoil of 44 acres was also utilized as needed. The revegetation project involved the filling of three open pits using protore (sub-grade ore) stockpiles, substrate materials from mine waste rock dumps, and covering with topsoil stockpiles.

Reclamation and revegetation techniques were first tested by the Anaconda Mining Company (AMC) starting in 1976, and continued on 11 additional waste piles in 1977, 1979, and 1980-1981 (Weston, 1991). The techniques AMC tested included topsoiling procedures based on soils analysis, seed mixtures, fertilization, and straw mulching. The results of the soil surveys on mine reclaimed waste dumps, stockpiled soils, and various locations within the mine site showed that all of the soil samples can be considered suitable plant growth media (Weston 1991). Soils from a few areas may have problems with permeability or salt content if used in isolation.

There was no site activity from 1982 to 1989. Final reclamation of the entire mine site started in 1990, and was completed at the end of 1996. The work involving topsoiling started in 1991 on waste dumps, and was continued on slopes and in pit bottoms until 1995.

05000168

3.0 SOILS MONITORING AND ANALYSIS

Monitoring for soils was specified in Table 1-5 in the EIS as once prior to seeding. The proposed soils monitoring program is presented in Table 3-1. The ROD specified that the waste dumps with Jackpile Sandstone would be covered with 3 feet of overburden (generally Mancos Shale), and 18 inches of topsoil. Protore (Jackpile Sandstone, JPSS) used as backfill in pit areas would be covered with 3 feet of overburden, and 2 feet of Tres Hermanos Sandstone or alluvial material.

Overview of Soil Reports - Several documents present soil sampling results, and recommendations for use and need for monitoring before and after final reclamation. The Jacobs Environmental Monitoring Plan was designed to meet the specifics of the ROD and was, in fact, the approved plan that superceded the EIS table of recommendations. The Jacobs Environmental Monitoring Plan called for annual monitoring of salt in the pit bottoms for ten years, which would meet the requirements of the ROD; however, this monitoring was apparently not performed. The Soils and Vegetation Evaluation (Weston 1991) completed before reclamation started, indicates that no further soils testing should be required. The reports by Munk and Boden (Munk and Boden, 1996, 1997), which reported results of soils monitored after reclamation was complete, described soil profiles and characteristics in the pit bottoms, and provided discussion on potential for plant uptake from soils. There are no reports or records of soil being tested beyond the Munk and Boden reports of 1997.

There were three types of soils testing discussed in documents associated with the Jackpile Reclamation:

1) **testing for suitability for topsoil that could support revegetation goals,**
2) **testing for salt buildup that could reach concentrations toxic to plants and**
3) **testing of heavy metals and radiological compounds.**

Table 3-1
Soils Testing Requirements Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	One grid per 50 acres on each waste dump and pit bottom	Item 10: EIS Table 1-5 Unspecific	For Salt Buildup NP Pit: 2 east, 2 west SP Pit: 2 east, 2 west Jackpile: 4 locations Half the locations in each pit will be in areas where ponding occurs after large precipitation events and half on well-drained areas. Sample collected from 3 to 9 inches below surface. Sampling points marked with 3 foot steel posts.	1.) For Topsoil Suitability Landmark/Weston (1991) collected 38 samples from 26 locations in the pit areas. 2.) No Salinity Sampling 3.) For Potential for Plant Uptake Munk & Boden (1997) collected 12 samples

05000169

Frequency	Once Prior to Seeding		Annually	1.) Once 2.) Never 3.) Once
Parameters	U(natural), RA-226, Th-230, Se, Va, As, Cd, Mo, Pb, Zn		EC of saturated paste extract	1.) pH, EC, saturation %, Ca, Mg, Na, SAR, soil characteristics 2.) As, Cu, Mo, Pb, Se, Zn, Va, Pb-210, Po-210, Ra-226
Duration	Once Prior to Seeding		Begin after backfilling and continue for 10 years	1.) Once 2.) Not Done 3.) Once

3.1 Topsoil

The Jacobs Monitoring Report discusses soil testing to determine suitability for top dressing which was part of the reclamation operations and included in the construction specifications. It was not a part of the Long Term Post Closure Monitoring Program discussed in ROD Item 10. There are several reports which contain data on soils for suitability for top dressing.

a.) Landmark/Weston (1991)

In 1991, personnel from Weston collected and analyzed 38 soil samples from 26 locations in the South Paguate, North Paguate, and Jackpile areas. The soils sampled were analyzed for pH, EC, saturation percent, calcium, magnesium, sodium, sodium adsorption ratio, sand, silt, clay, and texture. These parameters were measured to determine the suitability of the soil to serve as top dressing over the Mancos Shale, and support growth of native species.

The results of the soil monitoring by Weston personnel (Landmark Reclamation/Weston, *"Jackpile Reclamation Project, Pueblo of Laguna, New Mexico, Soils and Vegetation Evaluation for Final Reclamation"*, Final, April 1991.) showed moderate soil parameters within normal ranges. Soils were moderately alkaline with a pH range of 7.3 to 8.2, low conductivity of 0.35 to 3.77 (with one sample to 5.37), and low sodium adsorption ratio (SAR) ranging from 0.11 to 1.13 (three samples were higher to 5.07), and textures from loam to sandy clay loam. Concerns raised by this study were the potential for high sodium content and low permeability soils. However, most soils had low clay content allowing salts to be leached. Other concerns were for high permeability with low water holding capacity; however, topsoiling materials were mixed and placed over shale, which compensates for high permeability. There were some areas showing potential revegetation problems that could not be attributed to soil conditions alone. The conclusion of this soils study was that the topsoiling material tested could support successful revegetation, and no further soils testing was necessary.

05000170

b.) Munk and Boden (1996, 1997)

The report on interim reclamation by Munk and Boden (1996) presented a table of soil characteristics for the cover materials in the pit bottoms from 6-foot deep pits. The parameters recorded were material depths, color, texture, percent fragments, effervescence, and rooting depths.

There is information in the abbreviated soils descriptions in the reports by Munk and Boden (1996, 1997) on soil depths and characteristics in three pit bottoms. One purpose of the soil investigation was to evaluate the general characteristics. Depths of topdressing ranged from 18 to 60 inches with an average depth of 30 inches; depths of shale ranged from 7 to 36 inches with an average of 21 inches. Textures were medium and varied from sandy loam to silty clay. The pH measured in this study ranged from 7.7 to 8.2, and EC ranged from 0.93 to 11.2. Soluble calcium was typically high from sulfate solid phases. The dark Mancos Shale layer is medium to fine texture with clay contents up to 45%. This shale was a mixed substrate with pH ranges from 3.5 to 7.8, and also had a high level of soluble calcium. The acid forming potential of the shale is limited as indicated by Acid Base Account evaluation.

c.) Miscellaneous Field Data Sheets

Field data sheets measuring shale and topsoil cover of waste dumps during 1991 and 1993 showed topsoil depths averaging 18 to 20 inches, and shale cover from 12 to 14 inches. No information was available on pit bottoms from these data sheets.

Suitability of topsoil dressing material was adequately measured prior to the start of reclamation. The soils were found to be suitable for revegetation, and further testing should not be required. This soils evaluation met the requirements of the ROD for monitoring soils once prior to seeding. The parameters measured were different from that specified by the EIS; however, the parameters measured identified the soils as suitable for plant growth.

The results of the soils monitoring showed varying depths of topsoil and overburden cover on the waste dumps and pit bottoms. There were two periods of measuring soil cover depths; 1) during construction on waste piles, and 2) post reclamation in the pit bottoms. The cover depths were adequate to provide growth media for plant growth and revegetation. Topdressing materials averaged 30 inches and shale overburden 21 inches for a total cover depth of 51 inches (4.25 feet). The ROD specified 3 feet of overburden, and 2 feet of topsoil for a total of 5 feet. The difference of 0.75 feet can be attributed to settling and compaction after soils were placed.

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Conclusion

Overall, soils used for revegetation on the mine site were suitable for plant growth, and presented no problems for vigorous and productive vegetation communities. The reports on soils evaluation showed that the soil parameters were within normal ranges for local and native soils. Appropriate topsoil source areas were found and appropriate depths were laid down.

3.2 Salt Buildup

The ROD required salinity monitoring in the pits. The Jacobs Monitoring Plan directed the soils in the pits be monitored for salt buildup since a survey of drainages blocked by waste dumps showed the build-up of salts to levels toxic to plants in areas adjacent to the blockage. There were no data found regarding monitoring for salt in soils. No salinity in soils was monitored.

Conclusion

The ROD requirement to monitor salt buildup for impact to vegetation has not been met. Although visual inspection during reclamation and post reclamation does not indicate the presence of salinity induced stress in revegetated areas, a one time sampling and analysis of soils in areas adjacent blockages is recommended to verify this conclusion.

3.3 Radiologicals and Heavy Metals in Soils

The EIS Table 1-5 presents radiological and heavy metal parameters to be tested in soils from the dumps and pit bottoms, to assess potential for plant uptake. There was a one-time sampling of soils for chemical and radiological analyses. In September/October 1996 (Munk and Boden, 1997) 12 locations in the pit bottoms were sampled for soil parameters and characteristics after reclamation was complete, primarily for determining plant uptake of heavy metals and radionuclides. They sampled the topdressing (Tres Hermanos Sandstone TD), Mancos Shale (MS), and Jackpile Sandstone uranium protore (JPSS) layers. The constituents measured included arsenic (As), copper (Cu), molybdenum (Mo), lead (Pb), selenium (Se), zinc (Zn), vanadium (V); and the radionuclides lead-210 (^{210}Pb), polonium-210 (^{210}Po), and radium-226 (^{226}Ra).

The Munk and Boden (1997) reports that samples were taken at 12 locations within the pits for some radiological and heavy metals compounds. The reported results of soils monitored after reclamation was complete, provided discussion on the potential for plant uptake from soils. Their analysis of the soil topdressing, shale cover material, and protore in the pit bottoms indicated that the heavy metals, arsenic, copper, lead, molybdenum, and zinc occurred at typical levels for natural soils. They concluded that additional measurements of arsenic, copper, lead, molybdenum, and zinc were not warranted in the pit bottoms. However, the heavy

05000172

metals, selenium and vanadium, and the radionuclides, radium-226, lead-210, and polonium-210, occurred at elevated levels in the Jackpile Sandstone protore. These metals and radionuclides have the potential for redistribution to the soil surface by vegetation, and should be monitored.

Conclusion

Because of the construction of barrier covers over the protore in the areas that had elevated metals and radionuclide, concentrations, those areas should be of no concern. The ROD requirement for monitoring was met for soil testing.

4.0 Plant Uptake Monitoring and Analysis

The EIS recommended several reclamation and revegetation activities that were intended to reduced the potential for vegetation uptake of metals and radionuclides or prevent grazing. The activities included:

1. Moving stockpiled protore (Jackpile Sandstone) into the pits and covering with overburden (Mancos Shale) and topsoil (Tres Hermanos Sandstone) before seeding for revegetation.
2. Covering exposed surfaces of Jackpile Sandstone on waste dumps with overburden and topsoil.
3. Clearing and moving contaminated materials from facilities, roads, rail spur, and disturbed sites; and topsoiling all disturbed sites (old roads, etc.) before revegetation.
4. Stabilizing slopes of waste dumps and pit highwalls.
5. Fencing pit bottoms (to prevent access of domestic cattle and human entry).

There was no site activity from 1982 to 1989. Final reclamation of the entire mine site started in 1990, and was completed at the end of 1996. Monitoring for vegetation uptake started with soils investigation in 1996 and continued with vegetation monitoring until 2006.

Requirements of the ROD and EIS, concerning monitoring for heavy metals and radionuclides uptake, were specified in Table 1-5 in the EIS. Table 4-1 presents the proposed and actual monitoring for vegetation uptake.

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Table 4-1
Comparison of Monitoring Requirements for Radionuclide and Heavy Metal Uptake Into Vegetation Comparison

	EIS Table 1-5	ROD	Jacobs Environmental Monitoring Plan	Actual
Sampling Points	Transects on selected reclaimed waste dumps and all pit bottoms	Item 12: EIS Table 1-5, minimum 10 years following reseeding	One location per dump with JSS on outer surface	Pit Bottoms
Frequency	Annually		Annually	2001,2003, 2005, 2006
Paramcters	U(natural), RA-226, Po-210, Th-230, Se, V, As, Cu, Cd, Mo, Pb, Zn		Edible Fraction for Ra-226, Po-210, Pb-210, Se, Va, As, Mo, Pb, Cu, Zn	As, Cu, Pb, Mo, Se, V, Zn, Pb-210, Po-210, Ra-226
Duration	A minimum of 10 years following reclamation		Commence one year after reseeding for a minimum of 10 years following reclamation. Increase locations if the trends indicate that toxic levels are being approached.	

Overview of Uptake Reports Two documents in addition to the ROD and EIS dealt with the proposed vegetation uptake monitoring program after final reclamation.

a.) Jacobs, 1989

The Jacobs Environmental Monitoring Report reports that early data sets showed that *"vegetation on the disturbed areas is not accumulating heavy metals or radionuclides in concentrations that are toxic to livestock"*, but that it would be prudent to monitor to see if uptake changed with time. The monitoring plan proposed by Jacobs Engineering (Jacobs 1989) suggested annual monitoring begin one year after seeding and continue for 10 years. Thorium-230 was not included in the monitoring plan due to a low uptake factor, and Uranium (total) was also not included because of low plant uptake and a low conversion factor for the ingestion pathway. Instead, Polonium-210 was considered to have a greater potential human exposure pathway through ingestion, and was included in the monitoring that was implemented.

b.) Miscellaneous Data Sets

There were four years (2001, 2003, 2005, and 2006) in which vegetation was clipped and analyzed for heavy metals and radionuclides. The following metal and radionuclides were analyzed during these time periods:

05000174

1. June 2001, May 2003 and June 2005: heavy metals - As, Cu, Mo, Pb, Se, V, and Zn; radionuclides - ^{226}Ra, ^{210}Po, and ^{210}Pb.
2. September 2006: heavy metals - As, Cu, Mo, Pb, Se, V, and Zn; and radionuclides were analyzed.

The results of the vegetation uptake monitoring are presented in Table 4-2. The results presented are the range of values, number of non-detects or negative values, and the average value for each time period. The following summarizes the values for each metal and radionuclide.

The following presents a discussion of these data sets.

METALS

Arsenic: The average concentrations were low at 0.2 to 0.4 mg/Kg, with many non-detects. One maximum concentration at 5.0 mg/Kg was recorded, but no discernable trend was observed during the 5-year monitoring period

Copper: This metal was detected in all vegetation samples at low average concentrations of 2.4 to 2.9 mg/Kg. There was one value of 7.6 mg/Kg, but there was no increase or trends noted during the sampling periods.

Lead: The average concentrations were low at 0.1 to 0.4 mg/Kg, with many non-detects. There was one value at 4.0 mg/Kg, but no trends were noted.

Molybdenum: The average concentrations were low at 0.2 to 0.5 mg/Kg, with many non-detects. There was one value at 3.7 mg/Kg, but no trends were noted.

Selenium: The concentrations varied from 0 to a maximum value of 42.9 mg/Kg. The concentrations measured in 2006 had increased in average value in the 2006 samples to 6.4 mg/Kg due to uptake by a perennial shrub (four-wing saltbush).

Vanadium: The concentrations were low averaging 0.6 to 1.5 mg/Kg with many non-detects

Zinc: The concentrations were consistent in all plants sampled varying from 3 to 47 mg/Kg. Average values were 14 to 20 mg/Kg, with no trends in the years sampled.

Measured uptake concentrations of metals into vegetation were either below, or within, normal ranges for all heavy metals analyzed. As discussed by Munk and Boden (1997), the potential for uptake by most plants is minimal given the soil properties in the pit bottoms. This was confirmed by the four growing seasons (2001 to 2006) of vegetation sampled and analyzed for heavy metals (see Table 5-1, and discussion of concentrations in plant species sampled). There was some concern by Munk and Boden (1997) that selenium and vanadium may accumulate on the surface and be translocated from the Jackpile Sandstone backfilled and covered in the pit bottoms. However, there was no increasing trend of these two metals measured in the vegetation eleven years after revegetation was complete.

The concentration in one shrub (four-wing saltbush) analyzed for selenium was within a normal high range, and may indicate that this shrub species is a secondary accumulator.

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This species is a member of the goosefoot family, and is not generally grazed by domestic livestock when other more palatable grass species are available.

Domestic livestock can graze the grass/shrub vegetation in the pit bottoms without toxic effects from heavy metals. Selenium was the only metal found to have the potential for sub-acute toxicity in one sample in one shrub species that is generally not browsed by livestock. It is recommended that heavy metals monitoring should not be required in the future based on the sample results to date.

RADIONUCLIDES

Lead-210: The concentrations measured in vegetation were consistently low at less than 1 pCi/g (range 0 to 1.1) with some non-detects, and averaging 0.07 to 0.50 pCi/g. There was no increasing or decreasing trend in uptakes measured
Polonium-210: The concentrations measured in vegetation were also consistently low at less than 0.4 pCi/g (range 0 to 1.16) with some non-detects, and averaging 0.05 to 0.28 pCi/g. There was a slight increase in uptakes measured in 2006 (1.16 pCi/g) due to values in perennial shrubs (four-wing saltbush), and one grass sample.
Radium-226: The concentrations measured in vegetation were generally low at less than 1 pCi/g (range 0.002 to 2.1) with some non-detects, and averaging 0.17 to 0.72 pCi/g. There was no increasing or decreasing trend in uptakes measured

The concentration levels of radionuclides in the plant samples analyzed were uniformly low with no increasing trends in levels over the four periods vegetation was sampled. The concentration levels are well below values that are considered toxic to domestic livestock or wildlife; therefore, sampling of radionuclides should not be required in the future.

Table 4-2
Summary of Results of the Heavy Metal and Radionuclide Vegetation Uptake Monitoring for the Jackpile Reclamation Project.
Results are in mg/Kg (ppm) for metals, and pCi/g (picocuries per gram) for radionuclides.
***ND – non-detects or minus values**

Year	2001 – 15 Samples			2003 – 10 Samples			2005 – 39 Samples			2006 – 16 Samples		
Metals	Range	ND*	Avg	Range	ND	Avg	Range	ND	Avg	Range	ND	Avg
As	0-0.8	13	0.2	-	10	-	0-5.0	10	0.8	0-3.3	12	0.4
Cu	1.1-4.0	0	2.5	1.3-4.7	0	2.4	1.4-3.8	0	2.5	1.9-7.6	0	2.9
Pb	0-1.3	13	0.1	0-1.8	8	0.02	0-4.0	25	0.4	0-2.2	12	0.4
Mo	0-2.1	12	0.2	0-3.7	9	0.4	0-3.3	6	0.4	0-3.1	8	0.5
Se	0.94	9	1.5	0-5.3	3	0.9	0-5.3	9	1.4	0.5-42.9	0	6.4
V	0-3.7	9	0.6	0-4.8	7	0.6	0-8.1	28	0.7	0-19.1	13	1.5
Zn	9-47	0	20	8-29	0	15	3-34	0	18	8-25	0	14
Radio-nuclides												
^{210}Pb	0.1-1.9	0	0.44	0-1.12	1	0.50	0-0.3	14	0.07	0-0.87	4	0.28
^{210}Po	0-0.5	5	0.17	.03-.34	0	0.12	0-0.2	2	0.05	.02-1.16	0	0.28
^{226}Ra	0-0.5	5	0.17	0.2-0.5	0	0.38	0-2.1	2	0.72	.002-.51	1	0.19

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Conclusions

Based on this vegetation uptake review, the following conclusions can be drawn:

1. The Jackpile Reclamation Project vegetation uptake-monitoring program deviated from the requirement of the ROD in that heavy metals and radionuclides were not measured for ten consecutive years after reclamation was completed.
2. Vegetation had low levels of metal and radionuclide uptake based on sampling and laboratory analysis. However, it should be noted that the uptake data collected was poorly documented and not analyzed or checked for concentrations or trends.
3. Vegetation growing on the reclaimed mine presents a minimal potential for hazards to domestic livestock or human health due to the low or normal concentrations of metals and radionuclides.
4. There is a semi-permanent surface water feature in the North Paguate pit. This area was not sampled for vegetation uptake. The vegetation around that pit should be monitored to determine if it is consistent with the vegetation uptake in the dry areas.

Recommendations

1. Vegetation on the reclaimed mine appears to be stable and should not require further general testing or monitoring for heavy metals or radionuclides, with the exception of the area near the North Paguate surface water feature.
2. The reclaimed mine can be released from the vegetation monitoring requirements and should not require future monitoring.
3. Based on this vegetation uptake evaluation, post-reclamation land uses can be initiated.
4. It is possible that some additional specific vegetation analysis may be required based on a future surface water sampling program.

5.0 Data Condition

An evaluation of the soils monitoring data and vegetation uptake monitoring data is presented in Tables 5-1 and 5-2, respectively.

Table 5-1
Evaluation of Soils Monitoring Data

Positives	Negatives
• Reports were clear and concise, and presented adequate detail. • Survey and analytical methods were adequately explained. • Reports were consistent for topsoil	• Soil depths were not consistently measured across the mine sites. • Soil suitability was not measured immediately prior to seeding. • Soil parameters required by the EIS were

05000177

suitability for revegetation • Depths of topsoil and overburden placed averaged just below the required depth due to settling.	not analyzed until reclamation was complete. • There was no discussion or evaluation of the soil data for suitability based on heavy metals or radionuclides. • The required monitoring of salt build-up was not performed

Table 5-2
Evaluation of Vegetation Uptake Monitoring Data

Positives	Negatives
• All heavy metals and radionuclides were sampled during each time period. • Sampling and laboratory analytical methods were adequately explained. • The early monitoring plan and soils investigation report were well written and consistent.	• Recommendations for which metals to analyzed were not followed. • Vegetation was not sampled for the 10-year period required by the EIS. • Data collected was not analyzed for trends to determine which constituents should be continually monitored. • Data was in a poorly tabulated form and not checked for accuracy.

The review and analysis of the vegetation uptake data was difficult due to the poorly organized and presented data sheets, which had no periodic evaluation. An early sampling in 1997 or 1998 could have resulted in no need to sample for several of the metals as suggested by Munk and Boden (1997). An evaluation of the first three sampling periods in 2001, 2003, and 2005 would have shown that sampling for any metals or radionuclides in 2006 may not have been necessary.

6.0. REFERENCES

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Munk, Lewis P. and Boden, Paul, Soils and Biogeochemistry, *"Interim Reclamation Success Analysis, North and South Paguate Open Pits, Jackpile-Paguate Uranium Mine"*, December 1996

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05000178

US Department of the Interior, Bureau of Land Management and Bureau of Indian Affairs, *"Jackpile-Paguate, Uranium Mine Reclamation Project, Final Environmental Impact Statement"*, Volumes 1 and 2, October 1986.

U.S. Department of the Interior, Bureau of Land Management and Bureau of Indian Affairs, *"Jackpile-Paguate, Uranium Mine Reclamation Project, Record of Decision"*, December 1986.

Field Data Sheets - Shale Cover and Top Soil Cover depths, 1991, 1993

Vegetation uptake measurements in data sheets (Excel or pdf) for heavy metals and radionuclides, 2001, 2003, 2005, and 2006.

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JACKPILE-PAGUATE URANIUM MINE
POST-RECLAMATION
WATER QUALITY DATA REVIEW

Table of Contents

Section	Title	Page
1.0	Introduction	1
2.0	Background	1
3.0	Meeting the Requirements of the ROD and EIS	2
	3.1 Groundwater	4
	3.2 Surface Water	7
4.0	Results	9
5.0	Discussion of Results	11
	5.1 Data Condition	11
	5.2 Water Characteristics	11
	5.2.1 Groundwater	11
	5.2.2 Surface Water	14
	5.3 Potential Hazards	17
	5.3.1 Drinking Water	17
	5.3.2 Agriculture	20
	5.4 Quality Control and Quality Assurance	21
6.0	Conclusions and Recommendations	22
7.0	References	24

Section	APPENDICES
Appendix A	Monitoring Data Evaluation Tables – 1996-2007 (On CD-ROM)
Appendix B	Analytical Methods

List of Tables

Table 3-1: Proposed Water Quality Monitoring as Presented in the EIS (DOI_1, 1986) 3
Table 3-2: Proposed Wells Locations in the Environmental Monitoring Plan (Jacobs Engineering Group, 1989) 4
Table 3-3: Groundwater Monitoring Well Locations and Completion Information 5
Table 3-4: Proposed Surface Water Monitoring Locations in the Environmental Monitoring Plan 7
Table 3-5: Existing Surface Water Sampling Locations 8
Table 4-1: Example of Data Reduction Table as Presented in Appendix A 9
Table 5-1: Evaluation of Post Reclamation Water Quality Data 10
Table 5-2: 2005 Groundwater Quality (Major Caion and Anion) Summary 11
Table 5-3: National Maximum Contaminate Levels (USEPA, 2002) 17
Table 5-4: National Secondary Drinking Water Standards (USEP, 2002) 19
Table 5-5: Salinity Hazard (USDA,) 19
Table 5-6: Post-reclamation Sample Evaluation - Cation-Anion Balances 20
Table 6-1: Evaluation of Post Reclamation Water Quality Data 21

List of Figures

Figure 5-1 Piper Diagram – 2005 Groundwater Jackpile-Paguate Reclamation Project 12
Figure 5-2: Post Reclamation TDS Trends for Jackpile Paguate Observation Wells 1997 - 2006 13
Figure 5-3: Post Reclamation TDS Trends for Jackpile-Paguate Pit Wells - 1997 - 2006 13
Figure 5-4: Piper Diagram for 2005 Surface Water Samples 14
Figure 5-5: Post Reclamation TDS Trends for the Rio Paguate - 1997 - 2006 15
Figure 5-6: Post Reclamation TDS Trends for the Rio Moguine - 1997- 2006 15

05000183

1.0 INTRODUCTION

The following presents a review of the post-reclamation water quality monitoring and data for the Jackpile-Paguate Uranium Mine located on the Laguna Indian Reservation, Cibola County, New Mexico (see Figure 1-1). Please note that this analysis was prepared in the Fall of 2006, prior to receipt of the 2006 and 2007 water quality data and prior to the installation and sampling of two wells in the Jackpile Pit. Please see the attached addendum for these data analyses.

The objectives of this report are to:

1) Determine if the post-reclamation water quality monitoring has met the requirements as defined in the Jackpile-Paguate Reclamation Project Environmental Impact Statement (DOI_1, 1986) and the associated Record of Decision (ROD) (DOI_2, 1986).
2) Examine the water quality data collected as to its validity and its applicability in assessing long-term risks to people and the environment.
3) Define contaminants of concern and trends of these data.
4) Make recommendations as to future monitoring programs and steps that should be taken to ensure the health and safety of nearby residents.

The following presents a brief overview of the hydrology of the site and importance of the overall water quality monitoring program, as well as addressing each of the objectives outlined above.

2.0 BACKGROUND

The Jackpile-Paguate Uranium Mine was operated between 1953 and 1980. The mine consisted of three open pits (the Jackpile, North Paguate, and South Paguate) and a series of underground workings. The pits were between 200 and 300 feet deep with the mine and associated facilities within a 7,868 lease area, of which approximately 3,140 acres of land was reclaimed. A little less that 1/3 of this disturbed acreage was reclaimed prior to 1980 by the Anaconda Copper Company, which operated the mine.

In December 1986, under a series of agreements between the Bureau of Indian Affairs and the Pueblo of Laguna, it was agreed that the Pueblo of Laguna would perform the management, coordination and administration of the Jackpile-Paguate Reclamation Project in accordance with the requirements set forth in the Jackpile-Paguate Reclamation Project Environmental Impact Statement (DOI_1, 1986) and the associated Record of Decision (ROD) (DOI_2, 1986). This project involved the reclamation of the three open pits, 32 waste dumps, 23 protore (sub-grade ore) stockpiles, four topsoil stockpiles, as well as roads and buildings on the remaining 2,656 acres of disturbed land. As defined in the ROD, the objectives of the reclamation are:

1) To ensure human health and safety.

05000184

2) To reduce the release of radioactive elements and radionuclei to as low as reasonably achievable.
3) To ensure the integrity of all existing cultural, religious and archeological sites.
4) To return the vegetative cover to a productive condition compatible with the surrounding area.
5) Provide for additional land uses that are compatible with other reclamation objectives and that are desired by the Pueblo of Laguna.
6) Eliminate the need for post-reclamation maintenance.
7) Blend the visual characteristics of the mines with the surrounding terrain.
8) Employ the Pueblo of Laguna people in efforts that afford them opportunities to utilize the skills or train them as appropriate.

An important aspect of the EIS and the ROD is gaining a thorough understanding of the hydrogeology and surface water hydrology of the site. Much has been written about the hydrology of the site. Dames and Moore (1980), Hydro Geo Chem (1982), Zehner (1985), and others have presented detailed descriptions of the aquifers and surface water drainages at the mine site. It is suggested that the reader review the EIS for additional information of the overall hydrology of the site. This information was utilized to develop an environmental monitoring plan for the Pueblo of Laguna (Jacobs Engineering Group Inc., 1989). This monitoring plan, which will be discussed later in more detail, covered the monitoring of groundwater in the Jackpile Sandstone which is the principle aquifer underlying the site, the alluvium, and the fill in the pits as well as the surface waters in the Rio Moquino and Rio Paguate which receive runoff from the site.

3.0 MEETING THE REQUIREMENTS OF THE ROD AND EIS

As mentioned earlier, one of the objectives of this report is to determine if the post-reclamation has met the water quality monitoring requirements of the EIS and the ROD. In Table 1-5 (Summary of Proposed Monitoring Programs) of the EIS for the Preferred Alternative it was suggested that the following water quality monitoring program be implemented, which is presented in Table 3-1.

05000185

Table 3-1
Proposed Water Quality Monitoring as Presented in the EIS (DOI_1, 1986)

Item	Proposed Water Quality Monitoring for Proposed Alternative	
Surface Water Quality	No. of Stations	7
	Parameters	Group A: pH, EC, temperature, Bicarbonate Chloride. Sulfate, Sodium, Silicon dioxide, Magnesium, Nitrate, Manganese, Iron, Uranium (natural) and Radium 226 Group B: Same as Group A with Arsenic, Boron, Barium, Cadmium, cyanide, Cobalt, Chromium, Copper, Fluoride, Mercury, Molybdenum, Nitrogen, Lead, Phosphate, Selenium, Vanadium, Zinc, and Ra228
	Frequency	Quarterly for Group A and Semi-annually for Group B
	Duration	During reclamation and 10 years thereafter.
Groundwater	Number of Wells	17
	Parameters	Group A: pH, EC, temperature, Bicarbonate Chloride. Sulfate, Sodium, Silicon dioxide, Magnesium, Nitrate, Manganese, Iron, Uranium (natural) and Radium 226 Group B: Same as Group A with Arsenic, Boron, Barium, Cadmium, cyanide, Cobalt, Chromium, Copper, Fluoride, Mercury, Molybdenum, Nitrogen, Lead, Phosphate, Selenium, Vanadium, Zinc, and Ra228 Plus water levels
	Frequency	Semi-annually fro Group A and Annually for Group B
	Duration	During reclamation and 10 years thereafter

In the ROD (DOI_2, 1986), monitoring requirements were stated as follows:

"The monitoring period will vary for each parameter. Existing monitoring activities to be continued will include: meteorologic sampling, air particulate sampling, radon sampling (ambient)……water monitoring and subsidence. The monitoring program will be expanded to include: radon daughter levels (working levels) in any remaining workings and ground water recover levels/salt build-up in the open pits. The ground water monitoring period will be of sufficient duration to determine the stable future water table conditions. Refer to Table 1-5 of the FEIS for details of the monitoring plan as described under the Preferred Alternative."

The following presents the proposed and applied water quality monitoring programs for groundwater and surface water.

3.1 Groundwater

In the Final Approved Environmental Monitoring Plan (Jacobs Engineering Group Inc., 1989), the monitoring program proposed in the EIS was somewhat modified. For groundwater, it was recognized that the potential for groundwater contamination is one of the "most sensitive" issues to the public. Based on groundwater studies by numerous consultants, it was determined that contaminated water has not migrated offsite and that the open pits act as groundwater sinks, and potential for groundwater to move offsite would not occur for some time. In this plan, it was recommended that five wells be completed in the Jackpile Sandstone, four wells in the alluvium, six wells in the pit

05000186

backfill and two additional locations to be selected. Table 3-2 presents the Jacobs Environmental Monitoring Plan preferred locations of these wells. With the initiation of monitoring, a total of eight wells were completed with four wells in the Jackpile Sandstone, four wells in the alluvium, and four wells in fill material. Details for these wells are presented in Table 3-3 and illustrated in Figure 3-1. Fewer wells were installed than proposed in the Jacobs Environmental Monitoring Plan and the upgradient well for the SP Pit area (MW-8) collapsed in 1991 and was never replaced. The actual monitoring program is deficient in that it lacks two wells in the Pit and lacks a well downgradient of the Jackpile Pit in the Jackpile Sandstone formation. One of the two downgradient wells, MW-2 or MW6, was supposed to be placed in the Jackpile Sandstone formation, however, both are in the alluvium. Reportedly, the Jackpile Sandstone is not present at the downgradient boundary.

Table 3-2
Proposed Wells Locations in the Environmental Monitoring Plan (Jacobs Engineering Group, 1989)

Location	Formation for Completion
GROUP A	
Southwest of South Paguate Pit (background well)	Jackpile Sandstone
North of North Paguate Pit (background well)	Jackpile Sandstone
North-northeast of Jackpile Pit (background well)	Jackpile Sandstone
North of the Rio Paguate and west of the Rio Moquino near the confluence	Alluvium
South of the Rio Paguate and north of the South Paguate Pit	Alluvium
South of the Jackpile Pit offices and east of the Rio Paguate	Alluvium
In Oak Canyon adjacent to the designated site boundary	Jackpile Sandstone
Near the Intersection of the south end of the designated site boundary and the Rio Paguate	Jackpile Sandstone
Near the intersection of the south end of the designated site boundary and the Rio Paguate	Alluvium
GROUP B	
In the North Paguate Pit after backfilling	Fill
In the North Paguate Pit after backfilling, west thumb	Fill
In the South Paguate Pit after backfilling, SP-20 pit	Fill
In the main South Paguate Pit after backfilling	Fill
In the central portion of the Jackpile Pit after backfilling (2 wells)	Fill
GROUP C	
Two location to be selected by the Pueblo of Laguna and Department of Interior[1]	
[1] More wells may be required if the migration of contaminated groundwater off the site is detected by the proposed monitoring wells.	

05000187

Table 3-3
Groundwater Monitoring Well Locations and Completion Information

Well Number	Location		Total Depth (ft)	Description	Formation
	Northing	Easting			
MW-1	1506790	639458	231	North of N. Paguate Pit	Jackpile SS
MW-2	1500707	648932	40	Near the Intersection of the south end of the designated site boundary and the Rio Paguate	Alluvium
MW-3	1504131	643052	60	South of the Jackpile Pit offices and east of the Rio Paguate	Alluvium
MW-4	1503734	639392	50	South of the Rio Paguate and north of the South Paguate Pit	Alluvium
MW-5	1494714	648687	262	In Oak Canyon adjacent to the designated site boundary	Jackpile SS
MW-6	1495801	650527	60	Near the intersection of the south end of the designated site boundary and the Rio Paguate	Alluvium
MW-7	1511275	647255	375	North of the Rio Paguate and west of the Rio Moquino near the confluence	Jackpile SS
MW-8	1500945	633094	456	Southwest of South Paguate Pit (collapsed)	Jackpile SS
SP-OP-34	1500641	637929	na	In the South Paguate Pit after backfilling, SP-20 pit	Backfill
SP-OP-35	1501033	634954	na	In the main South Paguate Pit after backfilling	Backfill
NP-OP20W	1504824	638746	na	In the North Paguate Pit after backfilling, west thumb	Backfill
NP-OP20E	1505123	641582	na	In the North Paguate Pit after backfilling	Backfill

In the Environmental Monitoring Plan, it was recommended that groundwater samples be analyzed for the following parameters:

- Water Levels
- pH
- Specific Conductivity
- Temperature
- Total Dissolved Solids
- Sulfate
- Molybdenum
- Vanadium
- Selenium
- Uranium (Total)
- Gross Alpha
- Lead-210
- Polouium-210
- Radium-226

05000188

Analysis of the following parameters, on a one time basis after reclamation is completed, was also recommended.

- Bicarbonate
- Chloride
- Calcium
- Sodium
- Sodium
- Silicon dioxide
- Magnesium
- Nitrates
- Nitrite
- Manganese
- Arsenic
- Barium
- Cadmium
- Cyanide
- Chromium
- Fluoride
- Mercury
- Lead
- Phosphorus
- Potassium
- Selenium
- Silver
- Zinc

In addition, on a one time basis after reclamation had been completed, organic substances including halogenated volatile organics (EPA Method 601), aromatic Volatile organics (EPA Method 602) and base/neutral, acid extractables, and pesticides (EPA Method 625) were to be analyzed.

Final groundwater monitoring between 1989 and 1994 consisted of semi-annual monitoring of each of the monitoring wells with the exception MW-8, which collapsed and was abandoned. Samples were taken in April/May and in November/December. The parameter list consisted of both sets of parameters recommended by the Environmental Monitoring Plan. During post-reclamation (1995 – present), monitoring consisted of annual sampling of MW-1 through MW-7 and the four pit wells for the same list of parameters. Sampling took place during April/May of each year. At the time of this review, water level information was only available on a semiannual basis between May 1992 and November 1994.

3.2 Surface Water

According to the Environmental Monitoring Plan (Jacobs Engineering Group, 1989), surface water studies by consultants for various organizations indicate that the mine site does not appreciably contribute to contamination of the Rio Moquino and the Rio Paguate. According to the plan, surface water samples were to be taken quarterly at each of the seven stations listed in Table 3-4.

Table 3-4
Proposed Surface Water Monitoring Locations
in the Environmental Monitoring Plan

Location
Upstream on the Rio Moquino
Rio Moquino above the confluence
Upstream on the Rio Paguate
Rio Paguate above the confluence
Rio Paguate below the confluence
Rio Paguate – Ford Crossing
Each major pond in the open pits

Samples taken from these sites were to be analyzed for total dissolved solids, gross alpha, and radium-226. Semi-annual samples were to be taken at each of the stations and analyzed for following parameters:

- pH
- Specific Conductivity
- Temperature
- Total Dissolved Solids
- Sulfate
- Molybdenum
- Vanadium
- Arsenic
- Selenium
- Uranium (Total)
- Gross Alpha
- Lead-210
- Polouium-210
- Radium-226

with the following parameters on a one time basis after reclamation is completed.

- Bicarbonate
- Chloride
- Calcium
- Sodium
- Silicon dioxide
- Magnesium
- Nitrates
- Nitrite
- Manganese
- Arsenic
- Barium
- Cadmium
- Cyanide
- Chromium
- Fluoride
- Mercury
- Lead
- Phosphorus
- Potassium
- Selenium
- Silver
- Zinc

With the initiation of monitoring, a total of seven surface water stations were monitored. These stations are listed in Table 3-5 and presented in Figure 3-1 and correspond with the six river sampling sites presented in the Environmental Monitoring Plan, plus the monitoring of Paguate Reservoir. The Jacobs Environmental Monitoring Plan required monitoring major ponded water in the open pits. This was not done. Surface water samples were analyzed for both sets of parameters recommended by the Jacobs Environmental Monitoring Plan on a semi-annual basis in April/May and

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November/December between 1989 and 1994 and annually in April/May between 1995 and present.

Table 3-5
Existing Surface Water Sampling Locations

Station	Location
RT	Rio Paguate – Ford Crossing – Rail Trestle
URP	Upper Rio Paguate - Upstream
LRP	Lower Rio Paguate above the confluence
URM	Upper Rio Moquino
LRM	Lower Rio Moquino
PM	Rio Paguate below the confluence
LAKE	Paguate Reservoir

4.0 RESULTS

As part of this review, data was evaluated for the ten-year monitoring period between 1996 and 2006. These analyses were completed by Hall, Assagai, or American Radiation Services. At the time of this report, complete analyses were not available for 2006. These results are presented in detail in Appendix A of the Water Quality Report. Highlighted in these data tables are those parameters which equal or exceed USEPA's (2002) Maximum Contaminate Levels (MCL) in light blue and National Secondary Water Quality Levels (NSWQL) in light gray. These exceedances will be discussed in Section 5 of this report. As part of the review process, the data were summarized in terms of count, mean, maximum, minimum, and median. An example of this data reduction is presented in Table 4-1. These results are also presented in Appendix A. Analytical methods used are summarized in Appendix B.

In addition to the field parameters, major cations and anions, nutrients, and trace metals, radionuclides and radioactive emissions were also analyzed. Radionuclides contain unstable nuclei and are said to be radioactive. This instability is manifested as the potential to decay or fall into a lower energy state by releasing principally either alpha or beta particles, or gamma rays. An alpha particle is defined as a positively charged particle consisting of two protons and two neutrons. A beta particle is either a negatively charged negatron/electron or a positively charged particle (positron). Gamma rays are high energy, short-wavelength electromagnetic radiation. Radioactive emissions are measured by an activity unit called a Curie (Ci), representing 3.7x1010 disintegrations per second.

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Table 4-1
Example of Reduced Data Table as Presented in Appendix A

GROUNDWATER MW-1							
	Analyte	Units	Number	Mean	Maximum	Minimum	Median
Field Measurements	sample temperature @	deg C					
	Conductivity	umhos/cm	10	1938	2200	1060	2015
	pH	units	10	7.918	8.2	7.2	7.995
Major Cations and Anions	Total Dissolved Solids	mg/L	10	1256.8	1400	719	1300
	Alkalinity, Bicarbonate	mg/L	10	497.7	576	451	493.5
	Alkalinity, Carbonate	mg/L	10	2.82	6.2	2	2
	Alkalinity, Total	mg/L	9	501	576	451	498
	Chloride	mg/L	10	15.14	16.6	13.7	15.2
	Sulfate	mg/L	9	529	602	469	514
	Calcium, dissolved	mg/L	10	12.5	61.3	5.2	6.8
	Magnesium, dissolved	mg/L	10	5.8	39.2	1.8	2.2
	Potassium, dissolved	mg/L	10	2.4	3.3	1.9	2.2
	Sodium, dissolved	mg/L	10	520.3	889.0	423.0	486.0
	Silica	mg/L	3	4.9	5.4	4.7	4.7
	Silica, as SiO2	mg/L	7	8.92	10.5	6.93	9
Nutrients	Nitrate, as N	mg/L	10	0.53	1.06	0.05	0.53
	Nitrite, as N	mg/L	10	0.15	0.9	0.05	0.05
	Orthophosphate, as P	mg/L	10	0.23	0.5	0.05	0.05
Tracc Metals	Arsenic, dissolved	mg/L	10	0.00071	0.0012	0.0005	0.0006
	Barium, dissolved	mg/L	10	0.01144	0.0214	0.0095	0.01015
	Cadmium, dissolved	mg/L	10	0.0005	0.0005	0.0005	0.0005
	Chromium, dissolved	mg/L	10	0.0012	0.003	0.001	0.001
	Cyanide, Total	mg/L	10	0.01	0.01	0.01	0.01
	Fluoride	mg/L	10	2.322	2.66	2.02	2.4
	Lead, dissolved	mg/L	10	0.0065	0.0600	0.0005	0.0005
	Lead-210	pCi/L	3	1.2506667	3.29	0.082	0.38
	Manganese, dissolved	mg/L	10	0.07492	0.721	0.0005	0.00315
	Mercury	ug/L	10	0.0202	0.2	0.0002	0.0002
	Molybdenum, dissolved	mg/L	10	0.006	0.009	0.002	0.006
	Selenium, dissolved	mg/L	10	0.0031	0.0080	0.0005	0.0028
	Silver, dissolved	mg/L	10	0.0005	0.0005	0.0005	0.0005
	Vanadium, dissolved	mg/L	10	0.0011	0.002	0.001	0.001
	Zinc, dissolved	mg/L	10	0.02501	0.1	0.005	0.00705

For drinking water, the common representation of activity is the Pico Curie (pCi), equal to 10-12 Ci. Parameter analyzed in water samples included:

- Gross alpha
- Gross beta
- Radium-226
- Lead-210
- Polonium-210

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For these parameters a range is presented as +/-, this range basically represents background radiation or potential error within the 95-percentile. A negative value indicates that background is higher than the radiation emitted. Although important, when evaluating radionuclides and emissions, the error is ignored. Exceedances to standards are based on the determined value or concentration with negative values being neglected.

5.0 DISCUSSION OF RESULTS

5.1 Data Condition

As mentioned earlier, data were evaluated for the last 10 years – 1997 through 2006. It should be noted that there are complete data sets for years prior to 1997 but these ten years were considered the most appropriate for this evaluation. In the evaluation of these data sets, there were both positive and negative aspects as presented in Table 5-1. Overall, there appears to have been no effort to evaluate the data over the last ten years. Data was not organized, laboratory QC/QA was not analyzed, trends were not evaluated, and conclusions were not drawn as to the potential hazards groundwater or surface water posed to human health and the environment.

Table 5-2
Evaluation of Post Reclamation Water Quality Data

Positives	Negatives
• Lab sheets were clear. • Analytical methods were explained. • Duplicate samples and QA/QC samples were identified • Detection limits were for the most part satisfactory • With a few exceptions, all parameters as suggested by the Environmental Monitoring Program were analyzed for each year • Samples were collected consistently during the months of April and May for each year	• Data was disorganized. • No effort was made by the laboratory or Reclamation Project to perform standard quality control and quality assurance processes. • Data transfer to logical tables as presented in Appendix A was sometimes difficult and time consuming. • It appears that no effort was made by the Reclamation project to review the data on an annual basis to evaluate trends and concerns. • No Water quality standards were defined in the ROD, Monitoring Plan or EIS. • No wells were installed in the Jackpile Pit. • Ponded water in open pits was not sampled. • No well in the Jackpile Sandstone formation near the downgradient boundary. • Water Table Elevation Data were not available. • Flow, although not required by the ROD would be helpful in understanding the surface water flow system.

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5.2 Water Characteristics

5.2.1 Groundwater

Hydro Geo Chem, Inc. did a complete evaluation of the hydrochemistry of the Jackpile-Paguate Mine in 1982. In their report, they concluded that groundwater at the mine site shows a chemical evolution from a calcium-sulfate to a sodium sulfate type. This is attributed to cation exchange along the groundwater flow path from the Zuni Uplift to the Pueblo of Laguna area. When the water enters the Rio Puerco Fault Zone it mixes with more saline waters upwelling from the Permian rocks. Zehner (1985) also evaluated groundwater at the mine site in 1985. His analysis indicated that well water that was in direct contact with clay and shale are dominated by sodium cations and bicarbonate/sulfate anions, whereas water from wells completed in more oxidized clay and shale are predominated by sodium – sulfate waters. Wells at the time of the Zehner (1985) study ranged in total dissolved solids between 900 and 1,500 mg/L.

Evaluation of groundwater quality data from the 2005 sampling (the last full set of data at the site) indicates that groundwater has evolved over time with sulfate in most cases being the predominate anion but with sodium being the predominate cation in pit wells (NPOP20E, SPOP-34, and SPOP-35) and in well water from MW-1, MW-5, and MW-7 which are completed in the Jackpile Sandstone. Wells completed in alluvium range from calcium-sulfate type water (MW-4) to calcium-bicarbonate water (MW-3) to magnesium–sulfate water in MW-6. These data are summarized in Table 5-1 and presented in Figure 5-1, which is a Piper Diagram illustrating the chemical analyses of water as percentages of total equivalent per liter. Total dissolved solids are also higher ranging between 671 mg/L (MW-3) and 8080 mg/L (NPOP20E).

Table 5-3
2005 Groundwater Quality (Major Cation and Anion) Summary

Well Number	Aquifer	Total Dissolved Solids (mg/L)	Water Type	
			Predominant Cation	Predominant Anion
MW-1	Jackpile SS	719	Sodium	Sulfate
MW-2	Alluvium	3200	Magnesium	Sulfate
MW-3	Alluvium	671.05	Calcium	Bicarbonate
MW-4	Alluvium	1069	Calcium	Sulfate
MW-5	Jackpile SS	1359	Sodium	Sulfate
MW-6	Alluvium	2460	Magnesium	Sulfate
MW-7	Jackpile SS	665.91	Sodium	Bicarbonate
NPOP20E	Fill	5360.5	Sodium	Sulfate
NPOP20W	Fill	8080	Magnesium	Sulfate
SPOP-34	Fill	1329	Sodium	Sulfate
SPOP-35	Fill	2637	Sodium	Carbonate?

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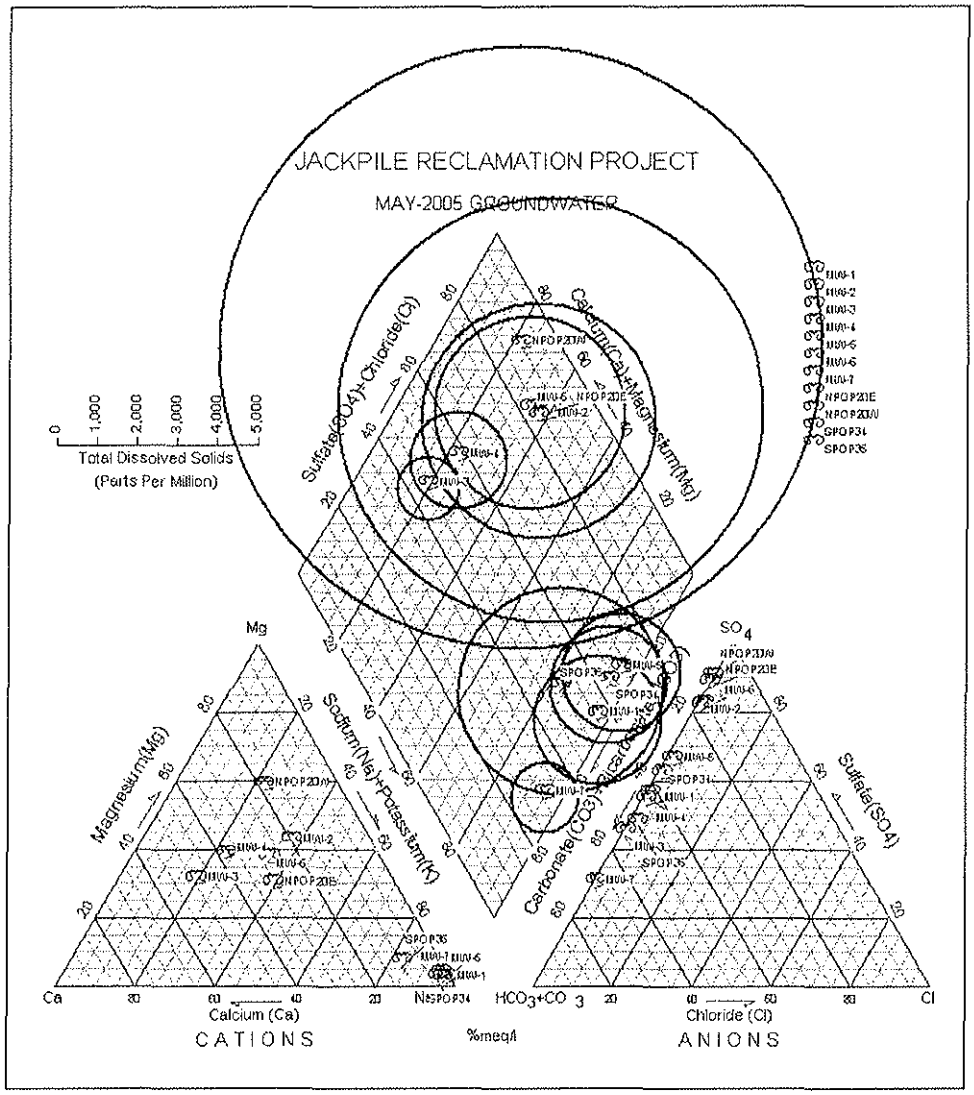
Figure 5-1
Piper Diagram – 2005 Groundwater Jackpile-Paguate Reclamation Project



Finally, trends in total dissolved solids in groundwater samples are quite variable. For observation wells outside the pit, total dissolved solids (TDS) generally have slightly decreased over the last ten years during post-reclamation as depicted for samples from wells MW-5 and MW-6. However, TDS in samples from alluvial wells MW-2 and MW-4 have gradually increased in TDS over time. These wells are located adjacent and down gradient from the pits. With the exception of SPOP34, samples for wells completed in fill material in the pits show a downward TDS trend. TDS levels in samples from SPOP34 are slightly increasing.

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Figure 5-2
Post Reclamation TDS Trends for Jackpile Paguate Observation Wells 1997 – 2006

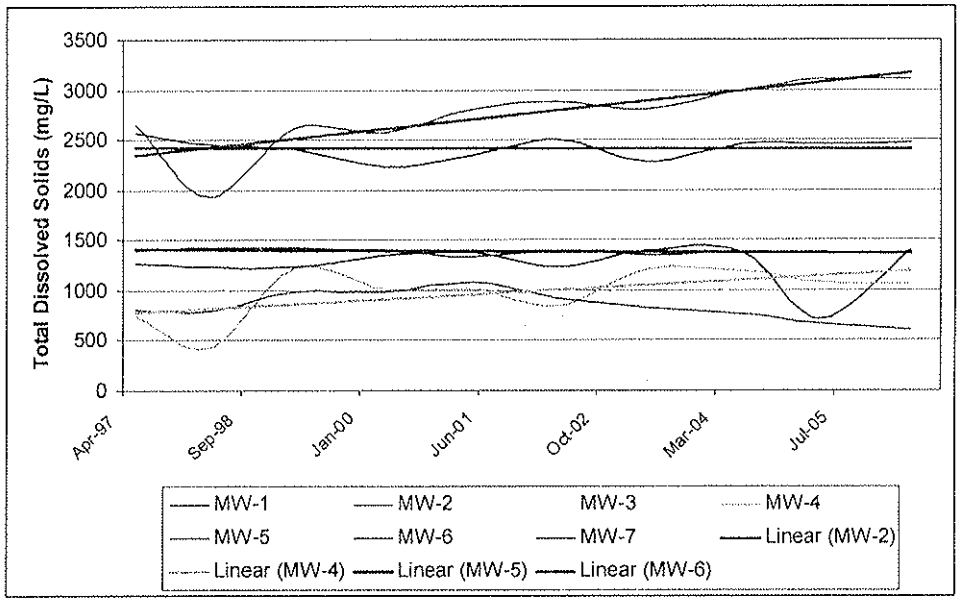
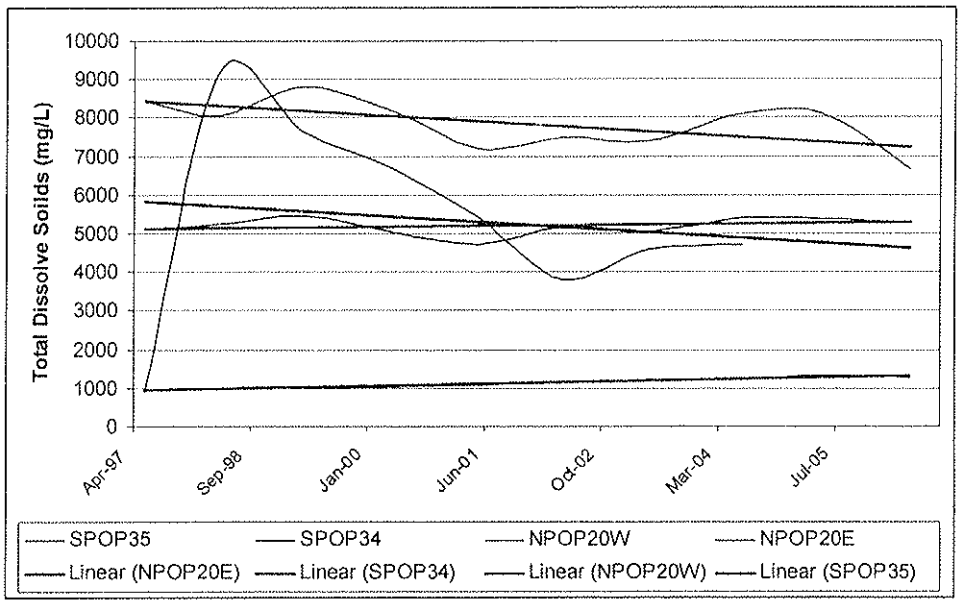


Figure 5-3
Post Reclamation TDS Trends for Jackpile-Paguate Pit Wells - 1997 – 2006



5.2.2 Surface Water

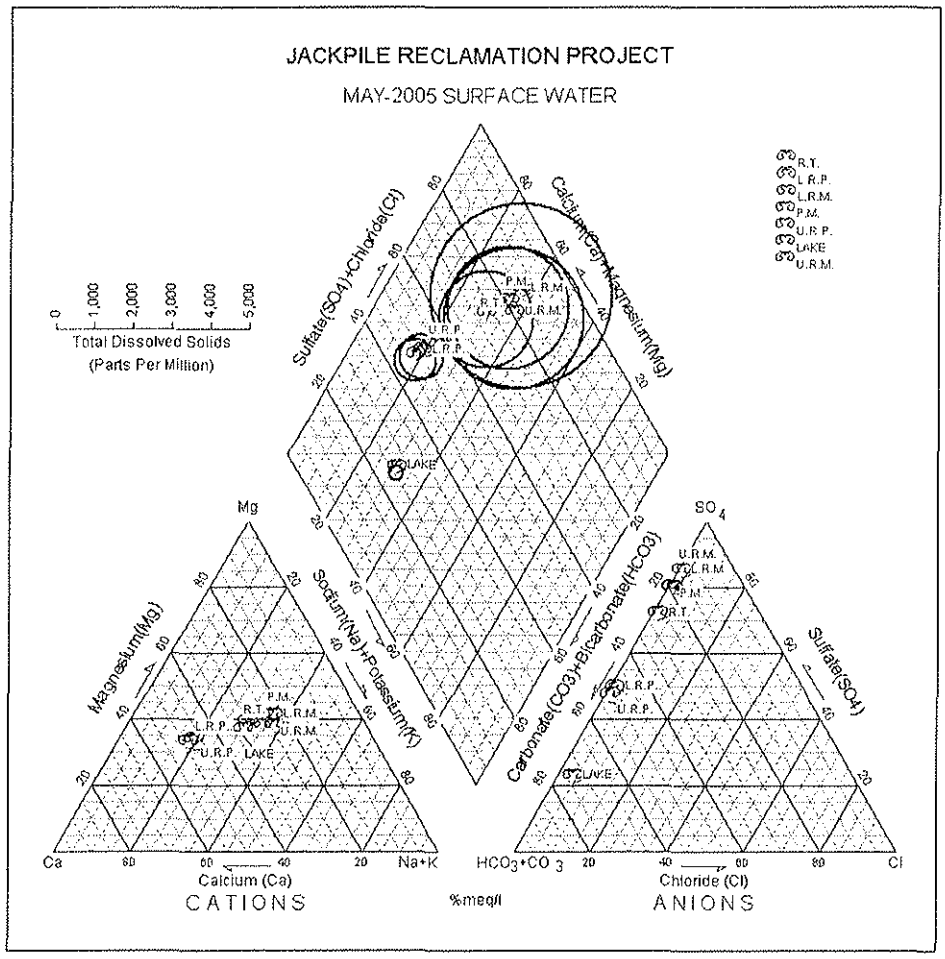
Zehner (1985) concluded that the Rio Moquino contains greater concentrations of dissolved solids than does the Rio Paguate. The mean dissolved solids concentrations at

05000196

the time of the Zehner study in the Rio Moquino range from 1,600 mg/L upstream from the mine area to 1,900 mg/L just upstream from its confluence with the Rio Paguate. In the Rio Paguate the total dissolved solids increased to about 2,000 mg/L. The Rio Moquino contained calcium, magnesium, and sodium concentrations in nearly equal proportions and sulfate concentrations greater than bicarbonate or chloride.

Again, looking at the last full set of data from 2005 as illustrated in the Piper Diagram (Figure 5-4), there appears to be three types of water. Water samples from the Rio Paguate upstream from the mine (URP) and above the confluence (LRP) are calcium-magnesium-bicarbonate waters. Water samples from the Rio Moquino (URM, LRM) and at sampling stations on Rio Paguate below the confluence (PM) and at Ford Crossing (RT) are slightly more sodium rich with sulfate being the predominate anion.

Figure 5-4
Piper Diagram for 2005 Surface Water Samples



Total dissolved solids are somewhat higher than those reported by Zehner (1985) with TDS concentrations for the Rio Moquino ranging between 2,350 (URM) to 2,960 (LRM) and for the Rio Paguate concentrations ranging between 735 mg/L at URP to 2,110 below

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the confluence at station PM. In general, total dissolved solid concentrations appear to be cyclical in nature over the last 10 sampling periods for both the Rio Paguate (Figure 5-5) and the Rio Moquino (Figure 5-6). There does appear to have been a general decrease in total dissolved concentrations at all stations except Station URP upstream from the mine. Without flow data it is uncertain at this time as to dilution affects on these long term trends.

Figure 5-5
Post Reclamation TDS Trends for the Rio Paguate - 1997 – 2006

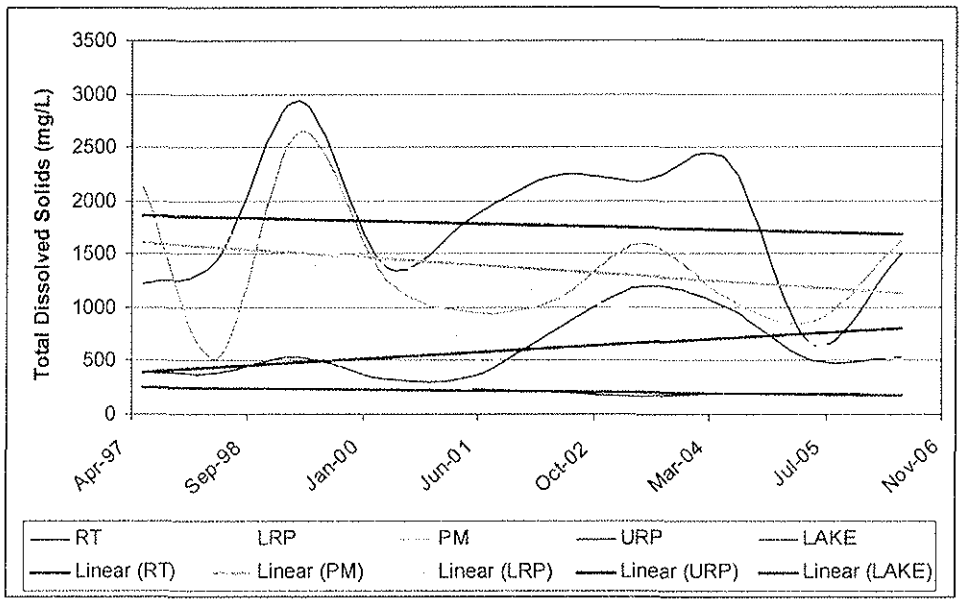
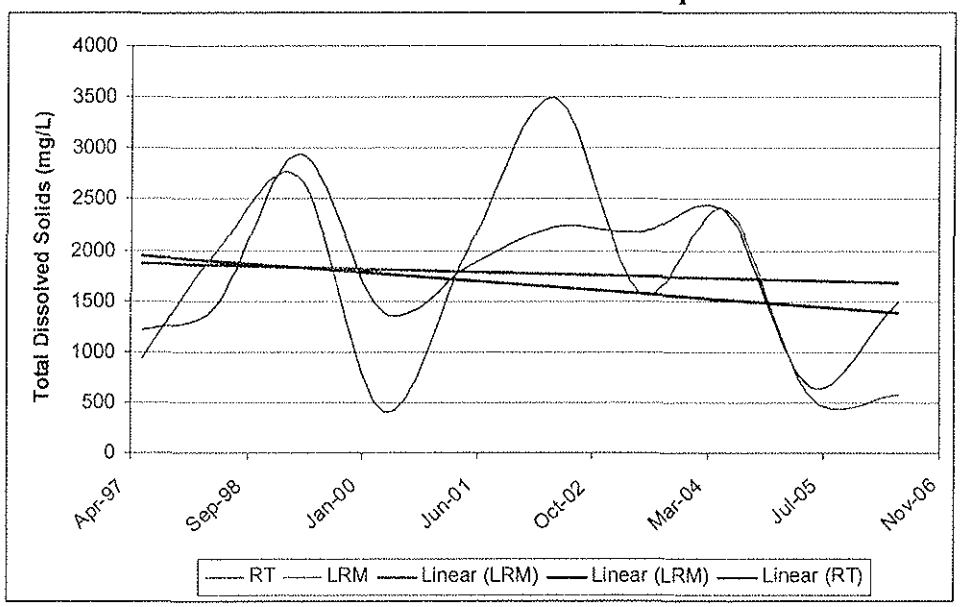


Figure 5-6
Post Reclamation TDS Trends for the Rio Moquino - 1997- 2006



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5.3 Potential Hazards

5.3.1 Drinking Water

One of the major concerns of the Record of Decision is the potential for contamination of surface water and groundwater, due to the mining and reclamation operation, to affect human health and post-reclamation land use. In 1989, a study of water quality in ponds in the open pits indicated that water exceeded national primary drinking water standards for uranium and radium, and secondary drinking water standards for total dissolved solids and sulfate, and could not be released into the Rio Paguate. Other studies of both groundwater and surface water indicated similar results.

For this data evaluation, surface water and groundwater analyses were compared to US EPA Maximum Contaminant Levels (MCL) for drinking water (Tables 5-3) and National Secondary Drinking Water Standards (Table 5-4). MCLs are defined by Primary Drinking Water regulations pursuant to section 1412 of the Public Health Service Act, as amended by the Safe Drinking Water Act (Pub. L. 93-523); and related regulations applicable to public water systems. Secondary Drinking Water Standards outline levels of aesthetic drinking water quality relative to the public acceptance of drinking water. At very high concentrations of these contaminants, health implications, as well as aesthetic degradation, may also exist. These regulations are not federally enforceable but are intended as guidelines.

As mentioned earlier, concentrations of parameters which exceed either MCLs or NSWQS are highlighted in Appendix A with exceedances of secondary standards in light gray and MCL concentrations in light blue. Based on this review, the following parameters are of primary concern:

Secondary Water Quality Standards

- Total Dissolved Solids – nearly all samples both surface and groundwater exceed the Secondary Water Quality Standard of 500 mg/L
- Sulfate – most surface water and groundwater exceed the Secondary Water Quality Standard of 250 mg/L
- Manganese – several exceedances of the secondary standard of 0.05 mg/L during the 10 year monitoring period for both surface water and groundwater. These included (number of times exceeded are in parentheses): MW-2 (10), MW-3 (3), MW-6 (7), SPOP35 (6), NPOP20W (10), NPOP20E (10), RT (2), LRM (5), LRP (6), PM (7), AND URP (8).
- pH – Two samples were non-compliant, one from URM and the other from SPOP34.

Primary Water Quality Standards (Maximum Contaminant Limits)

- Fluoride – Concentrations exceeding 4 mg/L were found in all samples taken from MW-1, an upgradient well.
- Lead – One excursion of the standard of 0.015 mg/L of was found in MW-1

- Arsenic – One sample from MW-4 exceeded the standard of 0.01 mg/L.
- Gross Alpha – Several samples exceeded 15 pCi/L. These included (number of times exceeded are in parentheses): MW-1 (1), MW-2 (9), MW-3 (6), MW-4 (9), MW-5 (3), MW-6 (8), MW-7 (4), SPOP35 (9), SPOP34 (9), NPOP20W (9), NPOP20E (9). Of primary concern are samples taken from pit wells which ranged between 8,966 to over 67,000 pCi/L of NPOP20E, 280.7 to 707.71 pCi/L for NPOP20W, 1,022 to 54,000 pCi/L for SPOP35, and 55.59 to 1,430 pCi/L to SPOP35.
- Uranium – Like Gross Alpha, numerous samples exceeded the MCL of 0.03 mg/L. These included (number of times exceeded are in parentheses): MW-1 (1), MW-2 (9), MW-3 (8), MW-4 (9) MW-5 (3), MW-6 (9), MW-7 (4), RT (9), LRM (9), PM (8), URM (5), URP (5), Lake (2), NPOPO20W (9), NPOP20E (9), SPOP34(8), and SPOP35(9). The Paguate Reservoir is a public recreation area used for fishing.
- Radium 226 – Fewer samples exceeded the standard of 5 pCi/L. No surface water samples were above the standard. Groundwater wells exceeding the standard included (number of times exceeded are in parentheses): MW-1 (1), MW-6 (1), MW-7 (4), NPOP20W (1), NPOP20E (8), SPOPO34 (8) and SPOP35 (8).

Again, wells completed in fill were of most concern with samples from NPOP20E ranging between 23.5 and 65.69 pCi/L, SPOPO34 ranging between 5 and 62 pCi/L and SPOP35 ranging between 11 and 45 pCi/L.

Table 5-4
National Maximum Contaminate Levels (USEPA, 2002)

Inorganic Chemicals Contaminant	MCL mg/L	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Arsenic	0.010 as of 01/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronics production wastes
Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints
Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits
Copper	TT; Action Level=1.3	Short term exposure: Gastrointestinal distress Long term exposure: Liver or kidney damage People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits
Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories

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Inorganic Chemicals Contaminant	MCL mg/L	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Fluoride	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories
Lead	0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities, Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits
Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands
Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium	0.05	Hair/fingernail loss; circulatory problems	Erosion of natural deposits; discharge from mines
Alpha particles	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation
Beta particles and photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation
Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits
Uranium	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits

05000201

Table 5-5
National Secondary Drinking Water Standards (USEP, 2002)

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

5.3.2 Agriculture

Another concern of the ROD is the potential for the build up of salts in the bottom of the pit. Examination of the electric conductivity (EC) and TDS data indicates that all samples taken (in and out of pits) present a high to very high salinity hazard for irrigation water according to Table 5-5.

Table 5-6
Salinity Hazard (USDA)

Salinity	Conductivity (□mhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	<250	<200
Medium salinity, detrimental effects to sensitive crops	250 – 750	200 – 500
High salinity, adverse effects on many crops	750 – 2250	500 – 1500
Very high salinity, suitable only for salt tolerant plants	2250 – 5000	1500 – 3000

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5.4 Quality Control and Quality Assurance

In the evaluation of water quality data, field and laboratory quality control and quality assurance measures are of primary concern. The Jackpile Project Environmental Monitoring Plan (Jacobs Engineering Group Inc.) goes into detail on how samples are to be collected in the field and how duplicate samples are to be used to ensure that the laboratory analyses are acceptable. For this review, it is assumed that these procedures were followed. Even though duplicate samples were taken, it is not apparent that these data were used anytime during the ten years of post reclamation monitoring to check on the accuracy of the lab. In addition, cation-anion balance calculations were not performed. These are good indicators of the validity of the laboratory data by equating the percentage of cations and anions in meq/L. The value should be within 5%. As a spot check of the data, cation-anion balances were performed for each of the samples. Table 5-6 presents the results of this review.

Table 5-7
Post-reclamation Sample Evaluation - Cation-Anion Balances

Sampling Point	1997	1998	1999	2000	2001	2002	2003	2004	2005
MW-1	**12.8**	3	1.9	3.6	*7.9*	**10.8**	4.9	3.7	1.8
MW-2	*6*	1	0.2	*6.9*	*8.2*	*7.8*	**10.1**	1	1.3
MW-3	1.4	**18**	1.4	**13**	**13**	**12**	**30**	2.1	3
MW-4	1.2	**17**	*10*	*6*	**11**	*8*	**35**	0.3	2
MW-5	0.8	0.8	*7*	4	*8*	*10*	*7*	2	3
MW-6	1.2	*1.3*	1.2	0.4	*6*	*6*	*3*	*8*	1.3
MW-7	4	*7*	3	**12**	0.67	**11**	*10*	*6*	1.3
SW-RT	1.8	*6.9*	0.5	*9*	**14**	*5*	**19**	3	0.02
SW-LRM	*6*	2.5	*9.7*	**18**	**11**	*6.3*	**14.5**	3.2	*5.4*
SW-LRP	1.5	2.3	*6.2*	*7.6*	*9.1*	**36**	**13.6**	1.7	*5.4*
SW-PM	0.5	**10.2**	2.6	*5.1*	*7.4*	*6.9*	**11.3**	3.8	2.1
SW-URM	1.9	0.2	1.3	*5.9*	**10.2**	*6.7*	1.2	*5.5*	0.9
SW-URD	*8.2*	*8.2*	2.3	**12.5**	**12.9**	*8.9*	**15.9**	4	*6.1*
SW-LAKE					2.2	*9.3*	**18.1**	**12.4**	**14.6**
SPOPO-35	**31.8**	**21.5**	**18.1**	0.31	4.9	4.6	4.4	*5.2*	**34**
SPOP-34	2	*6.6*	3.6	*9.6*	*5.2*	*7.6*	*6.6*	3.6	**22**
NPOP20W	**61**	**13**	*6.1*	1.2	*8*	4.3	**14.9**	*5.6*	3.8
NPOP20E	**23**	**52**	**49**	2	9.8	*6.4*	4.3	3.4	2.6

Unacceptable	**Bold**	> 10% cation-anion balance
Marginal	*Italics*	> 5% and <=10% cation-anion balance
Acceptable	Regular	< 5% cation-anion balance

The results of this analysis indicate the following:

25%	Unacceptable	> 10% cation-anion balance
33%	Suspect	> 5% and <=10% cation-anion balance
42%	Acceptable	< 5% cation-anion balance

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Having only 42% in the acceptable range is a point of concern for the accuracy of the analytical data.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on this review, it is concluded that the intent of the ROD was met, but there are some rather large data gaps and conclusions cannot be drawn as to environmental impacts and long term health risks associated with the closed mine.

1 As presented in Table 5-1 and repeated below in Table 6-1, the condition of post-reclamation water quality data had both positives and negatives. Most importantly, it is apparent that over the last ten years no one appears to have taken responsibility for the data. Without a responsible party, it would be impossible to develop an understanding of the data and determine if any further corrective action would be required.

Table 6-1
Evaluation of Post Reclamation Water Quality Data

Positives	Negatives
• Lab sheets were clear. • Analytical methods were explained. • Duplicate samples and QA/QC samples were identified • Detection limits were for the most part satisfactory • With a few exceptions, all parameters were analyzed each year, as suggested by the Environmental Monitoring program • Samples were collected consisting during the months of April and May for each year	• Data was disorganized. • The lack of standard QA/QC being performed on the laboratory results, resulted in suspect data. • Data transfer to logical tables as presented in Appendix A was sometimes difficult and time consuming. • It appears that no effort was made by the Reclamation project to review the data on an annual basis to evaluate trends and concerns. • No water quality standards were defined in the ROD, Monitoring Plan or EIS. • No wells were installed in the Jackpile Pit. • Ponded water in open pits was not sampled. • No well in the Jackpile Sandstone formation near the downgradient boundary. • Water table elevation data were incomplete. • Flow, although not required by the ROD would be helpful in understanding the surface water flow system.

The four data gaps 1) the depth to water measurements were reportedly recorded, but the record of those depths was incomplete, 2) the Jackpile pit wells were not installed until

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2007, 3) the ponded water was not sampled and analyzed until 2007, and 4) a downgradient boundary well in the Jackpile Sandstone was not installed (the Jackpile Sandstone is reportedly not present at the boundary), collectively represent a major deviation from the ROD and is therefore, ***non-compliant***.

2. Several analytes exceeded primary and secondary drinking water standards at most sampling stations. Parameters of concern included:

Secondary Standards

- Total Dissolved Solids – nearly all samples, both surface and groundwater, exceed the secondary of 500 mg/L
- Sulfate – like TDS – most surface water and groundwater exceed the secondary standard of 250 mg/L
- Manganese – several exceedances of the secondary standard of 0.05 mg/L during the 10 year monitoring period for both surface water and groundwater. These included (no. of excursions are in parentheses): MW-2 (10), MW-3 (3), MW-6 (7), SPOP35 (6), NPOP20W (10), NPOP20E (10), RT (2), LRM (5), LRP (6), PM (7), AND URP (8).
- pH – Two samples were in non-compliance, one from URM and the other from SPOP34.

Primary Standards (MCLs)

- Fluoride – Concentrations exceeding 4 mg/L were found in all samples taken from MW-1
- Lead – One excursion of the standard of 0.015 mg/L was found in MW-1
- Arsenic – One sample from MW-4 exceeded the standard of 0.01 mg/L.
- Gross Alpha – Several samples exceeded 15 pCi/L. These included (no. of excursions are in parentheses): MW-1 (1), MW-2 (9), MW-3 (6), MW-4 (9), MW-5 (3), MW-6 (8), MW-7 (4), SPOP35 (9), SPOP34 (9), NPOP20W (9), NPOP20E (9).

  Of primary concern are samples taken from pit wells which ranged between 8,966 to over 67,000 pCi/L of NPOP20E, 280.7 to 707.71 pCi/L for NPOP20W, 1,022 to 54,000 pCi/L for SPOP35, and 55.59 to 1,430 pCi/L to SPOP35.
- Uranium – Like Gross Alpha, numerous samples exceeded the MCL of 0.03 mg/L. These included (no. of excursions are in parentheses): MW-1 (1), MW-2 (9), MW-3 (8), MW-4 (9) MW-5 (3), MW-6 (9), MW-7 (4), RT (9), LRM (9), PM (8), URM (5), URP (5), Lake (2), NPOPO20W (9), NPOP20E (9), SPOP34(8), and SPOP35(9).
- Radium 226 – Fewer samples exceeded the standard of 5 pCi/L. No surface water samples were above the standard. Groundwater wells exceeding the standard included (no. of excursions are in parentheses): MW-1 (1), MW-6 (1), MW-7 (4), NPOP20W (1), NPOP20E (8),

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SPOPO34 (8) and SPOP35 (8). Again, wells completed in fill were of most concern with samples from NPOP20E ranging between 23.5 too 65.69 pCi/L, SPOPO34 ranging between 5 and 62 pCi/L and SPOP35 ranging between 11 and 45 pCi/L.

Agricultural

- Based on the salinity results alone, the groundwater appears to be unsuitable for irrigation and stock watering.
- Only 42% of the analyses had cation-anion balances within acceptable range. This leads to a concern on the accuracy of the laboratory.

Based on these observations, the following recommendations can be made:

1. Install and sample Jackpile pit wells.
2. Install a well in the Jackpile Sandstone formation near the boundary (near MW-6)
3. Sample ponded water within the pits.
4. Monitoring should continue for a least one more year. Parameters which should be monitored include field parameters, major cations and anions, manganese, total dissolved solids, arsenic, fluoride, lead, gross alpha, radium 226, and uranium (total).
5. With the completion of sampling, the accuracy of the data should be evaluated. The laboratory should be required to perform cation-anion balances and if not within an acceptable range the samples should be redone.
6. A risk assessment should be performed to determine the potential hazards and risks of the high levels of gross alpha, radium 226, and uranium in most samples, especially in the wells in fill material.
7. The compliance boundary needs to be defined.
8. With both surface water and groundwater samples showing some level of contamination, an evaluation should be made to determine if any contaminants have migrated beyond the compliance boundary.

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APPENDIX A

MONITORING DATAEVALUATION TABLES
1996-2007
(On CD-ROM)

05000208

Jackpile-Paguate
Uranium Mine
Record of Decision
Compliance Assessment
CD-ROM

September 2007

Appendix D
Water Quality, WQ Addendum &
Monitoring Results Tables

Prepared by: OA Systems Corporation
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APPENDIX B

ANALYTICAL METHODS

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ANALYTICAL METHODS

ANALYTE	TEST
Total Dissolved Solids	EPA 160.1
Fluoride	EPA 300.0
pH	EPA 150.1
Alkalinity, Total	EPA 310.1
Alkalinity, Bicarbonate	EPA 310.1
Alkalinity, Carbonate	EPA 310.1
Sulfate	EPA 300.0
Chloride	EPA 300.0
Orthophosphate, as P	EPA 300.0
Nitrate, as N	EPA 300.0
Nitrite, as N	EPA 300.0
Conductivity	EPA 120.1
Cyanide, Total	EPA 335.2 / SM 4500 CN-C
Selenium, dissolved	EPA 200.8 ICP-MS
Molybdenum, dissolved	EPA 200.8 ICP-MS
Zinc, dissolved	EPA 200.8 ICP-MS
Magnesium, dissolved	EPA 200.8 ICP-MS
Calcium, dissolved	EPA 200.8 ICP-MS
Barium, dissolved	EPA 200.8 ICP-MS
Lead, dissolved	EPA 200.8 ICP-MS
Manganese, dissolved	EPA 200.8 ICP-MS
Potassium, dissolved	EPA 200.8 ICP-MS
Chromium, dissolved	EPA 200.8 ICP-MS
Cadmium, dissolved	EPA 200.8 ICP-MS
Arsenic, dissolved	EPA 200.8 ICP-MS
Vanadium, dissolved	EPA 200.8 ICP-MS
Sodium, dissolved	EPA 200.8 ICP-MS
Silver, dissolved	EPA 200.8 ICP-MS
Silica, as SiO2	EPA 200.8 ICP-MS
Mercury	EPA 245.1 CVAA
Gross Alpha	EPA 900
Gross Beta	EPA 900
Radium-226	903.1
Polonium-210	ASL 300 Po-01
Total Uranium	908
Lead-210	ICHROM

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JACKPILE-PAGUATE URANIUM MINE
POST-RECLAMATION
WATER QUALITY DATA REVIEW
ADDENDUM

Table of Contents

Section	Title	Page
1.0	Introduction	1
2.0	Sampling Points	1
3.0	Quality Control and Quality Assurance	1
4.0	Contaminants	1
	4.1 Primary Drinking Water Regulations	1
	4.2 Secondary Drinking Water Regulations	3
5.0	Conclusions	3
6.0	Recommendations	4

List of Tables

Table 4-1	Gross Alpha Exceedances of the 15pCi/L MCL	1
Table 4-2	Total Uranium Exceedances of the 0.03 mg/L MCL	2

1.0 INTRODUCTION

This addendum addresses the water quality data received by OAS after the OAS Water Quality Data Review that was completed in the Fall of 2006. This addendum supplements the OAS report *"Jackpile-Paguate Uranium Mine Post-Reclamation Water Quality Review"*.

2.0 SAMPLING POINTS

- Initially, no wells were installed in the Jackpile Pit. This oversight was corrected in 2007 when two wells were placed in the Jackpile-Paguate pit fill material.

- The ponded water in the open pits was sampled for the first time in April 2007, when the pond in the North Paguate Pit was sampled and analyzed.

- Additional rounds of sampling were also conducted in 2006 and 2007 at the historic surface and ground water sampling points.

3.0 QUALITY CONTROL AND QUALITY ASSURANCE

The same conclusions regarding QA/QC that were presented in the Water Quality report still hold. Namely; there are many qualifiers (approaching 40%) in the reported laboratory data reports, the cations and anions are often out of balance, and there needs to be a thorough quality review of the reports and the laboratory QC.

4.0 CONTAMINANTS

The last two sequences of monitoring indicate the Total Dissolved Solids trends no longer hold. Several wells that had downward trends are now trending higher in TDS. The comparison of data to the Primary and Secondary Drinking Water Standards is updated to include the reporting years 1996 through 2007:

4.1 Primary Drinking Water Regulations (Maximum Contaminant Levels)

- Fluoride – Concentrations exceeding 4 mg/L were found in all samples taken from MW-1, an upgradient well\
- Lead – One excursion of the standard of 0.015 mg/L was found in MW-1
- Arsenic – One sample from MW-4 exceeded the standard of 0.01 mg/L.
- Gross Alpha – All surface waters, groundwaters, and pit wells had exceedances of the Gross Alpha MCL except for the reservoir. Many had exceedances for each sampling period.

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Table 4-1
Gross Alpha Exceedances of the 15 pCi/L MCL

Location	# samples > 15 pCi/L	Range	
Groundwater			
MW-1	1 of 9	ND	17.33
MW-2	10 of 10	12.51	97.67
MW-3	6 of 9	31.92	104.85
MW-4	9 of 9	20.99	202.3
MW-5	3 of 9	ND	23.94
MW-6	9 of 9	ND	118.72
MW-7	4 of 9	9.11	40.63
Surface Water			
NP Pond	1 of 1	1468.05	
Railroad Tresel	10 of 10	37.59	214.33
Lower Rio M	7 of 10	16.62	53.05
Lower Rio P	6 of 10	2.24	106.22
P-M Confluence	8 of 10	11.19	94.03
Upper Rio M	2 of 10	ND	35.11
Upper Rio P	1 of 10	ND	25.53
Lake/Reservoir	0 of 6	ND	3.04
Pit Wells			
NP-OP- 20 W	10 of 10	159.25	707.71
NP-OP- 20 E	10 of 10	8965.97	67,278.82
JP-OP- 41 N	1 of 1	385.07	
JP-OP- 41 S	1 of 1	323,803.05	
SP-OP-34	10 of 10	74.09	1490.91
SP-OP-35	10 of 10	1022	7385.57

- Uranium – All Surface waters, groundwaters, and pit wells had exceedances of the total uranium. Many had exceedances for each sampling period. The Lake/Reservoir is a public recreation area used for fishing.

Table 4-2
Total Uranium Exceedances of the 0.03 mg/L MCL

Location	# samples > 0.03 mg/L	Range	
Groundwater			
MW-1	6 of 9	3.87	6.27

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APPENDIX E

AERIAL PHOTOGRAPHS
JACKPILE-PAGUATE URANIUM MINE
1989 – 2003
(on DVD-ROM)

Jackpile-Paguate
Uranium Mine
Record of Decision
Compliance Assessment
DVD-ROM

September 2007

Appendix E
Aerial Photographs 1989 - 2003

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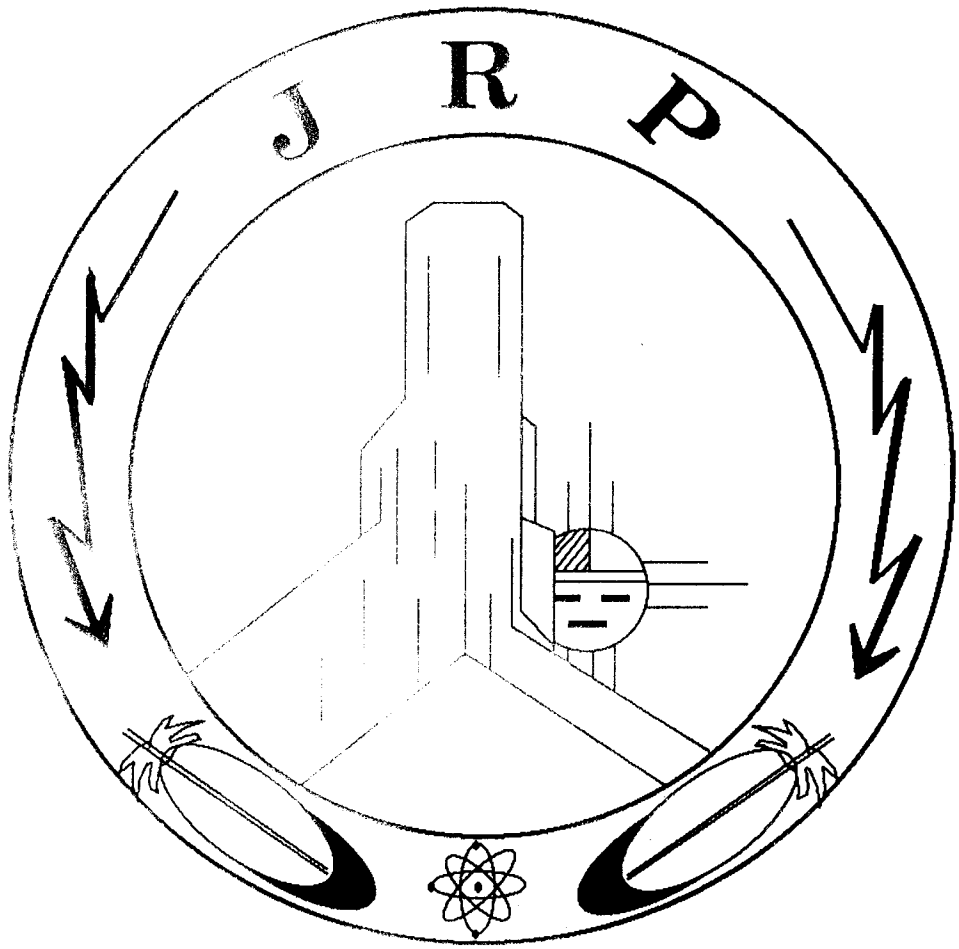
Jackpile Reclamation Project

Pueblo of Laguna , New Mexico



Project Status Report No. 71

JUNE, 1995

Prepared for the Pueblo of Laguna

by the Reclamation Project Technician II

060001

Jackpile Reclamation Project

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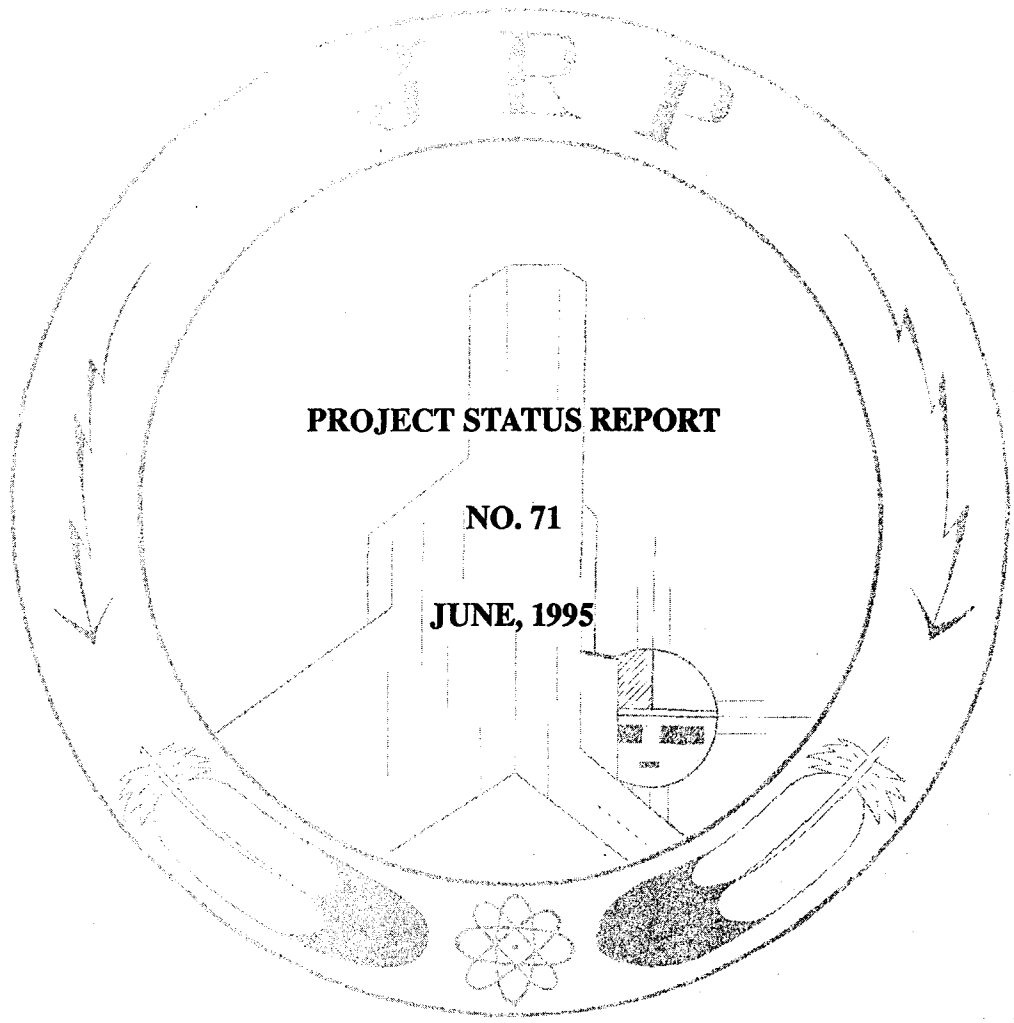

PROJECT STATUS REPORT

NO. 71

JUNE, 1995

BY: Marvin Sarracino

MARVIN SARRACINO

Reclamation Technician II

1.0 INDEX

2.0 ABSTRACT

2.1 Abstract

2.2 Progress Maps

2.3 Construction Photos

2.4 June, 1995 Milestones

3.0 ACTION ITEMS

3.1 POL/RPM Action Items

3.2 BIA Action Items

3.3 Subcontract Action Items

3.4 Laguna Construction Company Action Items

4.0 PROJECT SCHEDULE

4.1 Four (4) Week Lookahead

4.2 Project Schedule Discussion

5.0 WORK PACKAGE PROGRESS

5.1 Jackpile Project Tracking Summary

5.2 Work Package Discussion

5.3 Work Package Closeout Summary

5.4 Change Order Summary

5.5 Project-to-Date Closeout Summary

6.0 PERFORMANCE MEASUREMENT

6.1 Performance Measurement Summary

6.2 Variance and Variance Explanations

7.0 APPENDIX A: SPECIAL REPORTS/PLANS

7.1 Monthly Inspection Report--June, 1995

2.1 ABSTRACT

June, 1995 marked the Sixty Fifth month of full scale earthmoving activities. Trucks have been parked during the month of June. Scrapers completed hauling topsoil to the Jackpile Pit area and the shale borrow area. Dozer efforts continue on the south paguate dumps and punch list items with support from scrapers.

2.2 PROGRESS MAPS

The attached maps indicate the percentages of completion where work is being performed and show progress as of the June 24, 1995 field survey.

N 1,511,000
N 1,510,000
N 1,509,000
N 1,508,000
N 1,507,000
N 1,506,000
N 1,505,000
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E 638,000
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E 640,000
E 641,000
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E 643,000
E 644,000
E 645,000
E 646,000
E 647,000
E 648,000
E 649,000
E 650,000
E 651,000
E 652,000

JP-WS-19
JP-UA-67
JP-WD-66
JP-CS-78
JP-SB-64
JP-CS-65
JP-WD-18
JP-HW-33
JP-UA-61
JP-DP-43
JP-WS-17
JP-HW-32
NP-WD-01
JP-WS-15
JP-WT-16
JP-DN-73
JP-UA-75
JP-WD-14
NP-UA-29
JP-DP-41
JP-CS-39
JP-PS-27
JP-DN-74
JP-HW-34
JP-DP-42
JP-WD-20
JP-DN-57
JP-CS-39
JP-HW-31
NP-SB-27
NP-PS-18
JP-WD-11
NP-SB-26
NP-DN-28
NP-WS-31
NP-UA-30
JP-SS-49
JP-CS-38
JP-WS-13
JP-JA-62
JP-SS-48
NP-PS-17
JP-CS-37
NP-DP-21
JP-WD-14
NP-WD-02
NP-HW-08
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STATE ROAD 279 R.& W.
NP-DP-20
NP-WM-12
JP-WD-11
NP-WD-06
NP-DP-21
NP-DN-11
NP-WD-04
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NP-WT-10
NP-WS-03
NP-PS-13
NP-PS-14
NP-CS-24
NP-PS-15
NP-PS-16
NP-HW-25
NP-CS-23
JP-CS-36
JP-WD-10
SP-DN-51
NP-DN-22
SP-CS-33
SP-PS-01
SP-WT-03
SP-UA-52
SP-WT-15
SP-WM-12
SP-WT-16
SP-WS-17
SP-WD-04

EXPLANATION

NP	North Paguate Area-North of Rio Paguate, West of Rio Moquino
SP	South Paguate Area-South of Rio Paguate
HW	Highwall
PS	Protore Stockpile
DP	Open Pit
WS	Waste Dump - Shale
WD	Waste Dump - Ore Associated
WM	Waste Dump - Mixed
WT	Waste Dump - Tres Hermanos
CS	Contaminated Soil
SS	Surface Structure
UG	Underground Mine Related Structure
SB	Soil Borrow Area
SW	Surface Water
DN	Disturbed But Not Contaminated
UA	Undisturbed Area

Area Boundary
Rivers

PROGRESS EXPLANATION

10%-50% Completed
50%-90% Completed
Greater Than 90% Completed

-N-

Scale: 1" = 1000'
0 500' 1000'

NORTH PAGUATE
JACKPILE
SOUTH PAGUATE
SHEET INDEX

PUEBLO OF LAGUNA
Jackpile Project

PROTORE & SLOPING OPERATIONS
PROGRESS MAP
NORTH PAGUATE AREA

REVISION	DATE	DESCRIPTION	APPROVED

DRAWN:	DATE:	DESIGN ENG.:	DATE: 6-27-95	W.O. #	
CHECKED:		APPROVED:		DWG. #	PS-1

CONTRACT #

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SP-PS-01
SP-WD-04

Rio Paguate
Rio Moquino
STATE ROAD 279 R.O.W.

PROGRESS EXPLANATION

- 10%-50% Completed
- 50%-90% Completed
- Greater Than 90% Completed

LEGEND

- Area Boundary
- Rivers

-N-

Scale: 1" = 1000'

0 500' 1000'

NORTH PAGUATE
JACKPILE
SOUTH PAGUATE

SHEET INDEX

PUEBLO OF LAGUNA
Jackpile Project

SHALE COVER OPERATIONS
PROGRESS MAP
NORTH PAGUATE AREA

REVISION	DATE	DESCRIPTION	APPROVED

DRAWN:	DATE:	DESIGN ENG.:	DATE: 6-27-95	W.O. # 060007
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NP-D11

Rio Moquino
Rio Paguate
STATE ROAD 279 R.O.W.
SP-PS-01
SP-WD-04

LNP03.DWG 6/27/95

PROGRESS EXPLANATION

- 10%-50% Completed
- 50%-90% Completed
- Greater Than 90% Completed

LEGEND

- Area Boundary
- Rivers

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Scale: 1" = 1000'

0 500' 1000'

NORTH PAGUATE
JACKPILE
SOUTH PAGUATE

SHEET INDEX

PUEBLO OF LAGUNA
Jackpile Project

TOPSOIL COVER OPERATIONS PROGRESS MAP NORTH PAGUATE AREA

REVISION	DATE	DESCRIPTION	APPROVED

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NP-D10

STATE ROAD 279 R.O.W.

Rio Moquino

Rio Paguate

SP-PS-01

SP-WD-04

LEGEND

Area Boundary

Rivers

-N-

Scale: 1" = 1000'

0 500' 1000'

NORTH PAGUATE

JACKPILE

SOUTH PAGUATE

SHEET INDEX

PUEBLO OF LAGUNA
Jackpile Project

RESEEDING OPERATIONS
PROGRESS MAP
NORTH PAGUATE AREA

REVISION	DATE	DESCRIPTION	APPROVED

DRAWN: DATE: DESIGN ENG.: DATE: 6-27-95 W.O. #

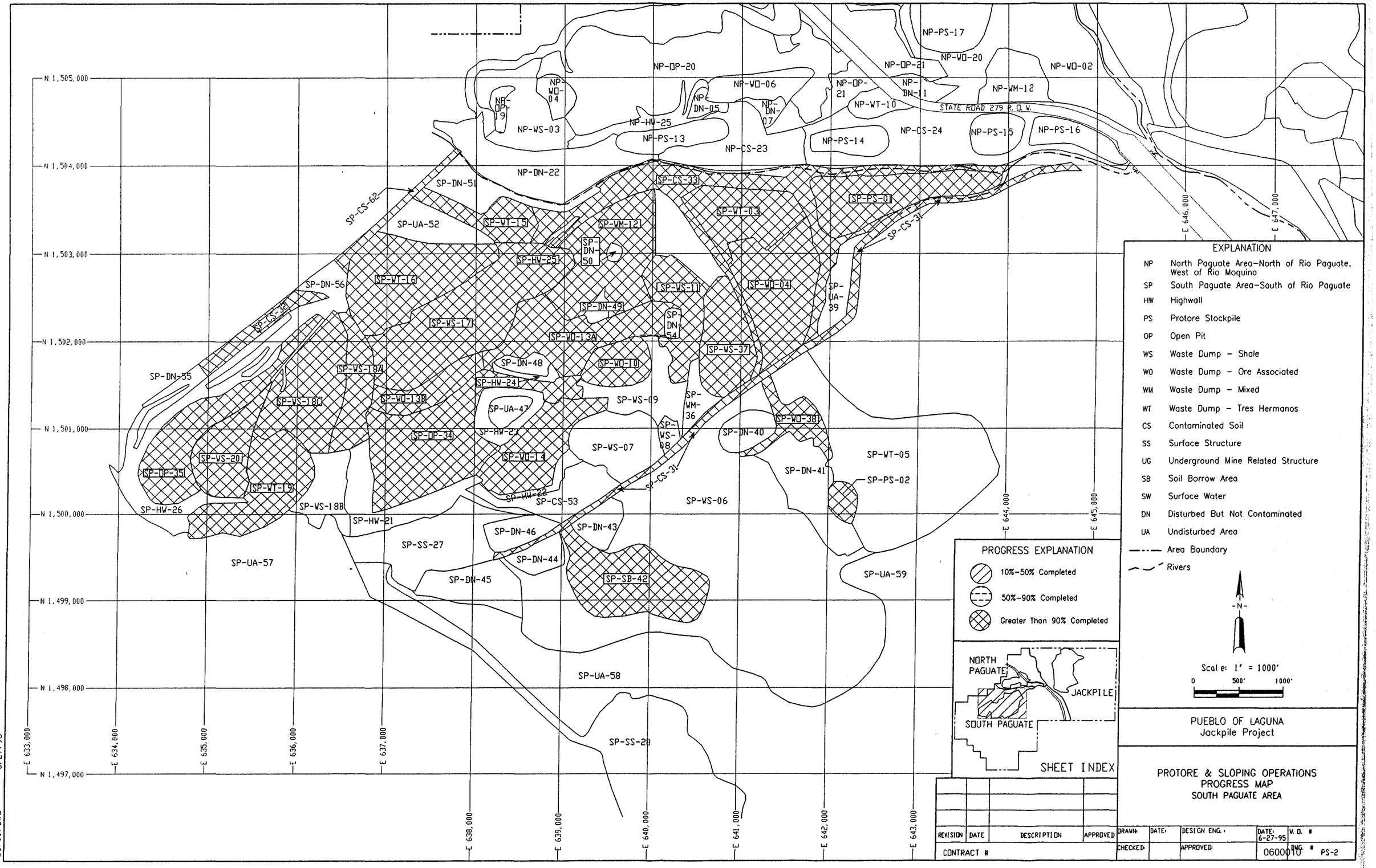
CHECKED: APPROVED: 060009 RS-1

CONTRACT #

6/27/95

LNP04.DWG

060009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NP-DP-21
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STATE ROAD 279 P. O. W.
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NP-PS-16
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SP-CS-62
SP-UA-52
SP-WT-15
SP-WM-12
SP-CS-33
SP-PS-01
SP-WT-03
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SP-WO-04
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SP-WO-13B
SP-WS-09
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SP-WO-38
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SP-OP-35
SP-WT-19
SP-HW-22
SP-CS-53
SP-CS-31
SP-WS-06
SP-HW-26
SP-WS-18B
SP-HW-21
SP-DN-46
SP-DN-43
SP-SS-27
SP-DN-44
SP-UA-57
SP-DN-45
SP-SB-42
SP-UA-59
SP-UA-58
SP-SS-28
EXPLANATION
NP North Paguate Area-North of Rio Paguate, West of Rio Moquino
SP South Paguate Area-South of Rio Paguate
HW Highwall
PS Protore Stockpile
OP Open Pit
WS Waste Dump - Shale
WO Waste Dump - Ore Associated
WM Waste Dump - Mixed
WT Waste Dump - Tres Hermanos
CS Contaminated Soil
SS Surface Structure
UG Underground Mine Related Structure
SB Soil Borrow Area
SW Surface Water
DN Disturbed But Not Contaminated
UA Undisturbed Area
Area Boundary
Rivers
PROGRESS EXPLANATION
10%-50% Completed
50%-90% Completed
Greater Than 90% Completed
NORTH PAGUATE
JACKPILE
SOUTH PAGUATE
SHEET INDEX
-N-
Scale: 1" = 1000'
0
500'
1000'
PUEBLO OF LAGUNA
Jackpile Project
PROTORE & SLOPING OPERATIONS
PROGRESS MAP
SOUTH PAGUATE AREA
REVISION
DATE
DESCRIPTION
APPROVED
DRAWN:
DATE:
DESIGN ENG.:
DATE: 6-27-95
V. O. #
CONTRACT #
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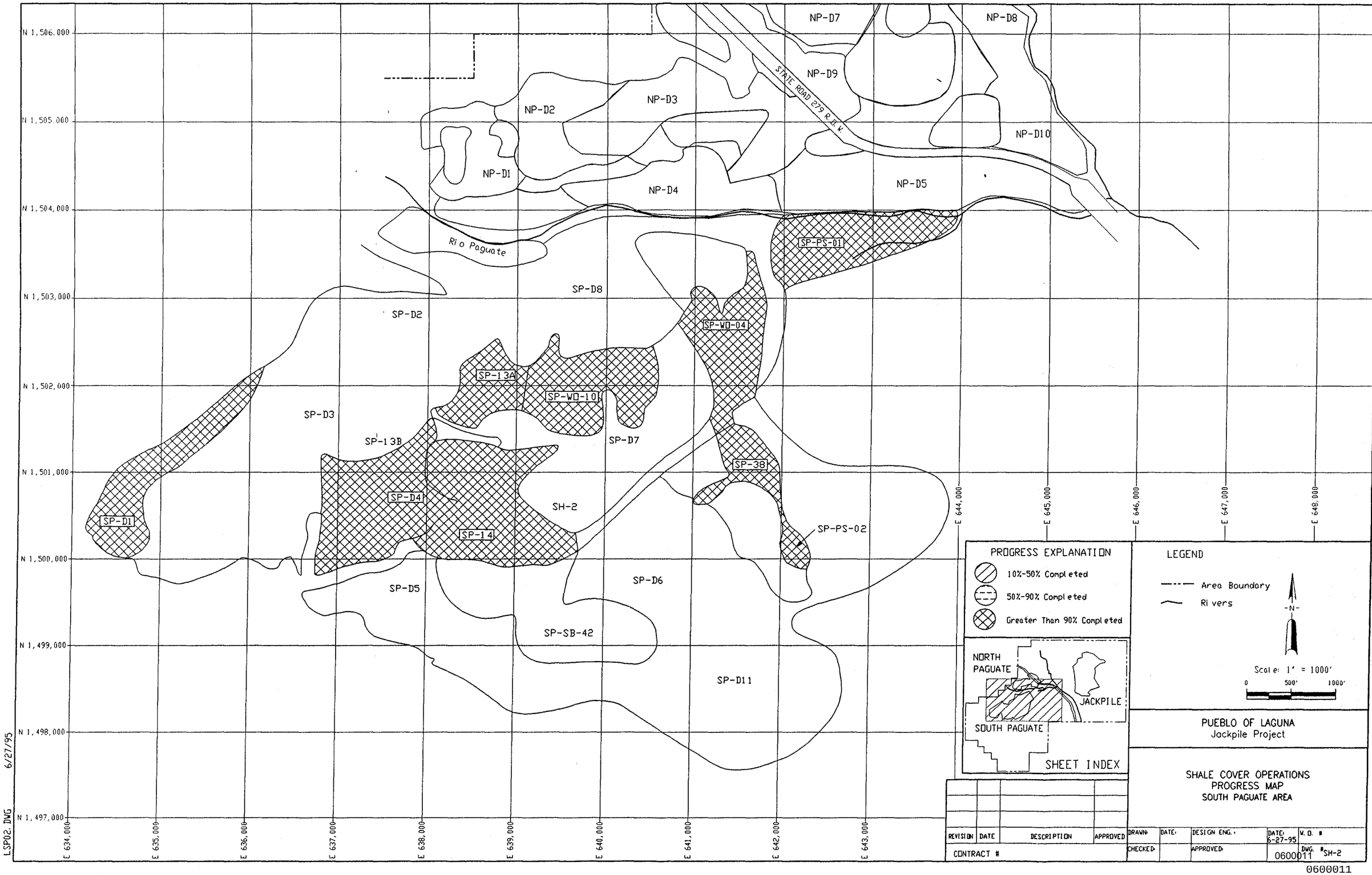
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STATE ROAD 279 R.O.W.
Rio Paguate
SP-D1
SP-D2
SP-D3
SP-D4
SP-D5
SP-D6
SP-D7
SP-D8
SP-D11
SP-13A
SP-13B
SP-14
SP-38
SP-PS-01
SP-PS-02
SP-WD-04
SP-WD-10
SH-2
SP-SB-42
PROGRESS EXPLANATION
10%-50% Completed
50%-90% Completed
Greater Than 90% Completed
LEGEND
Area Boundary
Rivers
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Scale: 1' = 1000'
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NORTH PAGUATE
JACKPILE
SOUTH PAGUATE
SHEET INDEX
PUEBLO OF LAGUNA
Jackpile Project
SHALE COVER OPERATIONS
PROGRESS MAP
SOUTH PAGUATE AREA
REVISION
DATE
DESCRIPTION
APPROVED
DRAWN
DATE
DESIGN ENG.
DATE: 6-27-95
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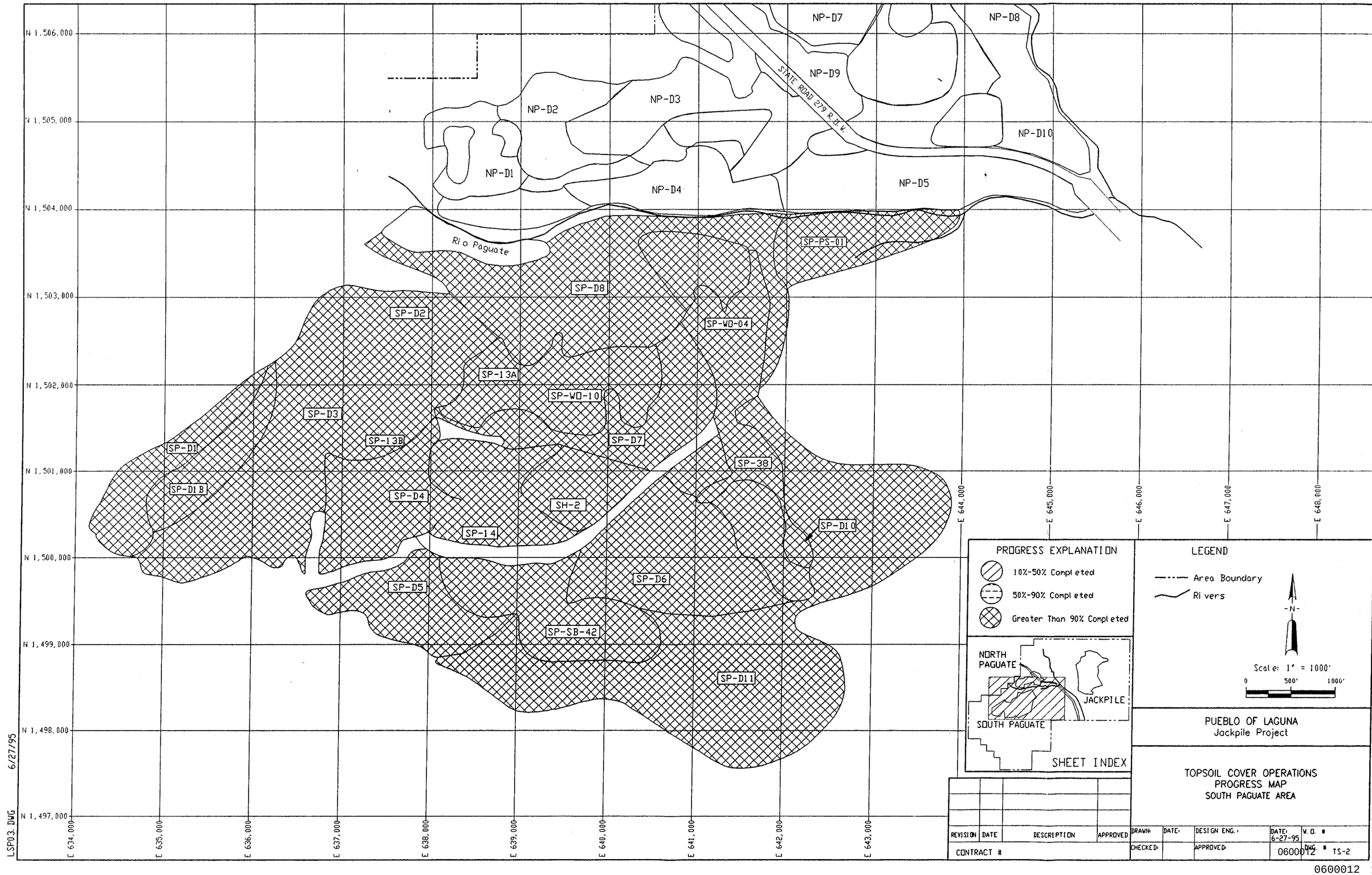
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STATE ROAD 279 R.O.W.
Rio Paguate
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SP-D1B
SP-D2
SP-D3
SP-D4
SP-D5
SP-D6
SP-D7
SP-D8
SP-D10
SP-D11
SP-13A
SP-13B
SP-14
SP-38
SP-PS-01
SP-WD-04
SP-WD-10
SH-2
SP-SB-42
PROGRESS EXPLANATION
10%-50% Completed
50%-90% Completed
Greater Than 90% Completed
NORTH PAGUATE
JACKPILE
SOUTH PAGUATE
SHEET INDEX
LEGEND
Area Boundary
Rivers
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Scale: 1" = 1000'
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PUEBLO OF LAGUNA
Jackpile Project
TOPSOIL COVER OPERATIONS
PROGRESS MAP
SOUTH PAGUATE AREA
REVISION
DATE
DESCRIPTION
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DATE: 6-27-95
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NP-D3
NP-D4
NP-D5
NP-D7
NP-D8
NP-D9
NP-D10

STATE ROAD 279 R.O.W.

Rio Paguate

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SP-D1B
SP-D2
SP-D3
SP-D4
SP-D5
SP-D6
SP-D7
SP-D8
SP-D10
SP-D11
SP-13A
SP-13B
SP-14
SP-38
SP-PS-01
SP-SB-42
SP-WD-04
SP-WD-10
SH-2

LEGEND

Area Boundary
Rivers

-N-

Scale: 1' = 1000'
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NORTH PAGUATE
JACKPILE
SOUTH PAGUATE
SHEET INDEX

PUEBLO OF LAGUNA
Jackpile Project

RESEEDING OPERATIONS
PROGRESS MAP
SOUTH PAGUATE AREA

REVISION	DATE	DESCRIPTION	APPROVED

CONTRACT #

DRAWN:	DATE:	DESIGN ENG.:	DATE: 6-27-95	W.O. #
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DWG # RS-2

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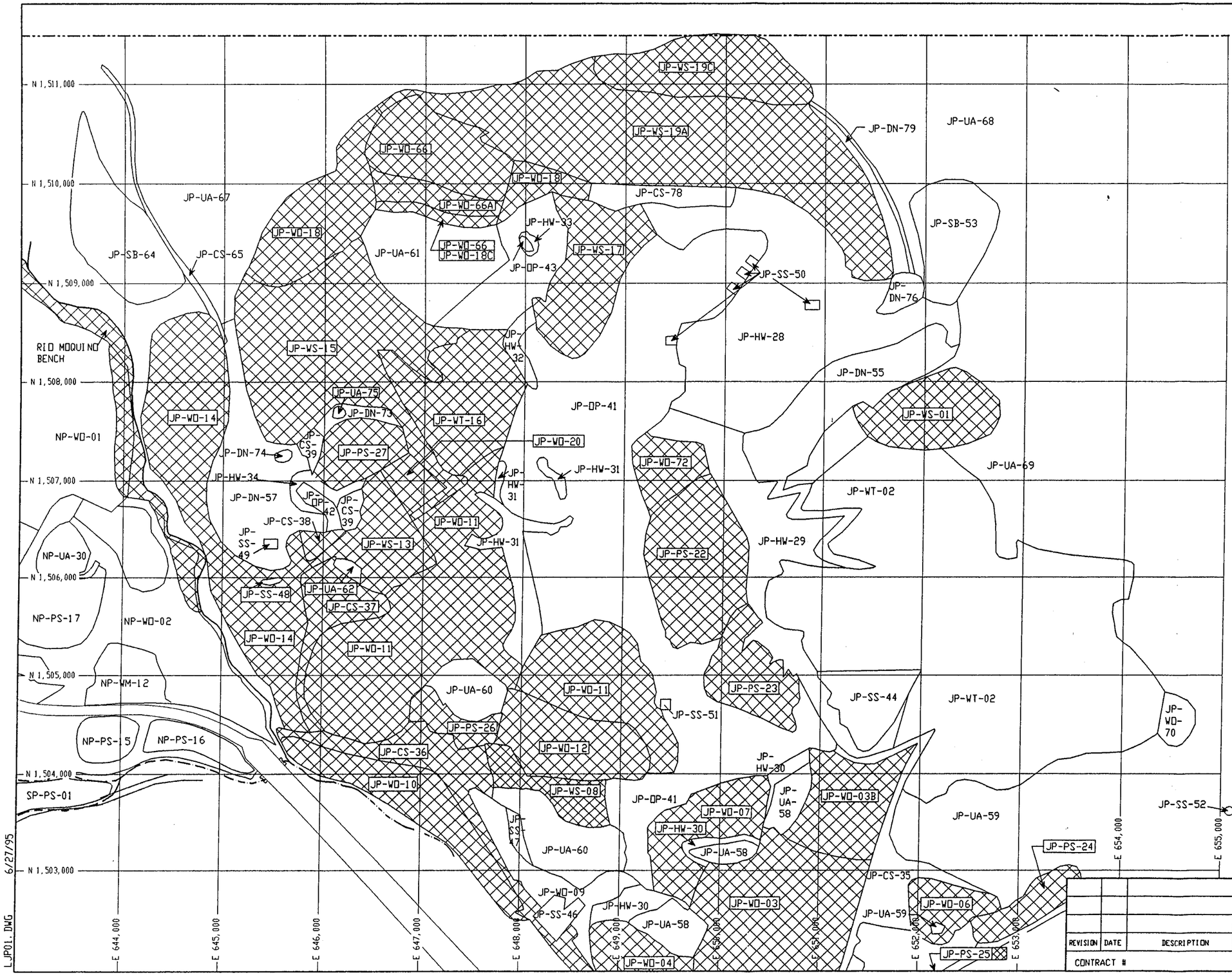
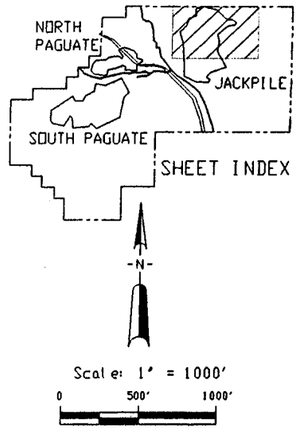


EXPLANATION

NP	North Paguate Area-North of Rio Paguate, West of Rio Moquino
SP	South Paguate Area-South of Rio Paguate
HW	Highwall
PS	Protore Stockpile
DP	Open Pit
WS	Waste Dump - Shale
WD	Waste Dump - Ore Associated
WM	Waste Dump - Mixed
WT	Waste Dump - Tres Hermanos
CS	Contaminated Soil
SS	Surface Structure
UG	Underground Mine Related Structure
SB	Soil Borrow Area
SW	Surface Water
DN	Disturbed But Not Contaminated
UA	Undisturbed Area
———	Area Boundary
~	Rivers

PROGRESS EXPLANATION

- 10%-50% Completed
- 50%-90% Completed
- Greater Than 90% Completed



PUEBLO OF LAGUNA
Jackpile Project

PROTORE & SLOPING OPERATIONS PROGRESS MAP
NORTHEAST PAGUATE AND JACKPILE AREA

REVISION	DATE	DESCRIPTION	APPROVED

DRAWN:	DATE:	DESIGN ENG.:	DATE: 6-27-95
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SH-1
JP-D5
JP-D4B
S-1
JP-SB-64
JP-D1
JP-D6
SH-2
JP-D9A
JP-D3
JP-WD-14
NP-WD-01
JP-D2
NP-PS-18
NP-UA-30
JP-D9B
SH-3A
JP-D8A
JP-D8B
NP-PS-17
NP-WD-02
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JP-D7
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SH-3B
JP-D4A
JP-D11
NP-PS-15
NP-PS-16
SP-PS-01
JP-D13
JP-D12
JP-D14
JP-D15

EXPLANATION

NP	North Paguate Area-North of Rio Paguate, West of Rio Moquino
SP	South Paguate Area-South of Rio Paguate
HW	Highwall
PS	Protore Stockpile
OP	Open Pit
WS	Waste Dump - Shale
WO	Waste Dump - Ore Associated
WM	Waste Dump - Mixed
WT	Waste Dump - Tres Hermanos
CS	Contaminated Soil
SS	Surface Structure
UG	Underground Mine Related Structure
SB	Soil Borrow Area
SW	Surface Water
DN	Disturbed But Not Contaminated
UA	Undisturbed Area

Area Boundary
Rivers

PROGRESS EXPLANATION

10%-50% Completed
50%-90% Completed
Greater Than 90% Completed

NORTH PAGUATE
JACKPILE
SOUTH PAGUATE
SHEET INDEX

-N-

Scale: 1' = 1000'
0 500' 1000'

PUEBLO OF LAGUNA
Jackpile Project

TOPSOIL COVER OPERATIONS
PROGRESS MAP
NORTH JACKPILE AREA

REVISION	DATE	DESCRIPTION	APPROVED

CONTRACT #

DRAWN	DATE	DESIGN ENG.	DATE: 6-27-95	W. O. #
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JP-D4A
SH-1
JP-D5
JP-D4B
S-1
JP-SB-64
JP-D1
JP-D6
SH-2
JP-D9A
JP-D3
JP-WD-14
NP-WD-01
JP-D2
NP-PS-18
NP-UA-30
JP-D8A
SH-3A
JP-D9B
JP-D8B
NP-PS-17
NP-WD-02
JP-10
JP-D7
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SH-3B
JP-D4A
JP-D11
NP-PS-5
NP-PS-16
SP-PS-01
JP-D13
JP-D12
JP-D14
JP-D15

EXPLANATION

NP	North Paguate Area-North of Rio Paguate, West of Rio Moquino
SP	South Paguate Area-South of Rio Paguate
HW	Highwall
PS	Protore Stockpile
OP	Open Pit
WS	Waste Dump - Shale
WO	Waste Dump - Ore Associated
WM	Waste Dump - Mixed
WT	Waste Dump - Tres Hermanos
CS	Contaminated Soil
SS	Surface Structure
UG	Underground Mine Related Structure
SB	Soil Borrow Area
SW	Surface Water
DN	Disturbed But Not Contaminated
UA	Undisturbed Area

Area Boundary
Rivers

NORTH PAGUATE
JACKPILE
SOUTH PAGUATE
SHEET INDEX

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Scale 1' = 1000'
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PUEBLO OF LAGUNA
Jackpile Project

RESEEDING OPERATIONS
PROGRESS MAP
NORTH JACKPILE AREA

REVISION	DATE	DESCRIPTION	APPROVED

CONTRACT #

DRAWN	DATE	DESIGN ENG.	DATE: 6-27-95	W.O. #
CHECKED		APPROVED		DWG. # 0600016 RS-3

6/27/95
LJP03.DWG

0600016

2.4 MILESTONES

- LCC had a full productive effort during the month of June due to several factors: The Weather; No days were lost due to rain or muddy conditions. One Holiday was observed this month and No Training interrupted the operation of LCC.

- Trucks have been parked this month.

- Scrapers are supporting dozer efforts with the south paguate dumps.

- The Punch list items are in progress.

3.0 ACTION ITEMS

3.1 POL/RPM ACTION ITEMS

1) Work with Allen Sedik on closure of Jackpile mine.

2) Work with Allen Sedik on revising the Cash Flow;

3) Prepare field survey panels for next aerial photo & volume check in Jackpile area;

3.2 BUREAU OF INDIAN AFFAIRS ACTION ITEMS

1) Work with Reclamation Tech on Jackpile closure;

2) Work with Reclamation Tech on revising cash flows;

3.3 SUBCONTRACT ITEMS

1) Eberline completed calibration of RGM-2 and swipe tests on heavy equipment;

2) Ground and surface water sampling done; results pending

3) Schedule aerial photo with TR Mann;

3.4 LAGUNA CONSTRUCTION COMPANY ACTION ITEMS

1) Complete Earthwork as soon as possible;

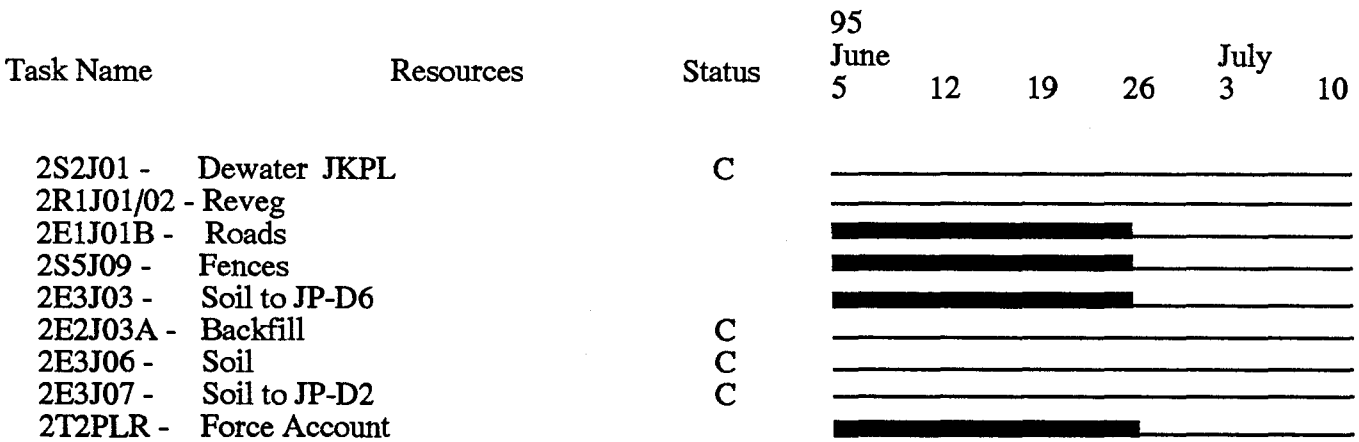
2) Apprise POL-Tech of any upcoming schedule variance (construction, training, etc.) which may impact work completion.

3) Complete Punch List Items;

4) Complete South Paguate dumps;

4.1 FOUR (4) WEEK LOOKAHEAD

Schedule Name : JUNE, 1995 Four Week Look Ahead
Responsible : LCC, Inc.
As-of Date : 30-June-95 Schedule File : c:\Geoworks\Documents\JUN95FWL.000



0600020

Detail Task (Started) (Slack)
Summary Task (Started) (Slack)
M Milestone
>>> Conflict
Resource delay

Scale: 1 day per character

4.2 PROJECT SCHEDULE

Scrapers have completed the topsoil cover in the Jackpile area. Trucks are currently parked and being maintenanced. Dozers and scrapers are working on the south paguate dumps. Punch list items are still in progress.

5.1 TRACKING SUMMARY

Volume surveys and billings are current through the June 24, 1995 survey date.

PY95; PY94

PY93

PY92

PY90 &PY91

INTERIM

MOBILIZATION

JACKPILE
PROJECT TO DATE TRACKING

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	PTD ACTUAL EQUIP CREDIT	PTD ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
MGMT CA SUMMARY									
1P1	POL MANAGEMENT CA TOTAL	$956,550.00	$673,770.42	$0.00	$673,770.42	$257,530.85	70%	94%	$238,046.01
1P2	POL OTHER PROGRAMS CA TOTAL	$1,042,857.76	$1,042,857.76	$0.00	$1,042,857.76	$0.00	100%	100%	$0.00
1P	POL MANAGEMENT TASK TOTAL	$1,999,407.76	$1,716,628.18	$0.00	$1,716,628.18	$257,530.85	86%	97%	$238,046.01
1C1	CONSTRUCTION MANAGEMENT CA TOTAL	$1,494,890.10	$963,207.85	$0.00	$963,207.85	$531,682.25	64%	92%	$446,415.46
1C2	INTERIM CMC CA TOTAL	$200,018.90	$205,116.43	$0.00	$205,116.43	$0.00	103%	103%	$0.00
1C3	CO-OP AGREEMENT CONTINGECY CA TOTAL	$2,800,000.00	$409,000.00	$0.00	$409,000.00	$2,391,000.00	15%	14%	($109,000.00)
1C	CONSTRUCTION MANAGEMENT TASK TOTAL	$4,494,909.00	$1,577,324.28	$0.00	$1,577,324.28	$2,922,682.25	35%	38%	$337,415.46
1	MANAGEMENT TOTAL	$6,494,316.76	$3,293,952.46	$0.00	$3,293,952.46	$3,180,213.10	51%	56%	$575,461.47
CONST CA SUMRY									
2L1	LCC COSTS CA TOTAL	$810,300.00	$778,983.34	$0.00	$778,983.34	$32,017.06	96%	100%	$32,017.06
2L2	LCC START-UP COSTS CA TOTAL	$940,100.00	$825,974.20	$0.00	$825,974.20	$84,425.80	88%	91%	$30,122.00
2L	LCC ADMINISTRATION TASK TOTAL	$1,750,400.00	$1,604,957.54	$0.00	$1,604,957.54	$116,442.86	92%	100%	$62,139.06
2M1	MOBILIZATION CA TOTAL	$444,617.00	$440,076.57	$50.52	$440,026.05	$0.00	99%	99%	$0.00
2M2	LAND SURVEY CA TOTAL	$904,858.00	$592,599.06	$12,898.36	$579,700.70	$326,051.65	65%	68%	$50,557.89
2M3	LCC TRAINING CA TOTAL	$563,453.00	$461,028.22	$3,635.60	$457,392.62	$52,052.74	82%	75%	($44,661.24)
2M	MOBILIZATION TASK TOTAL	$1,912,928.00	$1,493,703.85	$16,584.48	$1,477,119.37	$378,104.39	78%	77%	$5,896.65
2E1	BACKFILLING CA TOTAL	$16,544,636.89	$13,258,046.55	$2,454,574.57	$10,803,471.98	$3,286,590.34	80%	87%	$4,189,013.44
2E2	DUMP SLOPING CA TOTAL	$9,491,898.07	$7,905,848.15	$1,420,876.20	$6,484,971.95	$1,586,049.92	83%	98%	$2,157,718.87
2E3	COVER PLACEMENT CA TOTAL	$13,700,497.91	$12,407,224.81	$2,330,941.79	$10,076,283.02	$1,293,273.10	91%	90%	$2,539,518.00
2E4	CONTAMINATED SOIL CA TOTAL	$534,642.82	$491,304.37	$79,733.59	$411,570.78	$43,338.45	92%	85%	$50,358.04
2E5	HIGHWALL CA TOTAL	$293,745.00	$59,327.23	$190.14	$59,137.09	$234,417.77	20%	100%	$143,367.91
2E6	EROSION CONTROL CA TOTAL	$219,919.00	$161,611.67	$1,524.91	$160,086.76	$58,307.33	73%	100%	$59,832.24
2E	EARTHWORK TASK TOTAL	$40,565,420.69	$34,283,362.78	$6,287,841.20	$27,995,521.58	$6,501,976.91	85%	89%	$9,139,808.50
2S1	UG ENTRIES ABANDON CA TOTAL	$86,882.00	$21,999.51	$463.00	$21,536.51	$64,882.49	25%	54%	$46,714.49
2S2	PIT WATER CA TOTAL	$622,994.00	$427,253.67	$98,258.22	$328,995.45	$195,740.33	69%	95%	$276,122.55
2S3	SS DEMOLITION CA TOTAL	$175,829.00	$164,623.52	$6,512.33	$158,111.19	$11,205.48	94%	87%	($6,924.19)
2S4	SS DECON CA TOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2S5	PERMANENT STRUCTURES CA TOTAL	$193,181.00	$226,264.05	$7,602.09	$218,661.96	($33,083.05)	117%	84%	($67,096.96)
2S	STRUCTURES TASK TOTAL	$1,078,886.00	$840,140.75	$112,835.64	$727,305.11	$238,745.25	78%	88%	$248,815.89
2R1	SEEDING CA SUBTOTAL	$2,100,261.00	$1,043,275.14	$1,079.25	$1,042,195.89	$1,056,985.86	50%	74%	$691,095.78
2R2	IRRIGATION CA SUBTOTAL	$72,149.00	$0.00	$0.00	$0.00	$72,149.00	0%	100%	$0.00
2R	REVEGETATION TASK TOTAL	$2,172,410.00	$1,043,275.14	$1,079.25	$1,042,195.89	$1,129,134.86	48%	100%	$691,095.78
2T & 2	TERRACING/SPECIAL CASES	$2,129,080.20	$1,225,989.22	$183,843.98	$1,042,145.24	$903,090.98	58%	42%	($349,776.60)
2	CONSTRUCTION TOTAL	$49,609,124.89	$40,491,429.28	$6,602,184.55	$33,889,244.73	$9,267,495.25	82%	85%	$9,797,979.28
	JACKPILE PROJECT SUMMARY								
1	MANAGEMENT TOTAL	$6,494,316.76	$3,293,952.46	N/A	$3,293,952.46	$3,180,213.10	51%	56%	$575,461.47
2	CONSTRUCTION TOTAL	$49,609,124.89	$40,491,429.28	$6,602,184.55	$33,889,244.73	$9,267,495.25	82%	85%	$9,797,979.28
	GRAND TOTAL	$56,103,441.65	$43,785,381.74	$6,602,184.55	$37,183,197.19	$12,447,708.35	78%	81%	$10,373,440.75

0600023

PY95; PY94

PY93

PY92

PY90 & 91

INTERIM

MOBILIZATION

JACKPILE
PROJECT TO DATE: SUMMARY 2

WBS ID NO.	WORK PACKAGE DESCRIPTION	YTD ACTUAL COST	YTD ACTUAL EQUIP CREDIT	YTD ACTUAL CASH FLOW
MGMT CA SUMMARY				
1P1	POL MANAGEMENT CA TOTAL	$19,481.65	$0.00	$19,481.65
1P2	POL OTHER PROGRAMS CA TOTAL	$0.00	$0.00	$0.00
1P	POL MANAGEMENT TASK TOTAL	$19,481.65	$0.00	$19,481.65
1C1	CONSTRUCTION MANAGEMENT CA TOTAL	$27,801.15	$0.00	$27,801.15
1C2	INTERIM CMC CA TOTAL	$0.00	$0.00	$0.00
1C3	CO-OP AGREEMENT CONTINGECY CA TOTAL	$0.00	$0.00	$0.00
1C	CONSTRUCTION MANAGEMENT TASK TOTAL	$27,801.15	$0.00	$27,801.15
1	MANAGEMENT TOTAL	$47,282.80	$0.00	$47,282.80
CONST CA SUMRY				
2L1	LCC COSTS CA TOTAL	$0.00	$0.00	$0.00
2L2	LCC START-UP COSTS CA TOTAL	$30,000.00	$0.00	$30,000.00
2L	LCC ADMINISTRATION TASK TOTAL	$30,000.00	$0.00	$30,000.00
2M1	MOBILIZATION CA TOTAL	$0.00	$0.00	$0.00
2M2	LAND SURVEY CA TOTAL	$17,098.47	$776.78	$16,321.69
2M3	LCC TRAINING CA TOTAL	$7,013.98	$0.00	$7,013.98
2M	MOBILIZATION TASK TOTAL	$24,112.45	$776.78	$23,335.67
2E1	BACKFILLING CA TOTAL	$269,423.96	$27,172.07	$242,251.89
2E2	DUMP SLOPING CA TOTAL	$1,198,690.72	$236,577.38	$962,113.34
2E3	COVER PLACEMENT CA TOTAL	$791,681.58	$143,986.02	$647,695.56
2E4	CONTAMINATED SOIL CA TOTAL	$0.00	$0.00	$0.00
2E5	HIGHWALL CA TOTAL	$0.00	$0.00	$0.00
2E6	EROSION CONTROL CA TOTAL	$0.00	$0.00	$0.00
2E	EARTHWORK TASK TOTAL	$2,259,796.26	$407,735.47	$1,852,060.79
2S1	UG ENTRIES ABANDON CA TOTAL	$0.00	$0.00	$0.00
2S2	PIT WATER CA TOTAL	$0.00	$0.00	$0.00
2S3	SS DEMOLITION CA TOTAL	$0.00	$0.00	$0.00
2S4	SS DECON CA TOTAL	$0.00	$0.00	$0.00
2S5	PERMANENT STRUCTURES CA TOTAL	$33,601.31	$4,167.64	$29,433.67
2S	STRUCTURES TASK TOTAL	$33,601.31	$4,167.64	$29,433.67
2R1	SEEDING CA SUBTOTAL	$247,664.69	$0.00	$247,664.69
2R2	IRRIGATION CA SUBTOTAL	$0.00	$0.00	$0.00
2R	REVEGETATION TASK TOTAL	$247,664.69	$0.00	$247,664.69
2T/2S	TERRACING/SPECIAL CASES	$161,395.20	$9,265.92	$152,129.28
2	CONSTRUCTION TOTAL	$2,756,569.91	$421,945.81	$2,334,624.10
	JACKPILE PROJECT SUMMARY			
1	MANAGEMENT TOTAL	$47,282.80	N/A	$47,282.80
2	CONSTRUCTION TOTAL	$2,756,569.91	$421,945.81	$2,334,624.10
	GRAND TOTAL	$2,803,852.71	$421,945.81	$2,381,906.90

0600024

JACKPILE

PROJECT TO DATE: SUMMARY 1

PY92,PY93, & PY94

PY90 & 91

INTERIM

MOBILIZATION

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	ACTUAL COST PY90	ACTUAL COST PY91	ACTUAL COST PY92	ACTUAL COST PY93	ACTUAL COST PY94	TOTAL PTD ACTUAL COST PY90---94	TOTAL COST ESTIMATE
MGMT CA SUMMARY								
1P1	POL MANAGEMENT CA TOTAL	$85,607.08	$134,955.86	$130,009.83	$140,262.97	$19,481.65	$510,317.39	$904,998.00
1P2	POL OTHER PROGRAMS CA TOTAL	$0.00	$1,042,850.24	$8.70	$84.00	$0.00	$1,042,942.94	$1,006,614.00
1P	POL MANAGEMENT TASK TOTAL	$85,607.08	$1,177,806.10	$130,018.53	$140,346.97	$19,481.65	$1,553,260.33	$1,911,612.00
1C1	CONSTRUCTION MANAGEMENT CA TOTAL	$444,897.02	$302,825.07	$84,280.90	$58,183.28	$27,801.15	$917,987.42	$1,205,821.10
1C2	INTERIM CMC CA TOTAL	$205,116.43	$0.00	$0.00	$0.00	$0.00	$205,116.43	$200,018.90
1C3	CO-OP AGREEMENT CONTINGECY CA TOTAL	$0.00	$0.00	$409,000.00	$0.00	$0.00	$409,000.00	$2,500,000.00
1C	CONSTRUCTION MANAGEMENT TASK TOTAL	$650,013.45	$302,825.07	$493,280.90	$58,183.28	$27,801.15	$1,532,103.85	$3,905,840.00
1	MANAGEMENT TOTAL	$735,620.53	$1,480,631.17	$623,299.43	$198,530.25	$47,282.80	$3,085,364.18	$5,817,452.00
CONST CA SUMRY								
2L1	LCC COSTS CA TOTAL	$811,000.40	$0.00	($5,744.08)	($26,272.98)	$0.00	$778,983.34	$810,300.00
2L2	LCC START-UP COSTS CA TOTAL	$382,790.20	$119,306.00	$111,626.00	$112,252.00	$30,000.00	$755,974.20	$886,100.00
2L	LCC ADMINISTRATION TASK TOTAL	$1,193,790.60	$119,306.00	$105,881.92	$85,979.02	$30,000.00	$1,534,957.54	$1,696,400.00
2M1	MOBILIZATION CA TOTAL	$424,530.29	$15,546.28	$0.00	$0.00	$0.00	$440,076.57	$461,363.00
2M2	LAND SURVEY CA TOTAL	$131,705.71	$129,867.63	$117,163.78	$98,642.87	$17,098.47	$494,478.46	$551,873.00
2M3	LCC TRAINING CA TOTAL	$135,461.50	$54,635.05	$107,613.20	$101,985.39	$7,013.98	$406,709.12	$486,228.00
2M	MOBILIZATION TASK TOTAL	$691,697.50	$200,048.96	$224,776.98	$200,628.26	$24,112.45	$1,341,264.15	$1,499,464.00
2E1	BACKFILLING CA TOTAL	$3,104,841.61	$1,757,541.35	$4,096,662.15	$2,514,985.45	$269,423.96	$11,743,454.52	$13,718,836.00
2E2	DUMP SLOPING CA TOTAL	$1,436,751.40	$1,764,477.85	$961,644.89	$1,087,547.16	$1,198,690.72	$6,449,112.02	$7,564,988.00
2E3	COVER PLACEMENT CA TOTAL	$194.07	$3,432,344.30	$1,576,260.27	$3,395,488.18	$791,681.58	$9,195,968.40	$11,745,735.00
2E4	CONTAMINATED SOIL CA TOTAL	$117,322.06	$240,979.58	$70,170.86	$62,831.87	$0.00	$491,304.37	$323,637.00
2E5	HIGHWALL CA TOTAL	$58,321.27	$1,005.96	$0.00	$0.00	$0.00	$59,327.23	$396,732.00
2E6	EROSION CONTROL CA TOTAL	$0.00	$0.00	$0.00	$127,720.80	$0.00	$127,720.80	$0.00
2E	EARTHWORK TASK TOTAL	$4,717,430.41	$7,196,349.04	$6,704,738.17	$7,188,573.46	$2,259,796.26	$28,066,887.34	$33,749,928.00
2S1	UG ENTRIES ABANDON CA TOTAL	$12,300.80	$328.36	$2,124.15	$6,514.87	$0.00	$21,268.18	$128,147.00
2S2	PIT WATER CA TOTAL	$388,455.50	$19,906.77	$18,891.40	$0.00	$0.00	$427,253.67	$416,990.00
2S3	SS DEMOLITION CA TOTAL	$137,009.33	$22,829.59	$2,746.24	$2,038.36	$0.00	$164,623.52	$175,829.00
2S4	SS DECON CA TOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2S5	PERMANENT STRUCTURES CA TOTAL	$72,316.96	$66,171.21	$49,139.29	$1,534.68	$33,601.31	$222,763.45	$278,783.00
2S	STRUCTURES TASK TOTAL	$610,082.59	$109,235.93	$72,901.08	$10,087.91	$33,601.31	$835,908.82	$999,749.00
2R1	SEEDING CA SUBTOTAL	$31,304.00	$259,710.70	$152,308.25	$282,541.05	$247,664.69	$973,528.69	$1,738,609.00
2R2	IRRIGATION CA SUBTOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2R	REVEGETATION TASK TOTAL	$31,304.00	$259,710.70	$152,308.25	$282,541.05	$247,664.69	$973,528.69	$1,738,609.00
2T/S	TERRACING/SPECIAL CASES	$0.00	$0.00	$601,945.39	$87,307.46	$9,265.92	$698,518.77	$2,129,080.20
2	CONSTRUCTION TOTAL	$7,244,305.10	$7,884,650.63	$7,862,551.79	$7,855,117.16	$2,756,569.91	$33,603,194.59	$46,204,210.00
	JACKPILE PROJECT SUMMARY							
1	MANAGEMENT TOTAL	$735,620.53	$1,480,631.17	$623,299.43	$198,530.25	$47,282.80	$3,085,364.18	$5,817,452.00
2	CONSTRUCTION TOTAL	$7,244,305.10	$7,884,650.63	$7,862,551.79	$7,855,117.16	$2,756,569.91	$33,603,194.59	$46,204,210.00
	GRAND TOTAL	$7,979,925.63	$9,365,281.80	$8,485,851.22	$8,053,647.41	$2,803,852.71	$36,688,558.77	$52,021,662.00

0600025

DETAIL FOR PROJECT-TO-DATE

DETAIL FOR PTD

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
POL MGMT									
1P1L01	PROJECT MANAGEMENT – PY90	$110,859.00	$85,607.08	$0.00	$85,607.08	$0.00	77%	100%	$0.00
1P1L01A	PROJECT MANAGEMENT – PY91	$194,139.00	$134,955.86	$0.00	$134,955.86	$59,183.14	70%	100%	$59,183.14
1P1L01B	PROJECT MANAGEMENT – PY92	$193,172.00	$130,009.83	$0.00	$130,009.83	$63,162.17	67%	100%	$63,162.17
1P1L01C & D	PROJECT MANAGEMENT – PY93 & PY94	$344,380.00	$303,716.00	$0.00	$303,716.00	$40,664.00	88%	100%	$40,664.00
1P1L01E	PROJECT MANAGEMENT – PY95	$114,000.00	$19,481.65	$0.00	$19,481.65	$94,518.35	17%	50%	$75,036.70
1P1	POL MANAGEMENT CA TOTAL	$956,550.00	$673,770.42	$0.00	$673,770.42	$257,530.85	70%	94%	$238,046.01
A/E									
1P2L01	PRIOR DESIGN AND SPECIFICATIONS	$629,994.00	$629,994.00	$0.00	$629,994.00	$0.00	100%	100%	$0.00
1P2L02	PRIOR AND ONGOING LEGAL EXPENSE	$82,124.70	$82,124.70	$0.00	$82,124.70	$0.00	100%	100%	$0.00
1P2L03	PRIOR POL EXPENSE	$330,739.06	$330,739.06	$0.00	$330,739.06	$0.00	100%	100%	$0.00
1P2	ENGINEERING CA TOTAL	$1,042,857.76	$1,042,857.76	$0.00	$1,042,857.76	$0.00	100%	100%	$0.00
1P	POL MANAGEMENT TASK TOTAL	$1,999,407.76	$1,716,628.18	$0.00	$1,716,628.18	$257,530.85	86%	97%	$238,046.01
CMC									
1C1L01 & O1A	ENGINEERING SVCS. CONTRACT: PY90 & PY9	$638,882.00	$581,416.36	$0.00	$581,416.36	$57,465.64	91%	100%	$0.00
1C1L01C & D	ENGINEERING SVCS: PY93 & PY94	$89,001.00	$30,452.37	$0.00	$30,452.37	$58,548.63	34%	100%	$58,548.63
1C1L01B	ENGINEERING SERVICES—PY92	$62,762.00	$24,415.18	$0.00	$24,415.18	$38,346.82	39%	100%	$38,346.82
1C1L05/A/B/C/D	ENV. MONITORING PY90/91/92/93/94	$536,495.10	$299,122.79	$0.00	$299,122.79	$237,372.31	56%	100%	$237,372.31
1C1L01E	ENGINEERING SVCS: PY95	$13,350.00	$1,119.22	$0.00	$1,119.22	$12,230.78	8%	50%	$11,111.56
1C1L05E	ENVIRONMENTAL MONITORING: PY95	$154,400.00	$26,681.93	$0.00	$26,681.93	$127,718.07	17%	50%	$101,036.14
1C1	CONSTRUCTION MANAGEMENT CA TOTAL	$1,494,890.10	$963,207.85	$0.00	$963,207.85	$531,682.25	64%	92%	$446,415.46
INTERIM CMC									
1C2L01	COMPLETE 1989 (CONST. MGMT.)	$116,337.65	$115,775.00	$0.00	$115,775.00	$0.00	100%	100%	$0.00
1C2L02	COMPLETE 1989 (CMC PURCHASES)	$5,392.35	$5,392.35	$0.00	$5,392.35	$0.00	100%	100%	$0.00
1C2L03B	COMPLETE 1990 (ENV. MONITORING)	$78,288.90	$83,949.08	$0.00	$83,949.08	$0.00	107%	100%	$0.00
1C2	INTERIM CMC CA TOTAL	$200,018.90	$205,116.43	$0.00	$205,116.43	$0.00	103%	103%	$0.00
CONTINGENCY									
1C3L01	MITIGATION PER CO-OP AGREEMENT	$2,000,000.00	$0.00	$0.00	$0.00	$2,000,000.00	0%	0%	$0.00
1C3L02	REVEGETATION PER CO-OP AGREEMENT	$500,000.00	$0.00	$0.00	$0.00	$500,000.00	0%	0%	$0.00
1C3L03	PAGUATE REPAIR FUND	$300,000.00	$409,000.00	$0.00	$409,000.00	($109,000.00)	100%	100%	($109,000.00)
1C3	O-OP AGREEMENT CONTINGENCY CA TOTAL	$2,800,000.00	$409,000.00	$0.00	$409,000.00	$2,391,000.00	15%	14%	($109,000.00)
1C	CONSTRUCTION MANAGEMENT TASK TOTAL	$4,494,909.00	$1,577,324.28	$0.00	$1,577,324.28	$2,922,682.25	35%	38%	$337,415.46

0600027

DETAIL FOR PTD

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
1	MANAGEMENT TOTAL	$6,494,316.76	$3,293,952.46	$0.00	$3,293,952.46	$3,180,213.10	51%	56%	$575,461.47
LCC ADMIN									
2L1L01	COMPLETE 1990 (LCC G&A)	$810,300.00	$811,000.40	$0.00	$811,000.40	$0.00	100%	100%	$0.00
2L1L02A	LCC MARGIN—REFUND FOR OVERRUNS	$0.00	($32,017.06)	$0.00	($32,017.06)	$32,017.06	100%	100%	$32,017.06
2L1	LCC COSTS CA TOTAL	$810,300.00	$778,983.34	$0.00	$778,983.34	$32,017.06	96%	100%	$32,017.06
2L2L01 &LO3	1990 LCC MOB, G&A, INS.	$295,100.00	$265,400.00	$0.00	$265,400.00	$0.00	90%	100%	$0.00
2L2L02, 02A	LCC INSURANCE: INTERIM, PY90, PY91	$291,000.00	$236,696.20	$0.00	$236,696.20	$54,303.80	81%	100%	$0.00
2L2L02B/C & D	LCC INSURANCE-PY92/93/94	$324,000.00	$293,878.00	$0.00	$293,878.00	$30,122.00	91%	100%	$30,122.00
2L2L02E	LCC INSURANCE-PY95	$30,000.00	$30,000.00	$0.00	$30,000.00	$0.00	100%	100%	$0.00
2L2	LCC START-UP COSTS CA TOTAL	$940,100.00	$825,974.20	$0.00	$825,974.20	$84,425.80	88%	91%	$30,122.00
2L	LCC ADMINISTRATION TASK TOTAL	$1,750,400.00	$1,604,957.54	$0.00	$1,604,957.54	$116,442.86	92%	100%	$62,139.06
MOBILIZATION									
2M1L01	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	0%	$0.00
2M1L05	COMPLETE 1990 (SMALL TOOLS)	$63,724.00	$61,934.04	$0.00	$61,934.04	$0.00	97%	100%	$0.00
2M1L06	COMPLETE 1990 (REMODELING)	$46,520.00	$50,732.20	$0.00	$50,732.20	$0.00	109%	100%	$0.00
2M1L07	COMPLETE 1990 (RECONDITIONING)	$97,163.00	$113,909.36	$19.38	$113,889.98	$0.00	117%	100%	$0.00
2M1L08	COMPLETE 1990 (SHOPS)	$192,210.00	$190,603.34	$0.00	$190,603.34	$0.00	99%	100%	$0.00
2M1X01	BARRICADING ROAD CLOSURE	$45,000.00	$22,897.63	$31.14	$22,866.49	$0.00	51%	100%	$0.00
2M1	MOBILIZATION CA TOTAL	$444,617.00	$440,076.57	$50.52	$440,026.05	$0.00	99%	99%	$0.00
LAND SURVEY									
2M2N01	LAND SURVEY NP AREA	$117,913.00	$131,705.71	$2,550.04	$129,155.67	$0.00	112%	100%	$0.00
2M2S01	LAND SURVEY SP AREA	$266,237.00	$129,867.63	$3,104.87	$126,762.76	$136,369.37	49%	100%	$131,404.24
2M2J01	LAND SURVEY JP AREA	$266,165.00	$117,163.79	$2,443.22	$114,720.57	$149,001.21	44%	100%	$151,444.43
2M2J01,B,C & E	JACKPILE SURVEYING PY93/94 & 95	$254,543.00	$213,861.93	$4,800.23	$209,061.70	$40,681.07	84%	90%	($232,290.78)
2M2	LAND SURVEY CA TOTAL	$904,858.00	$592,599.06	$12,898.36	$579,700.70	$326,051.65	65%	68%	$50,557.89
TRAINING									
2M3L01	COMPLETE 1990 (MOB. OP. TRAINING)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2M3L02,A,B & C	OPERATOR TRAINING-PY90,91,92, & 93	$451,328.00	$400,955.96	$3,635.60	$397,320.36	$0.00	89%	100%	$0.00
2M3L02	OPERATOR TRAINING PY95	$22,425.00	$7,013.98	$0.00	$7,013.98	$15,411.02	31%	50%	$8,397.04
2M3L02	OPERATOR TRAINING—PY94	$89,700.00	$53,058.28	$0.00	$53,058.28	$36,641.72	59%	100%	($53,058.28)
2M3	LCC TRAINING CA TOTAL	$563,453.00	$461,028.22	$3,635.60	$457,392.62	$52,052.74	82%	75%	($44,661.24)
2M	MOBILIZATION TASK TOTAL	$1,912,928.00	$1,493,703.85	$16,584.48	$1,477,119.37	$378,104.39	78%	77%	$5,896.65
BACKFILLING									
2E1N01	COMPLETE 1990 (NP HAUL ROADS)	$60,352.00	$87,120.86	$12,184.44	$74,936.42	($26,768.86)	144%	100%	($14,584.42)
2E1N02	HAUL TO NP PIT: NP-PS-17	$1,838,682.00	$1,482,238.94	$288,214.26	$1,194,024.68	$356,443.06	81%	100%	$156,361.32

06000828

DETAIL FOR PTD

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
2E1N03	COMPLETED 1990 (NP-PS-18)	$1,313,140.00	$1,056,227.81	$222,620.62	$833,607.19	$256,912.19	80%	100%	$204,800.00
2E1N04	COMPLETED 1990 (NP-PS-14)	$413,123.00	$263,356.58	$30,389.74	$232,966.84	$149,766.42	64%	100%	$120,000.00
2E1N05	COMPLETED 1990 (NP-PS-15)	$408,830.00	$276,495.74	$33,927.65	$242,568.09	$132,334.26	68%	100%	$105,600.00
2E1N06	COMPLETED 1990 (NP-PS-16)	$257,759.00	$210,848.58	$39,889.15	$170,959.43	$46,910.42	82%	100%	$0.00
2E1N07	COMPLETE 1990 (SP-PS-01)	$1,616,723.00	$1,251,376.57	$213,963.59	$1,037,412.98	$365,346.43	77%	100%	$291,200.00
2E1N08	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E1N09	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E1N10	HAUL TO NP PIT: NP-WT-10	$102,067.00	$82,264.90	$9,653.05	$72,611.85	$19,802.10	81%	100%	$1,391.15
2E1N11	COMPLETE 1990 (NP-PS-13)	$149,157.00	$150,560.64	$18,071.14	$132,489.50	($1,403.64)	101%	100%	($14,403.50)
2E1N12	COMPLETE 1990 (NP-WS-19)	$148,393.00	$48,316.68	$0.00	$48,316.68	$100,076.32	33%	100%	$100,076.32
	NP BACKFILLING SUBTOTAL	$6,308,226.00	$4,908,807.30	$868,913.64	$4,039,893.66	$1,399,418.70	78%	100%	$950,440.87
2E1S01	CONSTRUCT SP HAUL ROADS	$87,899.00	$41,601.75	$5,609.10	$35,992.65	$46,297.25	47%	100%	$29,824.35
2E1S02	HAUL SP-PS-02 TO SP-OP-34	$120,303.99	$120,303.99	$22,894.92	$97,409.07	$0.00	100%	100%	($2,647.08)
2E1S03	SP-PS-02 ADDITIONAL VOLUME	$46,888.00	$46,888.00	$0.00	$46,888.00	$0.00	100%	100%	$0.00
	SP BACKFILLING SUBTOTAL	$255,090.99	$208,793.74	$28,504.02	$180,289.72	$46,297.25	82%	100%	$27,177.27
2E1J01/01B	JP HAUL ROADS & RAMPS THRU PY93	$217,556.00	$312,673.16	$58,066.82	$254,606.34	($95,117.16)	144%	100%	($37,050.34)
2E1J02	HAUL JP-PS-23 TO JP-OP-41	$223,098.00	$187,531.80	$29,899.03	$157,632.77	$35,566.20	84%	100%	$65,465.23
2E1J03	HAUL JP-PS-24 TO JP-OP-41	$1,107,581.00	$984,942.74	$194,917.86	$790,024.88	$122,638.26	89%	100%	$317,556.12
2E1J04	HAUL JP-PS-25 TO JP-OP-41	$2,447,871.22	$2,106,811.37	$365,719.36	$1,741,092.01	$341,059.85	86%	100%	$706,779.21
2E1J05	HAUL JP-PS-26 TO JP-OP-41	$460,060.10	$425,305.09	$87,169.06	$338,136.03	$34,755.01	92%	100%	$121,924.07
2E1J06	HAUL JP-WO-10 TO JP-OP-41	$86,149.00	$114,668.21	$26,074.95	$88,593.26	($28,519.21)	133%	100%	($2,444.26)
2E1J07	HAUL JP-PS-27 TO JP-OP-41	$375,010.74	$425,562.34	$88,862.75	$336,699.59	($50,551.60)	113%	100%	$38,311.15
2E1J08	HAUL JP-WO-07 TO JP-OP-41	$377,321.96	$331,128.81	$64,450.19	$266,678.62	$46,193.15	88%	100%	$110,643.34
2E1J09	HAUL JP-WO-12 TO JP-OP-41	$3,041,178.00	$1,959,647.60	$405,385.34	$1,554,262.26	$1,081,530.40	64%	100%	$1,486,915.74
2E1J10	HAUL JP-WS-08 TO JP-OP-41	$186,636.00	$0.00	$0.00	$0.00	$186,636.00	0%	0%	$0.00
2E1J11	HAUL JP-WS-15 TO JP-OP-41	$189,627.00	$272,664.51	$61,705.12	$210,959.39	($83,037.51)	144%	100%	($21,332.39)
2E1J12	HAUL JP-WO-71 TO JP-OP-41	$584,755.72	$449,268.65	$71,822.72	$377,445.93	$135,487.07	77%	100%	$207,309.79
2E1J13	HAUL JP-WO-03 TO JP-OP-41	$592,099.62	$492,107.10	$91,733.43	$400,373.67	$99,992.52	83%	100%	$191,725.95
2E1J14	HAUL JP-WS-13/WO-20 TO JP-OP-42	$52,578.63	$38,337.22	$4,014.42	$34,322.80	$14,241.41	73%	100%	$18,255.83
2E1J15	JACKPILE HAUL ROADS---FORCE ACCOUNT	$39,796.91	$39,796.91	$7,335.86	$32,461.05	$0.00	100%	100%	$7,335.86
	JP BACKFILLING SUBTOTAL	$9,981,319.90	$8,140,445.51	$1,557,156.91	$6,583,288.60	$1,840,874.39	82%	93%	$3,211,395.30
2E1	BACKFILLING CA TOTAL	$16,544,636.89	$13,258,046.55	$2,454,574.57	$10,803,471.98	$3,286,590.34	80%	87%	$4,189,013.44
DUMP SLOPING									
2E2N01	CUT BENCH NP-W0-01	$44,294.00	$30,464.54	$725.16	$29,739.38	$13,829.46	69%	100%	$14,554.62
2E2N02	CUT SLOPES NP-WO-02(BENEATH NP-PS-17)	$26,281.00	$19,305.52	$2,255.93	$17,049.59	$6,975.48	73%	100%	($35,289.59)
2E2N03	CUT NP-WS-03 SLOPES	$25,576.00	$20,713.64	$2,797.89	$17,915.75	$4,862.36	81%	100%	$1,829.25
2E2N04	COMPLETE 1990 (NP-WO-04)	$24,959.00	$20,111.21	$3,406.72	$16,704.49	$4,847.79	81%	100%	$0.00
2E2N05	CUT NP-WO-06 SLOPES	$23,741.00	$494.43	$41.68	$452.75	$23,246.57	100%	100%	$13,363.25
2E2N06	CUT NP-WT-09 SLOPES	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2N07	REGRADE NP-DN-22	$13,811.49	$15,768.46	$2,440.85	$13,327.61	($1,956.97)	114%	100%	($2,432.12)
2E2N08	CUT NP-WM-12 SLOPES	$14,262.00	$9,627.61	$907.31	$8,720.30	$4,634.39	68%	100%	$5,541.70
2E2N09	COMPLETE 1990 (NP-HW-25)	$24,309.00	$15,690.44	$1,560.41	$14,130.03	$8,618.56	65%	100%	$0.00
	NP DUMP SLOPING SUBTOTAL	$197,233.49	$132,175.85	$14,135.95	$118,039.90	$65,057.64	67%	100%	($2,432.89)
2E2S01	COMPLETED 1990 (SP-WO-13A/WO-10)	$156,202.00	$94,795.69	$6,964.98	$87,830.71	$61,406.31	61%	100%	$48,000.00
2E2S02	CUT SP-WS-17 SLOPES	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00

0600029

DETAIL FOR PTD

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
2E2S03	CUT SP-WO-13B/WS-18A SLOPES	$1,013,795.00	$1,050,177.34	$235,939.23	$814,238.11	($36,382.34)	104%	100%	($11,628.11)
2E2S04	COMPLETE 1990 (SP-WO-14)	$54,671.00	$39,385.36	$5,621.00	$33,764.36	$15,285.64	72%	100%	$0.00
2E2S05	CUT SP-WS-18B SLOPES	$68,933.00	$68,910.88	$12,354.81	$56,556.07	$22.12	100%	100%	$12,376.93
2E2S06	COMPLETED 1990 (SP-WS-18C/WT-19)	$694,880.00	$594,655.55	$123,410.45	$471,245.10	$100,224.45	86%	100%	$80,000.00
2E2S07	COMPLETED 1990 (SP-WT-03)	$42,786.00	$30,433.21	$3,083.78	$27,349.43	$12,352.79	71%	100%	$0.00
2E2S08A	SP-OP-34 Backfill (Force Account)	$209,645.47	$209,645.47	$44,656.48	$164,988.99	$0.00	100%	100%	$44,656.48
2E2S09	COMPLETE 1990 (SP-WO-38)	$2,377.00	$1,638.25	$197.80	$1,440.45	$738.75	69%	100%	$0.00
2E2S10	DELETED 1990 (SP-WS-06)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2S11	COMPLETE 1990 (SP-WT-19A)	$36,843.00	$30,471.16	$419.64	$30,051.52	$6,371.84	83%	100%	$0.00
2E2S12	COMPLETED 1990 (SP-WM-12/WS-11)	$50,512.00	$44,187.45	$7,006.12	$37,181.33	$6,324.55	87%	100%	$0.00
2E2S13	DELETED 1990 (SP-WT-15A/15B)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2S14	BACKFILL SP-OP-34 (D4 West)	$49,995.00	$72,236.38	$12,291.70	$59,944.68	($22,241.38)	144%	100%	($9,949.68)
2E2S15	COMPLETE 1990 (SP-WT-16/WT-37)	$34,710.00	$24,280.44	$2,994.50	$21,285.94	$10,429.56	70%	100%	$0.00
2E2S16	BACKFILL SP-OP-34 (D4 East)	$49,995.00	$97,278.52	$21,561.62	$75,716.90	($47,283.52)	195%	100%	($25,721.90)
2E2S17	BACKFILL SP-OP-34 (SP-14)	$49,995.00	$49,975.93	$9,020.97	$40,954.96	$19.07	100%	100%	$9,040.04
2E2S18	BACKFILL SP-OP-34 (SH-2)	$49,995.00	$53,181.65	$11,775.07	$41,406.58	($3,186.65)	106%	100%	$8,588.42
2E2S19	COMPLETED 1990 (SP-MISCELLANEOUS SLOP	$5,080.00	$3,690.12	$530.73	$3,159.39	$1,389.88	73%	100%	$0.00
	SP DUMP SLOPING SUBTOTAL	$2,570,414.47	$2,464,943.40	$497,828.88	$1,967,114.52	$105,471.07	96%	100%	$155,362.18
2E2J01	CUT JP-WO-11 SLOPES	$1,009,732.00	$297,097.52	$45,381.17	$251,716.35	$712,634.48	29%	100%	$758,015.65
2E2J02	CUT JP-WT-16D SLOPES	$477,243.00	$595,367.04	$134,017.66	$461,349.38	($118,124.04)	125%	100%	$15,893.62
2E2J03 & 3A	CUT JP-WS-17 SLOPES	$2,239,392.00	$2,244,548.80	$437,396.58	$1,807,152.22	($5,156.80)	100%	100%	$432,239.78
2E2J04	CUT JP-PS-22 SLOPES	$104,656.00	$71,292.61	$6,429.99	$64,862.62	$33,363.39	68%	100%	$39,793.38
2E2J05	CUT JP-WO-72 SLOPES	$51,974.60	$42,451.58	$5,835.20	$36,616.38	$9,523.02	82%	100%	$15,358.22
2E2J06	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2J07	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2J08	CUT JP-WS-01 SLOPES	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2J09	DELETED 1990 (JP-WT-02A/02B/02C)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2J10	JP-WO-73 BACKFILL	$128,768.71	$93,774.65	$12,270.95	$81,503.70	$34,994.06	73%	100%	$47,265.01
2E2J11	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2J12	CUT JP-WO-06 SLOPES	$65,957.46	$54,628.89	$7,833.36	$46,795.53	$11,328.57	83%	100%	$19,161.93
2E2J13	CUT JP-WS-08/12 SLOPES	$138,341.84	$127,106.93	$17,419.66	$109,687.27	$11,234.91	92%	100%	$28,654.57
2E2J14	CUT JP-WO-11 SLOPES	$721,679.00	$534,286.83	$65,230.59	$469,056.24	$187,392.17	74%	100%	$33,646.76
2E2J15	CUT JP-WS-15A/15B SLOPES	$157,141.00	$101,451.37	$8,560.86	$92,890.51	$55,689.63	65%	100%	$16,570.49
2E2J16	JP-WO-05 SLOPES	$69,997.46	$64,697.03	$11,612.66	$53,084.37	$5,300.43	92%	100%	$16,913.09
2E2J17	CUT JP-WS-16A/16B/16C SLOPES	$24,428.00	$0.00	$0.00	$0.00	$24,428.00	0%	0%	$0.00
2E2J18	SHALE TO JP-D4	$5,518.00	$0.00	$0.00	$0.00	$5,518.00	0%	0%	$0.00
2E2J19	JP-WO-72 BACKFILL	$85,482.50	$77,316.80	$14,523.32	$62,793.48	$8,165.70	90%	100%	$22,689.02
2E2J20	CUT SLOPES JP-WO-14 (NORTH SLOPES)	$7,172.00	$30,151.51	$5,523.48	$24,628.03	($22,979.51)	420%	100%	($17,456.03)
2E2J21	CUT JP-WS-19A SLOPES	$45,527.13	$61,227.22	$9,807.43	$51,419.79	($15,700.09)	134%	100%	($5,892.66)
2E2J22	CUT JP-WS-19B SLOPES	$279,126.03	$284,655.89	$41,840.62	$242,815.27	($5,529.86)	102%	100%	$36,310.76
2E2J23	CUT JP-WS-19C SLOPES	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2J24	CUT JP-WO-66 SLOPES	$182,107.84	$83,819.79	$10,035.13	$73,784.66	$98,288.05	46%	100%	$108,323.18
2E2J25	DELETED 1990 (JP-WO-70)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2J26	CUT JP-WO-18/66A SLOPES	$44,326.00	$30,832.65	$3,133.58	$27,699.07	$13,493.35	70%	100%	$16,626.93
2E2J27	CUT JP-WO-18/66B SLOPES	$102,953.00	$114,983.02	$15,380.86	$99,602.16	($12,030.02)	112%	100%	($19,690.16)
2E2J28	CUT JP-WO-18/66C SLOPES	$183,844.36	$86,630.95	$5,643.22	$80,987.73	$97,213.41	47%	100%	$102,856.63
2E2J29	JP-WO-03A SLOPES	$233,182.00	$128,312.94	$18,096.34	$110,216.60	$104,869.06	55%	100%	$122,965.40

060003O

DETAIL FOR PTD

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
2E2J30	JP-WO-03B SLOPES	$152,350.74	$52,926.13	$9,132.73	$43,793.40	$99,424.61	35%	100%	$108,557.34
2E2J31	CUT SLOPES JP-W0-04	$122,500.84	$90,041.80	$16,436.30	$73,605.50	$32,459.04	74%	100%	$48,895.34
2E2J32	CUT SLOPES JP-WO-04B	$90,848.60	$41,126.95	$7,369.68	$33,757.27	$49,721.65	45%	100%	$57,091.33
2E2J33	DELETED 1990 (JP-WO-05A)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E2J34	DELETED 1990 (JP-WO-05B)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	JP DUMP SLOPING SUBTOTAL	$6,724,250.11	$5,308,728.90	$908,911.37	$4,399,817.53	$1,415,521.21	79%	94%	$2,004,789.58
2E2	DUMP SLOPING CA TOTAL	$9,491,898.07	$7,905,848.15	$1,420,876.20	$6,484,971.95	$1,586,049.92	83%	98%	$2,157,718.87
COVER PLACEMENT									
2E3N01	HAUL SOIL FROM NP-SB-61 TO NP-D8	$89,573.66	$89,573.66	$17,867.21	$71,706.45	$0.00	100%	100%	$17,867.21
2E3N02	HAUL SOIL FROM NP-SB-26 TO NP-D2	$177,823.00	$182,140.04	$40,430.52	$141,709.52	($4,317.04)	102%	100%	$20,787.48
2E3N03	HAUL SOIL FROM NP-SB-27 TO NP-D7	$75,803.93	$75,803.93	$15,883.44	$59,920.49	$0.00	100%	100%	$15,883.44
2E3N04	HAUL SOIL FROM NP-SB-27 TO NP-D9	$33,699.90	$33,699.90	$6,896.74	$26,803.16	$0.00	100%	100%	$6,896.74
2E3N05	HAUL SOIL FROM NP-SB-27 TO NP-D6	$191,404.34	$152,449.28	$26,357.81	$126,091.47	$38,955.06	80%	100%	$4,546.87
2E3N06	HAUL SOIL FROM NP-SB-61 TO NP-D9	$44,865.45	$44,865.45	$9,417.00	$35,448.45	$0.00	100%	100%	$9,417.00
2E3N07	HAUL SOIL FROM SP-DN-61 TO NP-D4	$149,246.00	$133,332.06	$27,960.48	$105,371.58	$15,913.94	89%	100%	($788.58)
2E3N08	HAUL SOIL FROM SP-DN-61 TO NP-D1	$116,032.00	$112,434.42	$10,552.26	$101,882.16	$3,597.58	97%	100%	($20,573.16)
2E3N09	HAUL SOIL FROM SP-DN-61 TO NP-D3	$203,056.00	$199,073.84	$42,798.01	$156,275.83	$3,982.16	98%	100%	($13,985.83)
2E3N10	HAUL SOIL FROM SP-DN-61 TO NP-D5	$232,064.00	$188,560.45	$34,067.07	$154,493.38	$43,503.55	81%	100%	$8,123.62
2E3N11	HAUL SOIL FROM SP-DN-61 TO NP-D10	$210,600.00	$167,555.69	$29,355.96	$138,199.73	$43,044.31	80%	100%	$72,400.27
2E3N12	SOIL TO NP-D6 (BENCHES)	$113,607.00	$116,323.14	$17,552.71	$98,770.43	($2,716.14)	102%	100%	$14,836.57
2E3N13	HAUL SHALE FROM NP-WS-31 TO NP-D9	$65,168.72	$53,518.46	$7,894.30	$45,624.16	$11,650.26	82%	100%	$19,544.56
2E3N14	SHALE BORROW TO NP-D4	$49,144.13	$49,144.13	$11,382.07	$37,762.06	$0.00	100%	100%	$11,382.07
2E3N15	SHALE BORROW TO NP-D5	$136,500.00	$116,723.15	$23,191.46	$93,531.69	$19,776.85	86%	100%	$42,968.31
2E3N16	HAUL SHALE FROM NP-WS-31 TO NP-D8	$21,348.99	$20,797.90	$4,155.64	$16,642.26	$551.09	97%	100%	$4,706.73
2E3N17	HAUL SHALE FROM NP-WS-31 TO NP-D10	$84,240.00	$88,675.18	$18,554.38	$70,120.80	($4,435.18)	105%	100%	$14,119.20
2E3N18	HAUL SHALE FROM NP-WS-03 TO NP-D3	$83,873.00	$77,407.80	$15,259.07	$62,148.73	$6,465.20	92%	100%	$15,197.27
2E3N19	HAUL SHALE FROM NP-WS-03 TO NP-D2	$81,152.00	$77,153.57	$15,645.08	$61,508.49	$3,998.43	95%	100%	$12,619.51
2E3N20	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E3N21	HAUL SHALE FROM NP-WS-03 TO NP-D1	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	NP COVER PLACEMENT SUBTOTAL	$2,159,202.12	$1,979,232.05	$375,221.21	$1,604,010.84	$179,970.07	92%	100%	$255,949.28
2E3S01	SOIL BORROW SP-OP-35(SP-D1)FROM SP-SB	$176,082.00	$102,362.82	$6,741.69	$95,621.13	$73,719.18	58%	100%	$28,375.87
2E3S02	SOIL BORROW SP-WS-17(SP-D2)FROM SP-SB	$135,933.00	$147,803.17	$30,438.88	$117,364.29	($11,870.17)	109%	100%	$18,568.71
2E3S03	SOIL BORROW SP-D3 FROM SP-SB-44	$671,269.00	$206,210.99	$44,691.54	$161,519.45	$465,058.01	31%	100%	$509,749.55
2E3S04	HAUL SOIL FROM SP-SB-42 TO SP-D4	$238,662.00	$233,615.42	$52,847.23	$180,768.19	$5,046.58	98%	100%	$57,893.81
2E3S05	HAUL SOIL FROM SP-SB-42 TO SP-D5	$133,454.00	$79,765.97	$9,476.24	$70,289.73	$53,688.03	60%	100%	$63,164.27
2E3S06	HAUL SOIL FROM SP-SB-42 TO SP-D6	$164,704.00	$124,118.84	$16,488.41	$107,630.43	$40,585.16	75%	100%	$57,073.57
2E3S07	HAUL SOIL FROM SP-SB-42 TO SP-D7	$300,498.00	$220,918.54	$51,097.28	$169,821.26	$79,579.46	74%	100%	$100,808.74
2E3S08	SOIL BORROW (D8) FROM SP-SB-44	$425,531.00	$396,859.91	$81,966.27	$314,893.64	$28,671.09	93%	100%	$110,637.36
2E3S09	SOIL BORROW (D9) FROM SP-SB-42	$446,808.00	$372,735.22	$80,229.00	$292,506.22	$74,072.78	83%	100%	$154,301.78
2E3S10	HAUL SOIL FROM SP-SB-42 TO SP-D10	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E3S11	SOIL BORROW (SP-D11) FROM SP-SB-42	$236,109.02	$236,109.02	$56,194.87	$179,914.15	$0.00	100%	100%	$56,194.87
2E3S12	SOIL BORROW (SP-D12) FROM SP-SB-43	$244,568.98	$136,548.71	$13,352.44	$123,196.27	$108,020.27	56%	100%	$121,372.71
2E3S13	SOIL BORROW (SP-D1B) FROM SP-SB-50	$262,362.00	$205,115.25	$25,778.20	$179,337.05	$57,246.75	78%	100%	$83,024.95
2E3S14	SHALE BORROW (SP-13A)FROM SP-WS-17	$26,370.00	$23,973.73	$4,603.27	$19,370.46	$2,396.27	91%	100%	$6,999.54
2E3S15	SHALE BORROW (SP-13B)FROM SP-WS-17	$77,217.00	$0.00	$0.00	$0.00	$77,217.00	0%	0%	$0.00

0600031

DETAIL FOR PTD

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
2E3S16	SHALE BORROW SP-PS-01 FROM SP-WS-07	$83,484.00	$67,408.25	$11,198.25	$56,210.00	$16,075.75	81%	100%	$20,636.00
2E3S17	SHALE BORROW (SP-14) FROM SP-WS-07	$39,234.00	$32,170.93	$6,925.41	$25,245.52	$7,063.07	82%	100%	$13,988.48
2E3S18	HAUL SHALE FROM SP-WS-07 TO SP-04	$190,818.00	$178,325.44	$21,841.37	$156,484.07	$12,492.56	93%	100%	$34,333.93
2E3S19	HAUL SHALE FROM SP-WS-07 TO SP-D10	$14,368.00	$29,466.81	$6,594.24	$22,872.57	($15,098.81)	205%	100%	($10,300.57)
2E3S20	HAUL SHALE FROM SP-WS-07 TO SP-38	$14,947.00	$34,876.68	$7,376.80	$27,499.88	($19,929.68)	233%	100%	($16,005.88)
2E3S21	HAUL SHALE FROM SP-WS-07 TO SP-10	$21,143.00	$31,850.32	$16,581.20	$15,269.12	($10,707.32)	151%	100%	$3,996.88
	SP COVER PLACEMENT SUBTOTAL	$3,903,562.00	$2,860,236.02	$544,422.59	$2,315,813.43	$1,043,325.98	73%	95%	$1,414,814.57
2E3J01	HAUL SOIL FROM JP-SB-53 TO D4	$714,700.06	$413,403.00	$66,390.57	$347,012.43	$301,297.06	58%	100%	$367,687.63
2E3J02	HAUL SOIL FROM JP-SB-53 TO D5	$243,698.00	$285,454.96	$33,269.36	$252,185.60	($41,756.96)	117%	100%	($8,487.60)
2E3J03	HAUL SOIL FROM JP-SB-53 TO D6	$355,691.00	$309,879.56	$55,594.61	$254,284.95	$45,811.44	87%	100%	$101,406.05
2E3J04	HAUL SOIL FROM JP-SB-53 TO D9A	$74,184.00	$300,584.66	$48,284.68	$252,299.98	($226,400.66)	405%	100%	($178,115.98)
2E3J05	HAUL SOIL FROM JP-SB-53 TO D1	$478,170.00	$530,068.63	$95,826.85	$434,241.78	($51,898.63)	111%	100%	$43,928.22
2E3J06	HAUL SOIL FROM JP-SB-53 TO D3	$123,522.00	$297,826.16	$57,715.25	$240,110.91	($174,304.16)	241%	100%	($116,588.91)
2E3J07	HAUL SOIL FROM JP-SB-64 TO D2	$249,543.00	$445,706.39	$82,884.49	$362,821.90	($196,163.39)	179%	100%	($113,278.90)
2E3J08	HAUL SOIL FROM JP-SB-64 TO D7	$373,032.00	$330,600.76	$65,299.09	$265,301.67	$42,431.24	89%	100%	$107,730.33
2E3J09	HAUL SOIL FROM JP-SB-64 TO D11	$397,218.00	$353,734.58	$67,231.52	$286,503.06	$43,483.42	89%	100%	$110,714.94
2E3J10	HAUL SOIL FROM JP-SB-64 TO D12	$306,624.82	$271,409.30	$47,606.33	$223,802.97	$35,215.52	89%	100%	$82,821.85
2E3J11	HAUL SOIL FROM JP-SB-54 TO D16	$90,202.00	$126,740.16	$25,606.73	$101,133.43	($36,538.16)	141%	100%	($10,931.43)
2E3J12	HAUL SOIL FROM JP-SB-54 TO D15	$81,585.21	$101,854.87	$19,833.65	$82,021.22	($20,269.66)	125%	100%	($436.01)
2E3J13	SOIL TO JP-D4	$582,802.00	$505,554.53	$97,009.50	$408,545.03	$77,247.47	87%	100%	$174,256.97
2E3J14	DELETED 1990 (JP-SB-54)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E3J15	SOIL COVER FOR H-1 MINE AREA	$14,640.00	$8,063.31	$1,575.77	$6,487.54	$6,576.69	55%	100%	$8,152.46
2E3J16	SOIL JP-D13	$379,413.00	$361,556.05	$62,709.55	$298,846.50	$17,856.95	95%	100%	$80,566.50
2E3J17	SOIL JP-D8B	$590,808.00	$806,833.60	$172,741.93	$634,091.67	($216,025.60)	137%	100%	($43,283.67)
2E3J18	HAUL SHALE FROM JP-WS-19 TO D4	$0.00	$0.00	$0.00	$0.00	$0.00	0%	0%	$0.00
2E3J19	HAUL SHALE FROM JP-WS-15 TO D1	$146,718.00	$94.87	$4.76	$90.11	$146,623.13	0%	0%	$0.00
2E3J20	HAUL SHALE FROM JP-WS-15 TO D2	$126,963.48	$114,630.94	$21,143.01	$93,487.93	$12,332.54	90%	100%	$33,475.55
2E3J21	HAUL SHALE FROM JP-WS-15 TO D7	$188,892.00	$0.00	$0.00	$0.00	$188,892.00	0%	0%	$0.00
2E3J22	HAUL SHALE FROM JP-WS-15 TO D11	$277,001.00	$0.00	$0.00	$0.00	$277,001.00	0%	0%	$0.00
2E3J23	HAUL SHALE FROM JP-WS-15 TO D12	$105,151.01	$91,447.71	$14,955.63	$76,492.08	$13,703.30	87%	100%	$28,658.93
2E3J24	HAUL SHALE FROM JP-WT-02 TO D8A	$610,584.00	$728,408.06	$137,161.92	$591,246.14	($117,824.06)	119%	100%	$19,337.86
2E3J08A	JP-W0-07 TO BACKFILL	$864,310.08	$757,455.97	$150,789.26	$606,666.71	$106,854.11	88%	100%	$257,643.37
2E3J26	SHALE J-D13	$109,064.00	$193,148.69	$42,735.14	$150,413.55	($84,084.69)	177%	100%	($41,349.55)
2E3J27	SOIL JP-D4	$43,911.47	$46,959.12	$7,889.32	$39,069.80	($3,047.65)	107%	100%	$4,841.67
2E3J28	HAUL SHALE FROM JP-WT-02 TO D15	$84,872.00	$90,076.93	$18,680.45	$71,396.48	($5,204.93)	106%	100%	$13,475.52
2E3J29	HAUL SHALE FROM JP-WT-02 TO D16	$24,433.66	$96,263.93	$18,358.62	$77,905.31	($71,830.27)	394%	100%	($53,471.65)
	JP COVER PLACEMENT SUBTOTAL	$7,637,733.79	$7,567,756.74	$1,411,297.99	$6,156,458.75	$69,977.05	99%	91%	$868,754.15
2E3	COVER PLACEMENT CA TOTAL	$13,700,497.91	$12,407,224.81	$2,330,941.79	$10,076,283.02	$1,293,273.10	91%	90%	$2,539,518.00
CONTA OIL EXV									
2E4NO	HAUL CS FROM NP-CS-23/24 TO NP-OP-20	$106,304.00	$89,655.64	$20,825.16	$68,830.48	$16,648.36	84%	100%	$28,921.52
2E4NO	NORTH RIO PAGUATE-EAST	$45,600.00	$45,481.17	$10,334.34	$35,146.83	$118.83	100%	100%	$10,453.17
2E4NO	NORTH RIO PAGUATE-WEST	$45,600.00	$45,478.72	$10,246.14	$35,232.58	$121.28	100%	100%	$10,367.42
	NP CONTAMINATED SOIL SUBTOTAL	$197,504.00	$180,615.53	$41,405.64	$139,209.89	$16,888.47	91%	94%	$49,742.11
2E4S01	FM SP-CS-27/28/31/33/53 TO SP-OP-34	$162,633.00	$124,016.78	$26,289.04	$97,727.74	$38,616.22	76%	100%	$3,886.26
2E4S02	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00

0600032

DETAIL FOR PTD

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
2E4S03	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E4S04	SP-CS-33	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E4S05	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E4S06	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E4S07	COMPLETED 1990 (SP-CS-62/32 TO SP-OP-35)	$11,432.00	$23,146.83	$5,923.73	$17,223.10	($11,714.83)	202%	100%	($8,934.10)
	SP CONTAMINATED SOIL SUBTOTAL	$174,065.00	$147,163.61	$32,212.77	$114,950.84	$26,901.39	85%	100%	($5,047.84)
2E4J01	HAUL CS FROM JP-CS-36 TO JP-OP-41	$134,869.80	$114,861.98	$5,972.27	$108,889.71	$20,007.82	85%	100%	$25,980.09
2E4J02	HAUL CS FROM JP-CS-38/37 TO JP-OP-41	$28,204.02	$48,663.25	$142.91	$48,520.34	($20,459.23)	173%	100%	($20,316.32)
2E4J03	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E4J04	COMBINED INTO 2E4J02	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	JP CONTAMINATED SOIL SUBTOTAL	$163,073.82	$163,525.23	$6,115.18	$157,410.05	($451.41)	100%	100%	$5,663.77
2E4	CONTAMINATED SOIL CA TOTAL	$534,642.82	$491,304.37	$79,733.59	$411,570.78	$43,338.45	92%	85%	$50,358.04
HIGHWALL RECLAM									
2E5N01	TRIM NP HIGHWALLS	$78,967.00	$1,005.96	$190.14	$815.82	$77,961.04	1%	100%	$64,287.18
2E5N02	SCALE NP HIGHWALLS	$62,262.00	$0.00	$0.00	$0.00	$62,262.00	0%	0%	$0.00
	NP HIGHWALL SUBTOTAL	$141,229.00	$1,005.96	$190.14	$815.82	$140,223.04	1%	100%	$64,287.18
2E5S01	TRIM SP HIGHWALLS	$77,047.00	$29,160.64	$0.00	$29,160.64	$47,886.36	38%	100%	$34,022.36
2E5S02	SCALE SP HIGHWALLS	$75,469.00	$29,160.63	$0.00	$29,160.63	$46,308.37	39%	100%	$45,058.37
	SP HIGHWALL SUBTOTAL	$152,516.00	$58,321.27	$0.00	$58,321.27	$94,194.73	38%	100%	$79,080.73
2E5J01	TRIM JP HIGHWALLS	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E5J02	SCALE JP HIGHWALLS	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	JP HIGHWALL SUBTOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E5	HIGHWALL CA TOTAL	$293,745.00	$59,327.23	$190.14	$59,137.09	$234,417.77	20%	100%	$143,367.91
EROSION CONTROL									
2E6N01A	RIO MOQUINO-EROSION CONTROLS	$219,919.00	$161,611.67	$1,524.91	$160,086.76	$58,307.33	73%	100%	$59,832.24
2E6NO2	DELETE RIO MOQUINO CHANNEL	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E6NO3	DELETED 1990 (BEDDING MATERIAL)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	RIO MOQUINO AND NP DITCH SUBTOTAL	$219,919.00	$161,611.67	$1,524.91	$160,086.76	$58,307.33	73%	100%	$59,832.24
2E6XO1	DELETED 1990 (QUARRY ROCK)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E6XO2	DELETED 1990 (PROCESS ROCK)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	ROCK SUBTOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2E6	EROSION CONTROL CA TOTAL	$219,919.00	$161,611.67	$1,524.91	$160,086.76	$58,307.33	73%	100%	$59,832.24
2E	EARTHWORK TASK TOTAL	$40,565,420.69	$34,283,362.78	$6,287,841.20	$27,995,521.58	$6,501,976.91	85%	89%	$9,139,808.50
UG EN S ABAN									
2S1N0	SEAL PW 2/3 UG ENTRY: NP SUBTOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2S1SO1	SEAL P-13 ADIT	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2S1SO2	SEAL P-10 DECLINE	$13,844.00	$7,886.94	$281.22	$7,605.72	$5,957.06	57%	100%	$6,238.28

0600033

DETAIL FOR PTD

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
2S1SO3	COMPLETE 1990 (H-I ADIT)	$10,902.00	$734.25	$58.18	$676.07	$10,167.75	7%	100%	$10,225.93
2S1SO4	SEAL VENT HOLES	$56,640.00	$11,824.73	$10.00	$11,814.73	$44,815.27	21%	100%	$28,942.27
2S1SO5	COMPLETE 1990 (DRILL HOLES)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	SP UG ENTRIES ABANDON SUBTOTAL	$81,386.00	$20,445.92	$349.40	$20,096.52	$60,940.08	25%	56%	$45,406.48
2S1J01	SEAL JP-SS-50 ENTRIES	$2,748.00	$0.00	$0.00	$0.00	$2,748.00	0%	0%	$0.00
2S1J02	SEAL JP-PS-46 ENTRIES	$2,748.00	$1,553.59	$113.60	$1,439.99	$1,194.41	57%	100%	$1,308.01
	JP UG ENTRIES ABANDON SUBTOTAL	$5,496.00	$1,553.59	$113.60	$1,439.99	$3,942.41	28%	34%	$1,308.01
2S1	UG ENTRIES ABANDON CA TOTAL	$86,882.00	$21,999.51	$463.00	$21,536.51	$64,882.49	25%	54%	$46,714.49
PIT WATER									
2S2N01	COMPLETE 1990 (NP PIT)	$141,666.00	$161,935.47	$36,761.23	$125,174.24	($20,269.47)	114%	100%	$16,491.76
2S2S01	DISPOSE OF SP PIT WATER	$93,920.00	$128,155.26	$23,736.58	$104,418.68	($34,235.26)	136%	100%	($12,033.68)
2S2J01/A/B	DISPOSE OF JP WATER-PY91/92/93	$387,408.00	$137,162.94	$37,760.41	$99,402.53	$250,245.06	35%	100%	$271,664.47
2S2	PIT WATER CA TOTAL	$622,994.00	$427,253.67	$98,258.22	$328,995.45	$195,740.33	69%	95%	$276,122.55
SURF STRUC DEM									
2S3N01	COMPLETE 1990 (NP SURF. STRUC.)	$2,947.00	$1,172.61	$0.00	$1,172.61	$1,774.39	40%	100%	$1,774.39
2S3S01	DEMOLISH SP SURFACE STRUCTURES	$57,896.00	$50,548.23	$2,495.40	$48,052.83	$7,347.77	87%	100%	$9,843.17
2S3J01	DEMOLISH JP SURFACE STRUCTURES	$114,986.00	$112,902.68	$4,016.93	$108,885.75	$2,083.32	98%	100%	($18,541.75)
2S3	SS DEMOLITION CA TOTAL	$175,829.00	$164,623.52	$6,512.33	$158,111.19	$11,205.48	94%	87%	($6,924.19)
SURF STRC DECOM									
2S4XY	NOT ASSIGNED	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2S4	SS DECOM CA TOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
PERM STRUC									
2S5N01	CONSTRUCT PERMANENT ACCESS ROADS:NP	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2S5N02	CONSTRUCT PERMANENT FENCES: NP AREA	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	NP STRUCTURES SUBTOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2S5S01	CONSTRUCT PERMANENT ACCESS ROADS:SP	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2S5S02	CONSTRUCT PERMANENT FENCES: SP AREA	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	SP STRUCTURES SUBTOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2S5J01	CONSTRUCT PERMANENT ACCESS ROADS: JP	$41,616.00	$0.00	$0.00	$0.00	$41,616.00	0%	0%	$0.00
2S5J02A	RIO MOQUINO DROP STRUCTURE	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
	JP STRUCTURES SUBTOTAL	$41,616.00	$0.00	$0.00	$0.00	$41,616.00	0%	100%	$0.00
2S5J09	CONSTRUCT PERMANENT FENCES: ALL AREA	$151,565.00	$226,264.05	$7,602.09	$218,661.96	($74,699.05)	149%	100%	($67,096.96)
	ALL STRUCTURES SUBTOTAL	$151,565.00	$226,264.05	$7,602.09	$218,661.96	($74,699.05)	149%	100%	($67,096.96)
2S5	PERMANENT STRUCTURES CA TOTAL	$193,181.00	$226,264.05	$7,602.09	$218,661.96	($33,083.05)	117%	84%	($67,096.96)
2S	STRUCTURES TASK TOTAL	$1,078,886.00	$840,140.75	$112,835.64	$727,305.11	$238,745.25	78%	88%	$248,815.89
SEEDE									
2R1N01	PREPARE BED & SEED NP FLAT AREAS	$137,966.00	$205,572.98	$8.24	$205,564.74	($67,606.98)	149%	100%	($67,598.74)
2R1N02	PREPARE BED & SEED NP SLOPE AREAS	$82,344.00	$121,431.22	$0.00	$121,431.22	($39,087.22)	147%	100%	($39,087.22)

0600034

DETAIL FOR PTD

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	TOTAL COST ESTIMATE	PTD ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW	REMAINING COST ESTIMATE	% OF ESTIMATE SPENT	REPORTED % COMPLETE	ESTIMATED VARIANCE AT COMPLETION
	NP SEEDING SUBTOTAL	$220,310.00	$327,004.20	$8.24	$326,995.96	($106,694.20)	148%	100%	($106,685.96)
2R1S01	PREPARE BED & SEED SP FLAT AREAS	$363,458.00	$174,556.02	$819.15	$173,736.87	$188,901.98	48%	100%	$189,721.13
2R1S02	PREPARE BED & SEED SP SLOPE AREAS	$198,047.00	$129,589.89	$251.86	$129,338.03	$68,457.11	65%	100%	$68,708.97
2R1S03	COMPLETE 1990 (RESEED AT HOUSING AREA)	$54,917.00	$45,155.70	$0.00	$45,155.70	$9,761.30	82%	100%	$9,761.30
	SP SEEDING SUBTOTAL	$616,422.00	$349,301.61	$1,071.01	$348,230.60	$267,120.39	57%	100%	$268,191.40
2R1J01	PREPARE BED & SEED JP FLAT AREAS	$842,081.00	$216,394.37	$0.00	$216,394.37	$625,686.63	26%	50%	$409,292.26
2R1J02	PREPARE BED & SEED SP SLOPE AREAS	$421,448.00	$150,574.96	$0.00	$150,574.96	$270,873.04	36%	50%	$120,298.08
	JP SEEDING SUBTOTAL	$1,263,529.00	$366,969.33	$0.00	$366,969.33	$896,559.67	29%	50%	$529,590.34
2R1	SEEDING CA SUBTOTAL	$2,100,261.00	$1,043,275.14	$1,079.25	$1,042,195.89	$1,056,985.86	50%	74%	$691,095.78
IRRIGATION									
2R2N01	DELETED 1990 (IRRIGATION)	0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2R2S01	TREE PLANTING	$72,149.00	$0.00	$0.00	$0.00	$72,149.00	0%	0%	$0.00
2R2J01	DELETED 1990 (IRRIGATION)	$0.00	$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2R2	IRRIGATION CA SUBTOTAL	$72,149.00	$0.00	$0.00	$0.00	$72,149.00	0%	100%	$0.00
2R	REVEGETATION TASK TOTAL	$2,172,410.00	$1,043,275.14	$1,079.25	$1,042,195.89	$1,129,134.86	48%	100%	$691,095.78
TERRACING									
2T1N01	TERRACING NP AREA: 1200 LF	$5,100.00	$0.00	$0.00	$0.00	$5,100.00	0%	100%	$0.00
2T1S01	TERRACING SP AREA: 19100 LF	$81,175.00	$61,142.47	$2,806.83	$58,335.64	$20,032.53	75%	100%	($58,335.64)
2T1J01	TERRACING JP AREA : 29000 LF	$184,875.00	$239,886.00	$21,064.86	$218,821.14	($55,011.00)	130%	100%	($218,821.14)
2T1	TERRACING CA SUBTOTAL	$271,150.00	$301,028.47	$23,871.69	$277,156.78	($29,878.47)	111%	100%	($277,156.78)
SPECIAL CASES									
2T2S01	CUT SP-SW-06 SLOPES – OAK CANYON		$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2T2J01	JP-WS-01 SLOPES	$1,077,374.00	$245,275.97	$33,493.74	$211,782.23	$832,098.03	23%	100%	($211,782.23)
2T2PLR	PY94 FORCE ACCOUNT	$100,000.00	$108,988.85	$9,235.02	$99,753.83	($8,988.85)	109%	90%	($110,837.59)
2T2J03	CUT JP-WO-03A/3B/4A/4B SLOPES		$0.00	$0.00	$0.00	$0.00	0%	100%	$0.00
2T2PLRA	PY95 FORCE ACCOUNT	$100,000.00	$0.00	$0.00	$0.00	$100,000.00	0%	0%	$0.00
2T2N01	CUT NP-WO-01 BENCHES—RIO MOQUINO	$580,556.20	$570,695.93	$117,243.53	$453,452.40	$9,860.27	98%	100%	$250,000.00
2T2	SPECIAL CA SUBTOTAL	$1,857,930.20	$924,960.75	$159,972.29	$764,988.46	$932,969.45	50%	82%	($72,619.82)
2T	TERRACING/SPECIAL TASK	$2,129,080.20	$1,225,989.22	$183,843.98	$1,042,145.24	$903,090.98	58%	42%	($349,776.60)
2	CONSTRUCTION TOTAL	$49,609,124.89	$40,491,429.28	$6,602,184.55	$33,889,244.73	$9,267,495.25	82%	85%	$9,797,979.28

DETAIL FOR PY95

DETAIL FOR PY95

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	PY95 ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW
POL MGMT				
1P1L01	PROJECT MANAGEMENT – PY90	$0.00	$0.00	$0.00
1P1L01A	PROJECT MANAGEMENT – PY91	$0.00	$0.00	$0.00
1P1L01B	PROJECT MANAGEMENT – PY92	$0.00	$0.00	$0.00
1P1L01C & D	PROJECT MANAGEMENT – PY93 & PY94	$0.00	$0.00	$0.00
1P1L01E	PROJECT MANAGEMENT – PY95	$19,481.65	$0.00	$19,481.65
1P1	POL MANAGEMENT CA TOTAL	$19,481.65	$0.00	$19,481.65
A/E				
1P2L01	PRIOR DESIGN AND SPECIFICATIONS	$0.00	$0.00	$0.00
1P2L02	PRIOR AND ONGOING LEGAL EXPENSE	$0.00	$0.00	$0.00
1P2L03	PRIOR POL EXPENSE	$0.00	$0.00	$0.00
1P2	ENGINEERING CA TOTAL	$0.00	$0.00	$0.00
1P	POL MANAGEMENT TASK TOTAL	$19,481.65	$0.00	$19,481.65
CMC				
1C1L01 & O1A	ENGINEERING SVCS. CONTRACT: PY90 & PY9	$0.00	$0.00	$0.00
1C1L01C & D	ENGINEERING SVCS: PY93 & PY94	$0.00	$0.00	$0.00
1C1L01B	ENGINEERING SERVICES—PY92	$0.00	$0.00	$0.00
1C1L05/A/B/C/D	ENV. MONITORING PY90/91/92/93/94	$0.00	$0.00	$0.00
1C1L01E	ENGINEERING SVCS: PY95	$1,119.22	$0.00	$1,119.22
1C1L05E	ENVIRONMENTAL MONITORING: PY95	$26,681.93	$0.00	$26,681.93
1C1	CONSTRUCTION MANAGEMENT CA TOTAL	$27,801.15	$0.00	$27,801.15
INTERIM CMC				
1C2L01	COMPLETE 1989 (CONST. MGMT.)	$0.00	$0.00	$0.00
1C2L02	COMPLETE 1989 (CMC PURCHASES)	$0.00	$0.00	$0.00
1C2L03B	COMPLETE 1990 (ENV. MONITORING)	$0.00	$0.00	$0.00
1C2	INTERIM CMC CA TOTAL	$0.00	$0.00	$0.00
CONT NCY				
1C3L0	MITIGATION PER CO-OP AGREEMENT	$0.00	$0.00	$0.00
1C3L0	REVEGETATION PER CO-OP AGREEMENT	$0.00	$0.00	$0.00
1C3L0	PAGUATE REPAIR FUND	$0.00	$0.00	$0.00
1C3	CO-OP AGREEMENT CONTINGENCY CA TOTA	$0.00	$0.00	$0.00
1C	CONSTRUCTION MANAGEMENT TASK TOTAL	$27,801.15	$0.00	$27,801.15

0600037

DETAIL FOR PY95

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	PY95 ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW
1	MANAGEMENT TOTAL	$47,282.80	$0.00	$47,282.80
LCC ADMIN				
2L1L01	COMPLETE 1990 (LCC G&A)	$0.00	$0.00	$0.00
2L1L02A	LCC MARGIN---REFUND FOR OVERRUNS	$0.00	$0.00	$0.00
2L1	LCC COSTS CA TOTAL	$0.00	$0.00	$0.00
2L2L01 &LO3	1990 LCC MOB, G&A, INS.	$0.00	$0.00	$0.00
2L2L02, 02A	LCC INSURANCE: INTERIM, PY90, PY91	$0.00	$0.00	$0.00
2L2L02B/C & D	LCC INSURANCE-PY92/93/94	$0.00	$0.00	$0.00
2L2L02E	LCC INSURANCE-PY95	$30,000.00	$0.00	$30,000.00
2L2	LCC START-UP COSTS CA TOTAL	$30,000.00	$0.00	$30,000.00
2L	LCC ADMINISTRATION TASK TOTAL	$30,000.00	$0.00	$30,000.00
MOBILIZATION				
2M1L01	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2M1L05	COMPLETE 1990 (SMALL TOOLS)	$0.00	$0.00	$0.00
2M1L06	COMPLETE 1990 (REMODELING)	$0.00	$0.00	$0.00
2M1L07	COMPLETE 1990 (RECONDITIONING)	$0.00	$0.00	$0.00
2M1L08	COMPLETE 1990 (SHOPS)	$0.00	$0.00	$0.00
2M1X01	BARRICADING ROAD CLOSURE	$0.00	$0.00	$0.00
2M1	MOBILIZATION CA TOTAL	$0.00	$0.00	$0.00
LAND SURVEY				
2M2N01	LAND SURVEY NP AREA	$0.00	$0.00	$0.00
2M2S01	LAND SURVEY SP AREA	$0.00	$0.00	$0.00
2M2J01	LAND SURVEY JP AREA	$0.00	$0.00	$0.00
2M2J01B/C & E	LAND SURVEY PY93/94 & 95	$17,098.47	$776.78	$16,321.69
2M2	LAND SURVEY CA TOTAL	$17,098.47	$776.78	$16,321.69
TRAINING				
2M3L01	COMPLETE 1990 (MOB. OP. TRAINING)	$0.00	$0.00	$0.00
2M3L02,A,B & C	OPERATOR TRAINING-PY90,91,92, & 93	$0.00	$0.00	$0.00
2M3L	OPERATOR TRAINING PY95	$7,013.98	$0.00	$7,013.98
2M3L	OPERATOR TRAINING---PY94	$0.00	$0.00	$0.00
2M3	LCC TRAINING CA TOTAL	$7,013.98	$0.00	$7,013.98
2M	MOBILIZATION TASK TOTAL	$24,112.45	$776.78	$23,335.67
BACKFILLING				
2E1N01	COMPLETE 1990 (NP HAUL ROADS)	$0.00	$0.00	$0.00

0600038

DETAIL FOR F.5

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	PY95 ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW
2E1N02	HAUL TO NP PIT: NP-PS-17	$0.00	$0.00	$0.00
2E1N03	COMPLETED 1990 (NP-PS-18)	$0.00	$0.00	$0.00
2E1N04	COMPLETED 1990 (NP-PS-14)	$0.00	$0.00	$0.00
2E1N05	COMPLETED 1990 (NP-PS-15)	$0.00	$0.00	$0.00
2E1N06	COMPLETED 1990 (NP-PS-16)	$0.00	$0.00	$0.00
2E1N07	COMPLETE 1990 (SP-PS-01)	$0.00	$0.00	$0.00
2E1N08	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E1N09	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E1N10	HAUL TO NP PIT: NP-WT-10	$0.00	$0.00	$0.00
2E1N11	COMPLETE 1990 (NP-PS-13)	$0.00	$0.00	$0.00
2E1N12	COMPLETE 1990 (NP-WS-19)	$0.00	$0.00	$0.00
	NP BACKFILLING SUBTOTAL	$0.00	$0.00	$0.00
2E1S01	CONSTRUCT SP HAUL ROADS	$0.00	$0.00	$0.00
2E1S02	HAUL SP-PS-02 TO SP-OP-34	$0.00	$0.00	$0.00
2E1S03	SP-PS-02 ADDITIONAL VOLUME	$0.00	$0.00	$0.00
	SP BACKFILLING SUBTOTAL	$0.00	$0.00	$0.00
2E1J01/01B	JP HAUL ROADS & RAMPS THRU PY93	$140,575.73	$27,172.07	$113,403.66
2E1J02	HAUL JP-PS-23 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J03	HAUL JP-PS-24 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J04	HAUL JP-PS-25 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J05	HAUL JP-PS-26 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J06	HAUL JP-WO-10 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J07	HAUL JP-PS-27 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J08	HAUL JP-WO-07 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J09	HAUL JP-WO-12 TO JP-OP-41	$128,848.23	$0.00	$128,848.23
2E1J10	HAUL JP-WS-08 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J11	HAUL JP-WS-15 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J12	HAUL JP-WO-71 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J13	HAUL JP-WO-03 TO JP-OP-41	$0.00	$0.00	$0.00
2E1J14	HAUL JP-WS-13/WO-20 TO JP-OP-42	$0.00	$0.00	$0.00
2E1J15	JACKPILE HAUL ROADS—FORCE ACCOUNT	$0.00	$0.00	$0.00
	JP BACKFILLING SUBTOTAL	$269,423.96	$27,172.07	$242,251.89
2E1	BACKFILLING CA TOTAL	$269,423.96	$27,172.07	$242,251.89
DUMP SLOPING				
2E2N01	CUT BENCH NP-W0-01	$0.00	$0.00	$0.00
2E2N02	CUT SLOPES NP-WO-02(BENEATH NP-PS-17)	$0.00	$0.00	$0.00
2E2N03	CUT NP-WS-03 SLOPES	$0.00	$0.00	$0.00
2E2N04	COMPLETE 1990 (NP-WO-04)	$0.00	$0.00	$0.00
2E2N05	CUT NP-WO-06 SLOPES	$0.00	$0.00	$0.00
2E2N06	CUT NP-WT-09 SLOPES	$0.00	$0.00	$0.00
2E2N07	REGRADE NP-DN-22	$0.00	$0.00	$0.00
2E2N08	CUT NP-WM-12 SLOPES	$0.00	$0.00	$0.00
2E2N09	COMPLETE 1990 (NP-HW-25)	$0.00	$0.00	$0.00
	NP DUMP SLOPING SUBTOTAL	$0.00	$0.00	$0.00
2E2S01	COMPLETED 1990 (SP-WO-13A/WO-10)	$0.00	$0.00	$0.00

0600039

DETAIL FOR PY95

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	PY95 ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW
2E2S02	CUT SP-WS-17 SLOPES	$0.00	$0.00	$0.00
2E2S03	CUT SP-WO-13B/WS-18A SLOPES	$0.00	$0.00	$0.00
2E2S04	COMPLETE 1990 (SP-WO-14)	$0.00	$0.00	$0.00
2E2S05	CUT SP-WS-18B SLOPES	$0.00	$0.00	$0.00
2E2S06	COMPLETED 1990 (SP-WS-18C/WT-19)	$0.00	$0.00	$0.00
2E2S07	COMPLETED 1990 (SP-WT-03)	$0.00	$0.00	$0.00
2E2S08A	SP-OP-34 Backfill (Force Account)	$0.00	$0.00	$0.00
2E2S09	COMPLETE 1990 (SP-WO-38)	$0.00	$0.00	$0.00
2E2S10	DELETED 1990 (SP-WS-06)	$0.00	$0.00	$0.00
2E2S11	COMPLETE 1990 (SP-WT-19A)	$0.00	$0.00	$0.00
2E2S12	COMPLETED 1990 (SP-WM-12/WS-11)	$0.00	$0.00	$0.00
2E2S13	DELETED 1990 (SP-WT-15A/15B)	$0.00	$0.00	$0.00
2E2S14	BACKFILL SP-OP-34 (D4 West)	$0.00	$0.00	$0.00
2E2S15	COMPLETE 1990 (SP-WT-16/WT-37)	$0.00	$0.00	$0.00
2E2S16	BACKFILL SP-OP-34 (D4 East)	$0.00	$0.00	$0.00
2E2S17	BACKFILL SP-OP-34 (SP-14)	$0.00	$0.00	$0.00
2E2S18	BACKFILL SP-OP-34 (SH-2)	$0.00	$0.00	$0.00
2E2S19	COMPLETED 1990 (SP-MISCELLANEOUS SLOP	$0.00	$0.00	$0.00
	SP DUMP SLOPING SUBTOTAL	$0.00	$0.00	$0.00
2E2J01	CUT JP-WO-11 SLOPES	$46,027.22	$0.00	$46,027.22
2E2J02	CUT JP-WT-16D SLOPES	($287.72)	$0.00	($287.72)
2E2J03 & 3A	CUT JP-WS-17 SLOPES	$1,127,637.45	$236,577.38	$891,060.07
2E2J04	CUT JP-PS-22 SLOPES	$0.00	$0.00	$0.00
2E2J05	CUT JP-WO-72 SLOPES	$0.00	$0.00	$0.00
2E2J06	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E2J07	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E2J08	CUT JP-WS-01 SLOPES	$0.00	$0.00	$0.00
2E2J09	DELETED 1990 (JP-WT-02A/02B/02C)	$0.00	$0.00	$0.00
2E2J10	JP-WO-73 BACKFILL	$0.00	$0.00	$0.00
2E2J11	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E2J12	CUT JP-WO-06 SLOPES	$0.00	$0.00	$0.00
2E2J13	CUT JP-WS-08/12 SLOPES	$0.00	$0.00	$0.00
2E2J14	CUT JP-WO-11 SLOPES	$0.00	$0.00	$0.00
2E2J15	CUT JP-WS-15A/15B SLOPES	$0.00	$0.00	$0.00
2E2J16	JP-WO-05 SLOPES	$0.00	$0.00	$0.00
2E2J17	CUT JP-WS-16A/16B/16C SLOPES	$0.00	$0.00	$0.00
2E2J18	SHALE TO JP-D4	$0.00	$0.00	$0.00
2E2J19	JP-WO-72 BACKFILL	$0.00	$0.00	$0.00
2E2J20	CUT SLOPES JP-WO-14 (NORTH SLOPES)	$0.00	$0.00	$0.00
2E2J21	CUT JP-WS-19A SLOPES	$0.00	$0.00	$0.00
2E2J22	CUT JP-WS-19B SLOPES	$0.00	$0.00	$0.00
2E2J23	CUT JP-WS-19C SLOPES	$0.00	$0.00	$0.00
2E2J24	CUT JP-WO-66 SLOPES	$0.00	$0.00	$0.00
2E2J25	DELETED 1990 (JP-WO-70)	$0.00	$0.00	$0.00
2E2J26	CUT JP-WO-18/66A SLOPES	$0.00	$0.00	$0.00
2E2J27	CUT JP-WO-18/66B SLOPES	$0.00	$0.00	$0.00
2E2J28	CUT JP-WO-18/66C SLOPES	$0.00	$0.00	$0.00

0600040

DETAIL FOR PY95

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	PY95 ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW
2E2J29	JP-WO-03A SLOPES	$25,313.77	$0.00	$25,313.77
2E2J30	JP-WO-03B SLOPES	$0.00	$0.00	$0.00
2E2J31	CUT SLOPES JP-W0-04	$0.00	$0.00	$0.00
2E2J32	CUT SLOPES JP-WO-04B	$0.00	$0.00	$0.00
2E2J33	DELETED 1990 (JP-WO-05A)	$0.00	$0.00	$0.00
2E2J34	DELETED 1990 (JP-WO-05B)	$0.00	$0.00	$0.00
	JP DUMP SLOPING SUBTOTAL	$1,198,690.72	$236,577.38	$962,113.34
2E2	DUMP SLOPING CA TOTAL	$1,198,690.72	$236,577.38	$962,113.34
COVER PLACEMEN				
2E3N01	HAUL SOIL FROM NP-SB-61 TO NP-D8	$0.00	$0.00	$0.00
2E3N02	HAUL SOIL FROM NP-SB-26 TO NP-D2	$0.00	$0.00	$0.00
2E3N03	HAUL SOIL FROM NP-SB-27 TO NP-D7	$0.00	$0.00	$0.00
2E3N04	HAUL SOIL FROM NP-SB-27 TO NP-D9	$0.00	$0.00	$0.00
2E3N05	HAUL SOIL FROM NP-SB-27 TO NP-D6	$0.00	$0.00	$0.00
2E3N06	HAUL SOIL FROM NP-SB-61 TO NP-D9	$0.00	$0.00	$0.00
2E3N07	HAUL SOIL FROM SP-DN-61 TO NP-D4	$0.00	$0.00	$0.00
2E3N08	HAUL SOIL FROM SP-DN-61 TO NP-D1	$0.00	$0.00	$0.00
2E3N09	HAUL SOIL FROM SP-DN-61 TO NP-D3	$0.00	$0.00	$0.00
2E3N10	HAUL SOIL FROM SP-DN-61 TO NP-D5	$0.00	$0.00	$0.00
2E3N11	HAUL SOIL FROM SP-DN-61 TO NP-D10	$0.00	$0.00	$0.00
2E3N12	SOIL TO NP-D6 (BENCHES)	$0.00	$0.00	$0.00
2E3N13	HAUL SHALE FROM NP-WS-31 TO NP-D9	$0.00	$0.00	$0.00
2E3N14	SHALE BORROW TO NP-D4	$0.00	$0.00	$0.00
2E3N15	SHALE BORROW TO NP-D5	$0.00	$0.00	$0.00
2E3N16	HAUL SHALE FROM NP-WS-31 TO NP-D8	$0.00	$0.00	$0.00
2E3N17	HAUL SHALE FROM NP-WS-31 TO NP-D10	$0.00	$0.00	$0.00
2E3N18	HAUL SHALE FROM NP-WS-03 TO NP-D3	$0.00	$0.00	$0.00
2E3N19	HAUL SHALE FROM NP-WS-03 TO NP-D2	$0.00	$0.00	$0.00
2E3N20	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E3N21	HAUL SHALE FROM NP-WS-03 TO NP-D1	$0.00	$0.00	$0.00
	NP COVER PLACEMENT SUBTOTAL	$0.00	$0.00	$0.00
2E3S01	SOIL BORROW SP-OP-35(SP-D1)FROM SP-SB	$0.00	$0.00	$0.00
2E3S02	SOIL BORROW SP-WS-17(SP-D2)FROM SP-SB	$0.00	$0.00	$0.00
2E3S03	SOIL BORROW SP-D3 FROM SP-SB-44	$0.00	$0.00	$0.00
2E3S04	HAUL SOIL FROM SP-SB-42 TO SP-D4	$0.00	$0.00	$0.00
2E3S05	HAUL SOIL FROM SP-SB-42 TO SP-D5	$0.00	$0.00	$0.00
2E3S06	HAUL SOIL FROM SP-SB-42 TO SP-D6	$0.00	$0.00	$0.00
2E3S07	HAUL SOIL FROM SP-SB-42 TO SP-D7	$0.00	$0.00	$0.00
2E3S08	SOIL BORROW (D8) FROM SP-SB-44	$0.00	$0.00	$0.00
2E3S09	SOIL BORROW (D9) FROM SP-SB-42	$0.00	$0.00	$0.00
2E3S10	HAUL SOIL FROM SP-SB-42 TO SP-D10	$0.00	$0.00	$0.00
2E3S11	SOIL BORROW (SP-D11) FROM SP-SB-42	$0.00	$0.00	$0.00
2E3S12	SOIL BORROW (SP-D12) FROM SP-SB-43	$0.00	$0.00	$0.00
2E3S13	SOIL BORROW (SP-D1B) FROM SP-SB-50	$0.00	$0.00	$0.00
2E3S14	SHALE BORROW (SP-13A)FROM SP-WS-17	$0.00	$0.00	$0.00

06000041

DETAIL FOR PY95

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	PY95 ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW
2E3S15	SHALE BORROW (SP-13B)FROM SP-WS-17	$0.00	$0.00	$0.00
2E3S16	SHALE BORROW SP-PS-01 FROM SP-WS-07	$0.00	$0.00	$0.00
2E3S17	SHALE BORROW (SP-14) FROM SP-WS-07	$0.00	$0.00	$0.00
2E3S18	HAUL SHALE FROM SP-WS-07 TO SP-04	$0.00	$0.00	$0.00
2E3S19	HAUL SHALE FROM SP-WS-07 TO SP-D10	$0.00	$0.00	$0.00
2E3S20	HAUL SHALE FROM SP-WS-07 TO SP-38	$0.00	$0.00	$0.00
2E3S21	HAUL SHALE FROM SP-WS-07 TO SP-10	$0.00	$0.00	$0.00
	SP COVER PLACEMENT SUBTOTAL	$0.00	$0.00	$0.00
2E3J01	HAUL SOIL FROM JP-SB-53 TO D4	$0.00	$0.00	$0.00
2E3J02	HAUL SOIL FROM JP-SB-53 TO D5	$0.00	$0.00	$0.00
2E3J03	HAUL SOIL FROM JP-SB-53 TO D6	$309,879.56	$55,594.61	$254,284.95
2E3J04	HAUL SOIL FROM JP-SB-53 TO D9A	($3,574.58)	$0.00	($3,574.58)
2E3J05	HAUL SOIL FROM JP-SB-53 TO D1	$0.00	$0.00	$0.00
2E3J06	HAUL SOIL FROM JP-SB-53 TO D3	$242,412.47	$46,698.52	$195,713.95
2E3J07	HAUL SOIL FROM JP-SB-64 TO D2	$216,342.88	$41,692.89	$174,649.99
2E3J08	HAUL SOIL FROM JP-SB-64 TO D7	$0.00	$0.00	$0.00
2E3J09	HAUL SOIL FROM JP-SB-64 TO D11	$0.00	$0.00	$0.00
2E3J10	HAUL SOIL FROM JP-SB-64 TO D12	$0.00	$0.00	$0.00
2E3J11	HAUL SOIL FROM JP-SB-54 TO D16	$0.00	$0.00	$0.00
2E3J12	HAUL SOIL FROM JP-SB-54 TO D15	$0.00	$0.00	$0.00
2E3J13	SOIL TO JP-D4	($1,873.59)	$0.00	($1,873.59)
2E3J14	DELETED 1990 (JP-SB-54)	$0.00	$0.00	$0.00
2E3J15	SOIL COVER FOR H-1 MINE AREA	$0.00	$0.00	$0.00
2E3J16	SOIL JP-D13	$30,741.45	$0.00	$30,741.45
2E3J17	SOIL JP-D8B	$0.00	$0.00	$0.00
2E3J18	HAUL SHALE FROM JP-WS-19 TO D4	$0.00	$0.00	$0.00
2E3J19	HAUL SHALE FROM JP-WS-15 TO D1	$0.00	$0.00	$0.00
2E3J20	HAUL SHALE FROM JP-WS-15 TO D2	$0.00	$0.00	$0.00
2E3J21	HAUL SHALE FROM JP-WS-15 TO D7	$0.00	$0.00	$0.00
2E3J22	HAUL SHALE FROM JP-WS-15 TO D11	$0.00	$0.00	$0.00
2E3J23	HAUL SHALE FROM JP-WS-15 TO D12	$0.00	$0.00	$0.00
2E3J24	HAUL SHALE FROM JP-WT-02 TO D8A	$0.00	$0.00	$0.00
2E3J08A	JP-W0-07 TO BACKFILL	$0.00	$0.00	$0.00
2E3J26	SHALE J-D13	($2,246.61)	$0.00	($2,246.61)
2E3J27	SOIL JP-D4	$0.00	$0.00	$0.00
2E3J28	HAUL SHALE FROM JP-WT-02 TO D15	$0.00	$0.00	$0.00
2E3J29	HAUL SHALE FROM JP-WT-02 TO D16	$0.00	$0.00	$0.00
	JP COVER PLACEMENT SUBTOTAL	$791,681.58	$143,986.02	$647,695.56
2E3	COVER PLACEMENT CA TOTAL	$791,681.58	$143,986.02	$647,695.56
CONTA	IL EXV			
2E4NO	HAUL CS FROM NP-CS-23/24 TO NP-OP-20	$0.00	$0.00	$0.00
2E4NO	NORTH RIO PAGUATE-EAST	$0.00	$0.00	$0.00
2E4NO	NORTH RIO PAGUATE-WEST	$0.00	$0.00	$0.00
	NP CONTAMINATED SOIL SUBTOTAL	$0.00	$0.00	$0.00
2E4S01	FM SP-CS-27/28/31/33/53 TO SP-OP-34	$0.00	$0.00	$0.00

0600042

DETAIL FOR PY95

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	PY95 ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW
2E4S02	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E4S03	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E4S04	SP-CS-33	$0.00	$0.00	$0.00
2E4S05	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E4S06	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E4S07	COMPLETED 1990 (SP-CS-62/32 TO SP-OP-35)	$0.00	$0.00	$0.00
	SP CONTAMINATED SOIL SUBTOTAL	$0.00	$0.00	$0.00
2E4J01	HAUL CS FROM JP-CS-36 TO JP-OP-41	$0.00	$0.00	$0.00
2E4J02	HAUL CS FROM JP-CS-38/37 TO JP-OP-41	$0.00	$0.00	$0.00
2E4J03	NO WORK PACKAGE ASSIGNED THIS WBS #	$0.00	$0.00	$0.00
2E4J04	COMBINED INTO 2E2J02	$0.00	$0.00	$0.00
	JP CONTAMINATED SOIL SUBTOTAL	$0.00	$0.00	$0.00
2E4	CONTAMINATED SOIL CA TOTAL	$0.00	$0.00	$0.00
HIGHWALL RECLA				
2E5N01	TRIM NP HIGHWALLS	$0.00	$0.00	$0.00
2E5N02	SCALE NP HIGHWALLS	$0.00	$0.00	$0.00
	NP HIGHWALL SUBTOTAL	$0.00	$0.00	$0.00
2E5S01	TRIM SP HIGHWALLS	$0.00	$0.00	$0.00
2E5S02	SCALE SP HIGHWALLS	$0.00	$0.00	$0.00
	SP HIGHWALL SUBTOTAL	$0.00	$0.00	$0.00
2E5J01	TRIM JP HIGHWALLS	$0.00	$0.00	$0.00
2E5J02	SCALE JP HIGHWALLS	$0.00	$0.00	$0.00
	JP HIGHWALL SUBTOTAL	$0.00	$0.00	$0.00
2E5	HIGHWALL CA TOTAL	$0.00	$0.00	$0.00
EROSION CONTRO				
2E6N01A	RIO MOQUINO-EROSION CONTROLS	$0.00	$0.00	$0.00
2E6NO2	DELETE RIO MOQUINO CHANNEL	$0.00	$0.00	$0.00
2E6NO3	DELETED 1990 (BEDDING MATERIAL)	$0.00	$0.00	$0.00
	RIO MOQUINO AND NP DITCH SUBTOTAL	$0.00	$0.00	$0.00
2E6XO1	DELETED 1990 (QUARRY ROCK)	$0.00	$0.00	$0.00
2E6XO2	DELETED 1990 (PROCESS ROCK)	$0.00	$0.00	$0.00
	ROCK SUBTOTAL	$0.00	$0.00	$0.00
2E6	EROSION CONTROL CA TOTAL	$0.00	$0.00	$0.00
2E	EARTHWORK TASK TOTAL	$2,259,796.26	$407,735.47	$1,852,060.79
UG ENTRIES ABAN				
2S1N01	SEAL PW 2/3 UG ENTRY: NP SUBTOTAL	$0.00	$0.00	$0.00
2S1SO1	SEAL P-13 ADIT	$0.00	$0.00	$0.00

0600043

DETAIL FOR PY95

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	PY95 ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW
2S1SO2	SEAL P-10 DECLINE	$0.00	$0.00	$0.00
2S1SO3	COMPLETE 1990 (H-I ADIT)	$0.00	$0.00	$0.00
2S1SO4	SEAL VENT HOLES	$0.00	$0.00	$0.00
2S1SO5	COMPLETE 1990 (DRILL HOLES)	$0.00	$0.00	$0.00
	SP UG ENTRIES ABANDON SUBTOTAL	$0.00	$0.00	$0.00
2S1J01	SEAL JP-SS-50 ENTRIES	$0.00	$0.00	$0.00
2S1J02	SEAL JP-PS-46 ENTRIES	$0.00	$0.00	$0.00
	JP UG ENTRIES ABANDON SUBTOTAL	$0.00	$0.00	$0.00
2S1	UG ENTRIES ABANDON CA TOTAL	$0.00	$0.00	$0.00
PIT WATER				
2S2N01	COMPLETE 1990 (NP PIT)	$0.00	$0.00	$0.00
2S2S01	DISPOSE OF SP PIT WATER	$0.00	$0.00	$0.00
2S2J01/A/B	DISPOSE OF JP WATER-PY91/92/93	$0.00	$0.00	$0.00
2S2	PIT WATER CA TOTAL	$0.00	$0.00	$0.00
SURF STRUC DEM				
2S3N01	COMPLETE 1990 (NP SURF. STRUC.)	$0.00	$0.00	$0.00
2S3S01	DEMOLISH SP SURFACE STRUCTURES	$0.00	$0.00	$0.00
2S3J01	DEMOLISH JP SURFACE STRUCTURES	$0.00	$0.00	$0.00
2S3	SS DEMOLITION CA TOTAL	$0.00	$0.00	$0.00
SURF STRC DECO				
2S4XY	NOT ASSIGNED	$0.00	$0.00	$0.00
2S4	SS DECOM CA TOTAL	$0.00	$0.00	$0.00
PERM STRUC				
2S5N01	CONSTRUCT PERMANENT ACCESS ROADS:NP	$0.00	$0.00	$0.00
2S5N02	CONSTRUCT PERMANENT FENCES: NP AREA	$0.00	$0.00	$0.00
	NP STRUCTURES SUBTOTAL	$0.00	$0.00	$0.00
2S5S01	CONSTRUCT PERMANENT ACCESS ROADS:SP	$0.00	$0.00	$0.00
2S5S02	CONSTRUCT PERMANENT FENCES: SP AREA	$0.00	$0.00	$0.00
	SP STRUCTURES SUBTOTAL	$0.00	$0.00	$0.00
2S5J01	CONSTRUCT PERMANENT ACCESS ROADS: JP	$0.00	$0.00	$0.00
2S5J02A	RIO MOQUINO DROP STRUCTURE	$0.00	$0.00	$0.00
	JP STRUCTURES SUBTOTAL	$0.00	$0.00	$0.00
2S5J09	CONSTRUCT PERMANENT FENCES: ALL AREA	$33,601.31	$4,167.64	$29,433.67
	ALL STRUCTURES SUBTOTAL	$33,601.31	$4,167.64	$29,433.67
2S5	PERMANENT STRUCTURES CA TOTAL	$33,601.31	$4,167.64	$29,433.67
2S	STRUCTURES TASK TOTAL	$33,601.31	$4,167.64	$29,433.67
SEEDBEDS				
2R1N01	PREPARE BED & SEED NP FLAT AREAS	$0.00	$0.00	$0.00

0600044

DETAIL FOR PY95

JUNE, 1995

WBS ID NO.	WORK PACKAGE DESCRIPTION	PY95 ACTUAL COST	ACTUAL EQUIP CREDIT	ACTUAL CASH FLOW
2R1N02	PREPARE BED & SEED NP SLOPE AREAS	$0.00	$0.00	$0.00
	NP SEEDING SUBTOTAL	$0.00	$0.00	$0.00
2R1S01	PREPARE BED & SEED SP FLAT AREAS	$0.00	$0.00	$0.00
2R1S02	PREPARE BED & SEED SP SLOPE AREAS	$0.00	$0.00	$0.00
2R1S03	COMPLETE 1990 (RESEED AT HOUSING AREA)	$0.00	$0.00	$0.00
	SP SEEDING SUBTOTAL	$0.00	$0.00	$0.00
2R1J01	PREPARE BED & SEED JP FLAT AREAS	$125,384.79	$0.00	$125,384.79
2R1J02	PREPARE BED & SEED SP SLOPE AREAS	$122,279.90	$0.00	$122,279.90
	JP SEEDING SUBTOTAL	$247,664.69	$0.00	$247,664.69
2R1	SEEDING CA SUBTOTAL	$247,664.69	$0.00	$247,664.69
IRRIGATION				
2R2N01	DELETED 1990 (IRRIGATION)	$0.00	$0.00	$0.00
2R2S01	TREE PLANTING	$0.00	$0.00	$0.00
2R2J01	DELETED 1990 (IRRIGATION)	$0.00	$0.00	$0.00
2R2	IRRIGATION CA SUBTOTAL	$0.00	$0.00	$0.00
2R	REVEGETATION TASK TOTAL	$247,664.69	$0.00	$247,664.69
TERRACING				
2T1N01	TERRACING NP AREA: 1200 LF	$0.00	$0.00	$0.00
2T1S01	TERRACING SP AREA: 19100 LF	$0.00	$0.00	$0.00
2T1J01	TERRACING JP AREA : 29000 LF	$2,277.12	$30.90	$2,246.22
2T1	TERRACING CA SUBTOTAL	$2,277.12	$30.90	$2,246.22
SPECIAL CASES				
2T2S01	CUT SP-SW-06 SLOPES - OAK CANYON	$0.00	$0.00	$0.00
2T2J01	JP-WS-01 SLOPES	$50,129.23	$0.00	$50,129.23
2T2PLR	PY94 FORCE ACCOUNT	$108,988.85	$9,235.02	$99,753.83
2T2J03	CUT JP-WO-03A/3B/4A/4B SLOPES	$0.00	$0.00	$0.00
2T2PLRA	PY95 FORCE ACCOUNT	$0.00	$0.00	$0.00
2T2N01	CUT NP-WO-01 BENCHES--RIO MOQUINO	$0.00	$0.00	$0.00
2T2	SPECIAL CA SUBTOTAL	$159,118.08	$9,235.02	$149,883.06
2T	TERRACING/SPECIAL TASK	$161,395.20	$9,265.92	$152,129.28
2	CONSTRUCTION TOTAL	$2,756,569.91	$421,945.81	$2,334,624.10

0600045

5.2 WORK PACKAGE DISCUSSION

WP#	DESCRIPTION	REMARKS
1P1l01E	POL Project Management PY95	in-progress;
1C1L05E	Enviro. Monitoring PY95	in-progress;
1C1L01E	Engineering Services PY95	in-progress;
2M3L02E	Training PY95	in-progress;
2R1J01/02	Reseed Jackpile Flat/Slopes	Idle;
2E3J06	Soil to JP-D3	complete;
2E3J17	Soil to JP-D8	complete;
2E2J03A	JP-WS-17 backfill	complete;
2M2J01E	Surveying	in-progress;
2E3J03	Soil to JP-D6	complete;
2T2PLR	Force Account	complete;
2E1J01B	Jackpile roads and ramps	in-progress
2S5J09	Fences	in-progress

5.3 WORK PACKAGE CLOSEOUTS

1) New items submitted by LCC, Inc. for Final Inspection/Closeout:

NONE for June, 1995

2) New items submitted by Pueblo of Laguna to BIA for Final Closeout:

NONE for June, 1995

5.4 CHANGE ORDER SUMMARY

NONE for June, 1995

5.5 PROJECT-TO-DATE CLOSEOUT SUMMARY

AS OF JUNE, 1995

WORK PACKAGE NUMBER	DESCRIPTION	MONTH CLOSED
2E1NO4	Haul NP-PS-14 to Pit	2/90
2E1N11	Relocate NP-PS-13 to Pit	2/90
2E1N12	Cut Slopes NP-OP-19	2/90
2E2SO4	Cut SP-WO-14 Slopes	2/90
2E2SO9	Cut SP-WO-38 Slopes	2/90
2L2L01	G & A (Mobilization)	2/90
2M1LO5	Purchase Small Tools	2/90
2M1LO6	Remodel Project Offices	2/90
2M1LO7	Recondition Jobsite	2/90
2M1LO8	Set Up Shop Facilities	2/90
2M3LO1	Operator Training(Mobilization)	2/90
2S1NO1	Seal PW-2/3 Adit	2/90
2S1SO3	Seal H-1 Adit	2/90
2S1SO5	Plug Drill Holes	2/90
2S3N01	Demolish No. Paguate Structures	2/90
1C2L01 & 02	Interim CMC (Mobilization)	4/90
2M2N01	Land Surveying-No. Paguate	7/90
2S2N01	Dewater No. Paguate Pit	7/90
1C1L01	CMC & Consulting Services-1st Year Plan	11/90
1C1L05 & 02B	Environmental Monitoring-1st Year Plan	11/90
1P1L01	RPM Office-1st Year Plan	11/90
2E1N01	Build No. Paguate Haul Roads	11/90
2E1N03	NP-PS-18 to No. Paguate Pit	11/90
2E1N05	NP-PS-15 to No. Paguate Pit	11/90
2E1N06	NP-PS-16 to No. Paguate Pit	11/90
2E1N07	SP-PS-01 to No. Paguate Pit	11/90
2E2N04	Slope NP-WO-04	11/90
2E2N09	Slope NP-HW-25	11/90
2E2S01	Slope SP-13A/WO-10	11/90
2E2S06	Slope SP-WS-18C/WT-19	11/90
2E2S07	Slope SP-WT-03	11/90
2E2S11	Slope SP-WT-19A	11/90
2E2S12	Slope WS-WM-12	11/90
2E2S15	Slope SP-WT-16/37	11/90
2E2S19	Misc. So. Paguate Sloping	11/90
2E4S07	Cleanup SP-CS-62/33	11/90
2L1L01	LCC G & A 1st Year Plan	11/90
2L2L02	LCC Insurance-Interim Work	11/90
2S2S01	Dewater So. Paguate Pit	11/90

5.5 PROJECT-TO-DATE CLOSEOUT SUMMARY

AS OF JUNE, 1995

WORK PACKAGE NUMBER	DESCRIPTION	MONTH CLOSED
2E1N02	Haul to Pit NP-PS-17	9/91
2E1N10	NP-WT-10 Pit Backfill	9/91
2E1S02	Pit Backfill SP-PS-02	9/91
2E2J15	Cut Slopes JP-WS-15	9/91
2E2N02	Cut Slopes NP-WO-02	9/91
2E2N03	Cut Slopes NP-WS-03	9/91
2E2N08	Cut Slopes NP-WM-12	9/91
2E3N02	Topsoil NP-D2	9/91
2E3N09	Topsoil NP-D3	9/91
2E3N10	Soil Borrow NP-D5	9/91
2E3N14	Shale Borrow for NP-D4	9/91
2E3N15	Shale Borrow for NP-D5	9/91
2E3N18	Shale Borrow for NP-D3	9/91
2E3N19	Shale Borrow for NP-D2	9/91
2E3S16	Shale Borrow for SP-PS-01	9/91
2E3S18	Shale Borrow for SP-WO-04	9/91
2E3S20	SP-38 Shale from SP-WS-07	9/91
2E3N07	Topsoil to NP-D4	11/91
2E3N08	Topsoil to NP-D1	11/91
2E3S13	Topsoil to SP-D1B	11/91
2E3S19	Topsoil to SP-D10	11/91
1C1L01A	Engineering/Consulting Svcs. PY-91	12/91
1C1L05A	PY-91 Environmental Monitoring	12/91
1P1L01A	POL Project Management PY-91	12/91
2E1S03	SP-PS-02 Additional Volume	12/91
2E2S02	Cut Slopes SP-WS-17	12/91
2E2S18	Backfill SP-OP-34(Sh-2)	12/91
2E5N01	Scale N. Paguate Highwalls	12/91
2E5N02	Trim N. Paguate Highwalls	12/91
2E5S01	Scale S. Paguate Highwalls	12/91
2E5S02	Trim S. Paguate Highwalls	12/91
2L2L02A	LCC Insurance PY-91	12/91
2M1X01	Barricade Road ClosurePY-91	12/91
2M2N01	Surveying PY-91	12/91
2M3L02A	Training PY-91	12/91
2S2J01	Dewater Jackpile Pit PY-91	12/91
2S5J02	Construct Fences-Jackpile Area	12/91
2S5N02	Construct Fences-N. Paguate Area	12/91
2S5S02	Construct Fences-S. Paguate Area	12/91

5.5 PROJECT-TO-DATE CLOSEOUT SUMMARY

AS OF JUNE, 1995

WORK PACKAGE NUMBER	DESCRIPTION	MONTH CLOSED
2E2J20	Cut Slope JP-WO-14	12/91
2E2N07	Regrade NP-DN-22	12/91
2E2S03	Cut Slope SP-WO-13B & WS-18A	12/91
2E2S14	Backfill SP-OP-34 (D4-West)	12/91
2E2S16	Backfill SP-OP-34 (D4-East)	12/91
2E2S17	Backfill SP-OP-34 (SP-14)	12/91
2E3J15	Topsoil to H-1 mine area	12/91
2E3S02	Topsoil to SP-D2	12/91
2E3S03	Topsoil to SP-D3	12/91
2E3S08	Topsoil to SP-D8	12/91
2E3S09	Topsoil to SP-D9	12/91
2E3S11	Topsoil to SP-D11	12/91
2E3S17	Shale Cover to SP-14	12/91
2E4N01A	N. Paguate Backfill-East	12/91
2E4N01B	N. Paguate Backfill-West	12/91
2S1S01	Seal P-13 Adit	12/91
2E2J24	Cut Slopes JP-WO-66	9/91
2E3S01	Topsoil to SP-D1	9/91
2E3S14	Shale Cover SP-WO-13A	9/91
2E3S21	Shale Cover SP-WO-10	9/91
2E4N01	Pit Backfill NP-CS-24	9/91
2E1J05	Pit Backfill JP-PS-26	2/92
2E1J06	Pit Backfill JP-WO-10	2/92
2E1J13	JP-W0-03 to Backfill	2/92
2E2J14	JP-W0-11 Cut slopes	2/92
2E2J21	JP-WS-15A Cut slopes	2/92
2E2N01	Cut Bench NP-WO-01	2/92
2E3N04	Soil Cover NP-D9	2/92
2E3N06	Soil Cover NP-D9	2/92
2E3N13	Shale Cover to NP-D9	2/92
2E3N16	Shale to NP-D8	2/92
2E3S04	Soil Cover SP-D4	2/92
2E3S05	Soil Cover SP-D5	2/92
2E3S06	Soil Cover SP-D6	2/92
2E3S07	Soil Cover SP-D7	2/92
2E3S12	Soil Cover SP-D12	2/92
2E4J01	JP-CS-36 to Backfill	2/92
2S1S02	P-10 Closure	2/92
2S1S04	Seal Vent Holes	2/92

5.5 PROJECT-TO-DATE CLOSEOUT SUMMARY

AS OF JUNE, 1995

WORK PACKAGE NUMBER	DESCRIPTION	MONTH CLOSED
2E2J05	Cut JP-WO-72 Slopes	9/92
2E2J22	Cut Slopes JP-WS-19 B & C	9/92
2E2J27	Cut Slopes JP-WO-18B & 66C	9/92
2E3N01	Soil Cover NP-D8	9/92
2E3N02	Soil Cover NP-D7	9/92
2E3N11	Soil Cover NP-D10	9/92
2E3N12	Soil Cover NP-D6	9/92
2E3N16	Shale Cover NP-D8	9/92
2E3N17	Shale Cover NP-D10	9/92
2T2N01	Rio Moquino Benches	9/92
1C1L01B	Consulting Services PY-92	12/92
1C1L05B	Environmental Monitoring PY-92	12/92
1C3L03	Paguate Repairs Fund	12/92
1P1L01B	POL Project Management PY-92	12/92
2E1J02	JP-PS-23 to Backfill	12/92
2E1J07	JP-PS-27 to Backfill	12/92
2E1J14	JP-WS-13 & WO-20 Backfill	12/92
2E2J03	JP-WS-17 to Backfill (Dozers)	12/92
2E2J04	JP-PS-22 Cut Slopes	12/92
2E2J26	JP-WO-18A/66A Cut Slopes	12/92
2E2J28	JP-WO-18C/66C Cut Slopes	12/92
2E3N05	Soil Cover NP-D6	12/92
2E4J02	JP-CS-37/38 to Backfill	12/92
2L2L02B	LCC Insurance PY-92	12/92
2M2J01	Jackpile Surveying PY-92	12/92
2M3L02B	Training PY-92	12/92
2E1J03	JP-PS-24 Pit Backfill	4/93
2E1J04	JP-PS-25 Pit Backfill	4/93
2E1J08	JP-WO-07 Pit Backfill	4/93
2E2J12	JP-WO-06 Cut Slopes	4/93
2E2J13	JP-WO-08/WO-12 Cut Slopes	4/93
2E2J16	JP-WO-05 Cut Slopes	4/93
2E2J19	JP-WO-73 Pit Backfill	4/93
2E3J01	JP-D4 Soil Cover	4/93
2E3J02	JP-D4 Soil Cover	4/93
2E3J20	JP-D2 Shale Cover	4/93
2E3J23	JP-D12 Shale Cover	4/93
2E2J30	JP-WO-03B Cut Slopes	9/93
2E2J31	JP-WO-04A Cut Slopes	9/93

5.5 PROJECT-TO-DATE CLOSEOUT SUMMARY

AS OF JUNE, 1995

WORK PACKAGE NUMBER	DESCRIPTION	MONTH CLOSED
2E2J32	JP-WO-04B Cut Slopes	9/93
2E1J12	JP-WO-71 Pit Backfill	9/93
2E2J10	JP-WO-73 Pit Backfill	9/93
2E2J12	JP-WO-06 Cut Slopes	9/93
2E3J08A	JP-WO-07 Pit Backfill	9/93
2E3J10	Soil JP-D12A	9/93
2E3J11	Soil JP-D16	9/93
2E3J12	Soil JP-D15	9/93
2E3J23	Shale JP-D15	9/93
2E3J27	Shale JP-D14	9/93
2E3J29	Shale JP-D16	9/93
1C1L01C	Engineering Services PY-93	12/93
1C1L05C	Environmental Monitoring PY-93	12/93
1P1L01C	POL Project Management PY-93	12/93
2L2L02C	LCC Insurance PY-93	12/93
2M3L02C	Operator Training PY-93	12/93
2E1J09	JP-WO-12 to Pit Backfill	7/94
2E2J01	JP-WO-11 Backfill	7/94
2E2J02	JP-WT-16 Backfill	7/94
2E3J13	Soil to JP-D4	7/94
2E3J16	Soil to JP-D13	7/94
2E2J29	JP-WO-03A Cut Slopes	7/94
2E3J04	Soil Cover JP-D9A	7/94
2E3J12	Soil to JP-D15	7/94
2E3J26	Shale Cover JP-D13	7/94
2E3J28	Soil to JP-D15	7/94
2T2J01	JP-WS-01 Slopes	7/94
2E1J11	JP-WS-15 Pit Backfill	11/94
2E3J05	Soil Cover JP-D1	11/94
2E3J09	Soil Cover JP-D11	11/94
2E3J24	Shale Cover JP-D8	11/94
2E6N01A	Rio Moquino Erosion Control	11/94
2R1N01	Reseed NP Flat Areas	11/94
2R1N02	Reseed NP Slope Areas	11/94
1C1L01D	Engineering Services PY-94	2/95
1C1L05D	Environmental Monitoring PY-94	2/95
1P1L01D	POL Project Management PY-94	2/95
2L2L02D	LCC Insurance PY-94	2/95
2M3L02D	Operator Training PY-94	2/95

6.1 PERFORMANCE MEASUREMENT/DISCUSSION

No days were lost due to weather; LCC trucks have been parked in June, 1995. Approximately 32.1 million cubic yards of material have been handled through the June, 24, 1995 survey. The Project continues to run about 12 months ahead of the orginal engineer's forecast. Sloping is taking place on the South Paguate dumps and all material handling is done by dozers with scrapers support. Punch list items are being addressed.

6.2 VARIANCE AND VARIANCE EXPLANATIONS

NONE for June, 1995

7.0 APPENDIX A: SPECIAL REPORTS/PLANS

7.1 Marvin Sarracino-Pueblo of Laguna

MONTHLY INSPECTION REPORT--JUNE, 1995

Jackpile Reclamation Project

PUEBLO OF LAGUNA

Office of
Reclamation Project Manager
(505) 242-0506
(505) 552-6011

P.O. BOX 194
LAGUNA, NEW MEXICO 87026

Tribal Building
(505) 243-7616
(505) 552-6654
(505) 552-6655

Date: July 6, 1995

To: Roland E. Johnson
Governor, Pueblo of Laguna

From: Marvin Sarracino
Reclamation Technician II

Ref: *INSPECTION REPORT MONTH OF JUNE, 1995*

The weather this month was not a factor on the earth moving operations of the Laguna Construction Company. No days were lost. No Holiday's were observed this month. No training interrupted the operations of LCC.

The scrapers are parked at the maintenance shop ready for cleaning and maintenance. The South Paguate Dumps are complete.

The Trucks have been parked receiving maintenance.

The dozers have completed working with the scrapers on the South Paguate Dumps. Dozers are parked and ready for cleaning and maintenance.

The RGM-2 is calibrated and running. Data is being collected and logged. No Gamma surveys were done this month. No lunch trailers were on site. Laguna BIA Agency will loan us their instrument when needed.

I would like to remind everyone of the process by which you go through to get a tour of the Jackpile Reclamation Project. The Pueblo of Laguna has put restrictions on tours and the release of information materials from the Jackpile Mine. All tour requests must be made through the Governor's office until further notice. With the Governor's permission contact our office and we will schedule a date. The JRP number is 552-6011. To be on the mine site you Must be Accompanied by a Person from the Reclamation Project staff. LCC must also be notified of your presence on the mine site. This is for your safety and protection; and the protection of the Tribes efforts and interests. The POL phone number is (505) 552-6654. Approved tours will then be conducted by Marvin Sarracino, Reclamation Technician II.

One offical tour of the Jackpile was given this month. The tour was for a summer class from Duke University, Chapel Hill, NC. The class was studying geology of the Southwest Mineral belt in N.M.

The Laguna Construction Company also had the closing ceremonies on June 10, 1995 at the Mine site. This was to officially close out the Jackpile Reclamation Project. The mine site was opened up to the public to tour and see the work that had been done. All went well and a BIG Thank You is extended to LCC for a Job Well Done.

Water Sampling was completed, radiological results pending.

The Reclamation Tech. continues to help out with the Environmental Division Project. No training was attended this month.

The updating of spreadsheets, TMA\Eberline results and other inspection log entries are being maintained in the computer as work continues.

Highlights:

1. All equipment has been parked and is being cleaned and maintenanced.
2. Scrapers & dozers have completed the topsoil cover on the South Paguate Dumps.
3. RGM-2 - data being collected.
4. Radon detectors have been exchanged. Results are in and logged.
5. Water Sampling done. Results Pending.
6. Aerial Photo to be taken in July. Waiting on aerial panels.

HYDROLOGY OF THE JACKPILE-PAGUATE MINE AREA, NEW MEXICO

October 9, 1981

Prepared for:

ANACONDA Copper Company
P. O. Box 638
Grants, New Mexico 87020

Project No. 1240-81

HYDRO-SEARCH, INC.
Consulting Hydrologists-Geologists
333 Flint Street
Reno, Nevada 89501

Submitted by:

070001

John V.A. Sharp, Ph.D.
Principal Hydrologist
Manager, Reno Operations

TABLE OF CONTENTS

		Page
1.0	SUMMARY	1
2.0	INTRODUCTION	3
3.0	SURFACE WATER HYDROLOGY	6
	3.1 WATERSHED CHARACTERISTICS	7
	3.1.1 Rio Moquino	7
	3.1.2 Rio Paguate	8
	3.2 STREAMFLOW	9
	3.3 FLOW SURVEYS	13
	3.4 STANDING WATER BODIES	17
4.0	SURFACE WATER-GROUND WATER RELATIONSHIPS	21
	4.1 INTERACTION BETWEEN SURFACE WATER AND GROUND WATER IN CONSOLIDATED ROCKS	21
	4.2 INTERACTION BETWEEN SURFACE WATER AND GROUND WATER IN UNCONSOLIDATED SEDIMENTS	22
5.0	WATER QUALITY	25
	5.1 SURFACE WATER	25
	5.1.1 Rio Moquino	26
	5.1.2 Seboyetita Creek	35
	5.1.3 Rio Paguate	37
	5.1.4 Laboratory Dissolution Investigation	41
	5.2 GROUND WATER	45
	5.2.1 Jackpile Sandstone	51
	5.2.2 Alluvium	52
	5.2.3 Backfill Material	53
	5.2.4 Laboratory Equilibration Investigation	54
	5.2.5 Ground Water South of Jackpile-Paguate Mine	58
6.0	EFFECTS OF MINING AND RECLAMATION	59
	6.1 SURFACE WATER HYDROLOGY	60
	6.2 WATER QUALITY	61
	6.2.1 Surface Water	61
	6.2.2 Ground Water	62
7.0	SOURCES OF INFORMATION	64

TABLE OF CONTENTS (Cont'd)

Page

TABLES

Table 1. Summary of Standing Water Bodies, Survey of August 1-5, 1980. 19

Table 2. Dissolved Constituents, Rio Paguate, Rio Moquino, and Seboyetita Creek, Jackpile-Paguate Mine Area, New Mexico, August 1, 2, 4, 1980. 27

Table 3. Dissolved Constituents, Rio Paguate and Rio Moquino, Jackpile-Paguate Mine, New Mexico, July 18, 1980. 32

Table 4. Results of Laboratory Dissolution Experiments of Stream Salt Crusts and Ore Stockpile Materials, Jackpile-Paguate Mine, New Mexico. 43

Table 5. Dissolved Constituents, M-Series Wells, Jackpile-Paguate Mine, New Mexico. 46

Table 6. Dissolved Constituents, Off-Site Wells, Jackpile-Paguate Mine, New Mexico. 50

Table 7. Dissolved Constituents, P-10 Underground Water and Simulated Reclaimed Waters, Jackpile-Paguate Mine, New Mexico. 55

FIGURES

Figure 1. Location of Jackpile-Paguate Mine, New Mexico. 4

Figure 2. Relation of Electrical Conductivity to Geologic and Man-Made Influences on Rio Moquino, New Mexico, September 11, 1980. 30

Figure 3. Relation of Electrical Conductivity to Geologic and Man-Made Influences on Seboyetita Creek, New Mexico, August 23, 1980. 36

Figure 4. Relation of Electrical Conductivity to Geologic and Man-Made Influences on Rio Paguate, New Mexico, September 5-6, 1980. 38

TABLE OF CONTENTS (Cont'd)

		Page
	PLATES	
Plate I.	Explanation of Geologic Symbols for Plates II, IV, and V.	In Pocket
Plate II.	Location of Electrical Conductivity Samples and Standing Water Bodies.	In Pocket
Plate III.	Streamflow Hydrographs and Summary of Streamflow Survey.	In Pocket
Plate IV.	Chemical Quality of Surface Water.	In Pocket
Plate V.	Chemical Quality of Ground Water.	In Pocket
	APPENDICES	
A	FINDINGS OF REPORT OF FEBRUARY 26, 1981 REGARDING GROUND-WATER HYDROLOGY OF THE JACKPILE-PAGUATE MINE	A-1
B	GROUND-WATER QUALITY DATA, SOUTH AND WEST OF JACKPILE-PAGUATE MINE, NEW MEXICO	B-1
Table B.	Ground-Water Quality Data, South and West of Jackpile-Paguate Mine, New Mexico.	B-4
Plate B.	Offsite Ground-Water Sample Locations South and West of Jackpile-Paguate Mine.	In Pocket

1.0 SUMMARY

1. Rio Paguate and Rio Moquino drain approximately 107 square miles above the southern boundary of the Jackpile-Paguate Mine. The USGS gaged Rio Paguate about 2 miles north of Paguate Village where the average flow for 1937-41 was about 760 gpm. A USGS gage is currently located on Rio Paguate 1.4 miles south of the confluence with Rio Moquino. The average flow from 1976-1980 has been about 580 gpm.

2. Several streamflow surveys have been conducted by HSI and USGS. The surveys conducted during periods of low evapotranspiration (October-March) show a net gain across the mine of 43-135 gpm. However, the HSI survey conducted in July of 1980, the time of year when evapotranspiration is near a maximum, showed a net loss across the mine of about 83 gpm.

3. Few standing water bodies occur in the vicinity of the mine because of low runoff and high evaporation rates.

4. The primary interaction between surface water and ground water occurs in the unconsolidated alluvium deposits along the stream channels. In the area of the confluence of Rio Moquino and Rio Paguate, the stream deposits act as a mixing zone between water on the surface and ground water discharging from the underlying Jackpile sandstone.

5. Water quality of the streams degrades progressively from their sources in the canyons above the mine to the boundaries of the mine. This degradation, as observed in chemical, radiological and electrical conductivity surveys taken by HSI, is related primarily to the geologic materials traversed, and secondarily to the influences of man.

   Degradation in water quality continues through the mine area, primarily due to concentration by evapotranspiration.

6. Rio Moquino is high in concentration of dissolved constituents in comparison to upper Rio Paguate. Below the confluence, the Rio Paguate water is relatively high in dissolved constituents, showing the influence of admixed Rio Moquino water.

7. The net effects of mining and reclamation on the hydrology of the Jackpile-Paguate mine area can only be inferred because of the general lack of specific pre-mining hydrologic data.

The most obvious effect of mining activities is the alteration of the stream courses. A second, perhaps less obvious effect, is a possible slight decrease in streamflow due to decrease in discharge of ground water from the Jackpile sandstone ground-water system. This is due to diversion of ground water by the mining operations.

Reclamation should not have much effect on streamflow, considering that most flow originates upstream and offsite and that mining does not result in disappearance of streamflow. Eventual recovery of the ground-water system in the Jackpile sandstone and backfill materials could result in a slight increase in streamflow from current levels due to increased discharge from the ground-water system to the streams.

Results of an extensive sampling-analysis program indicate that ground water in the Jackpile sandstone has not been degraded from chemical and radiological standpoints as a result of mining activities.

Laboratory equilibration experiments using backfill material and P-10 underground water showed that even under worst-case conditions, ground-water quality after reaction with backfill materials could be expected to fall within the limits already observed for ground water within the mine.

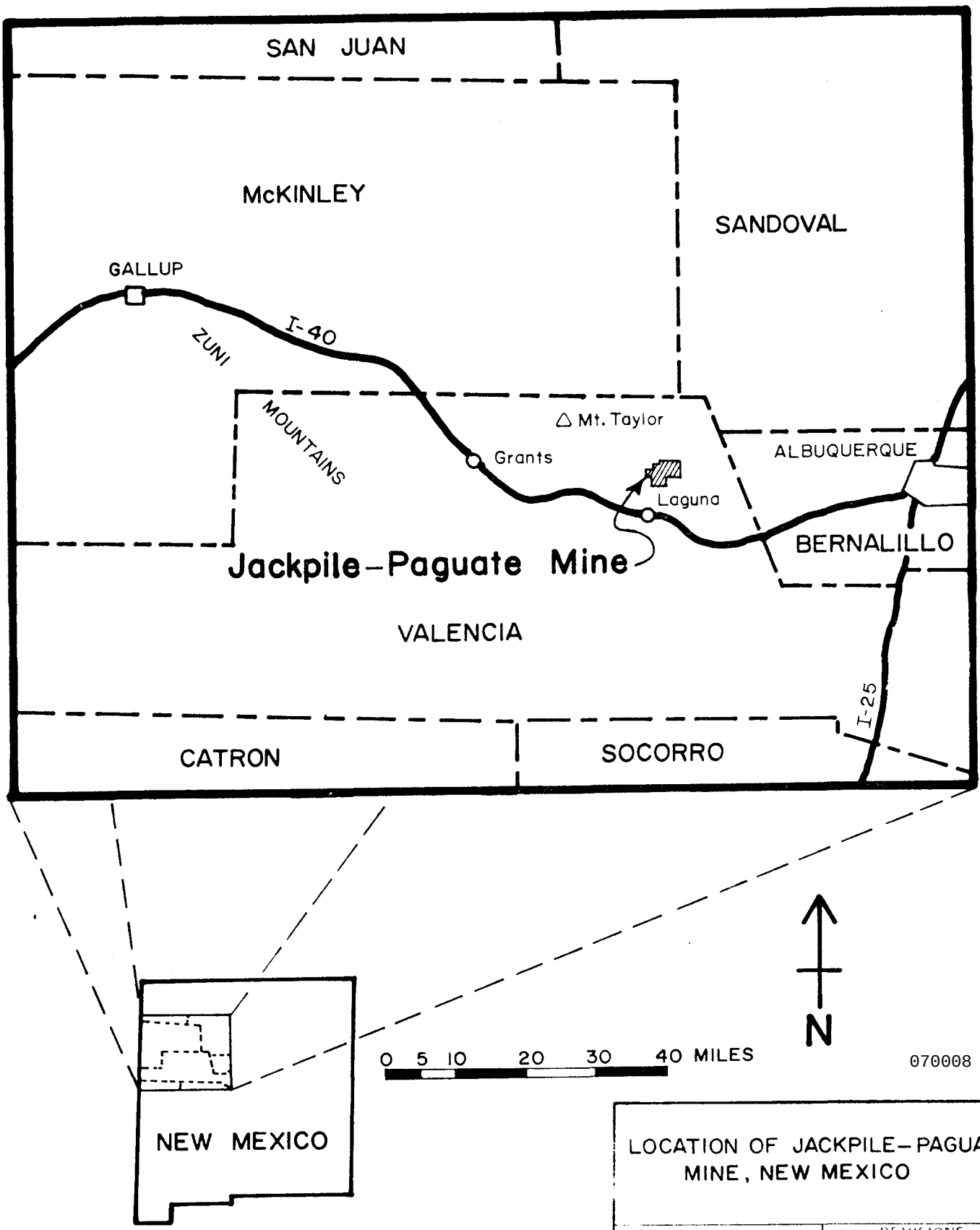
Results of stream surveys indicate that the chemical quality of Rio Paguate and Rio Moquino waters has not been degraded to a noticeable extent as a result of mining activities. Radiological quality of the surface waters may have been affected by mining activity, but the extent cannot be determined because pre-mining concentrations of radioactivity in the stream waters are not known.

2.0 INTRODUCTION

This report presents results of a detailed field and office investigation of the surface water hydrology and related aspects of ground-water hydrology of the Jackpile-Paguate mine and vicinity. The Jackpile-Paguate mine is operated by Anaconda Copper Company (Anaconda), and is located 7 miles northeast of the village of Laguna, Valencia County, New Mexico (Figure 1).

Hydro-Search, Inc. (HSI) was engaged by Anaconda to collect hydrologic data at the mine starting in March 1977. This initial work resulted in a report on the hydrogeologic relationships of the Rabbit Ear and P-10 holding ponds (HSI, 1979). HSI has since collected additional ground- and surface water data at and in the vicinity of the mine, including the construction of 37 hydrologic test wells in the summer and fall of 1980. The data from these wells were used as a basis for a report on the ground-water hydrology of the Jackpile-Paguate mine (HSI, 1981). In the future, the test wells will be used to monitor post-mining ground-water conditions. Hydrologic data had previously been collected intermittently by other groups and agencies, principally Anaconda.

Surface water surveys were conducted by HSI on Seboyetita Creek, Rio Moquino, and Rio Paguate. These surveys started at the origins of the streams on the flanks of Mount Taylor and extended to the southern mine boundary



LOCATION OF JACKPILE–PAGUATE MINE, NEW MEXICO

PROJECT 1240-81	REVISIONS 070008
DATE July 17, 1981	

Hydro-Search, Inc.
070008
CONSULTING HYDROLOGISTS-GEOLOGISTS
Austin • Denver • Reno

FIGURE 1

beyond which Rio Paguate only occasionally flows. The surveys included field measurement of electrical conductivity of stream waters (Chapter 5.0), sampling for water chemistry determinations (Chapter 5.0), and determination of flow rates of the Paguate and Moquino within the mine property (Section 3.3). These data, along with existing data from Anaconda files and published geologic and hydrologic information, form the basis for this report. Sources of information are listed in Chapter 7.0.

Messrs. Philip P. Ross, senior hydrologist; Randall J. Bargelt, hydrogeologist; and Thomas K. Wheeler, senior hydrogeologist prepared this report. Dr. John V.A. Sharp, principal hydrologist, reviewed and submitted the report.

3.0 SURFACE WATER HYDROLOGY

Rio Paguate and Rio Moquino drain approximately 107 square miles above the southern boundary of the Jackpile-Paguate Mine. The streams drain the eastern flank of Mt. Taylor and are intermittent in their uppermost reaches. Downstream some reaches are intermittent while others flow year-round. The minor tributaries of these streams are ephemeral, contributing flow only at times of high runoff from rainfall or snowmelt.

Rio Moquino joins Rio Paguate at about the center of the mine area. Rio Paguate is then tributary to Rio San Jose which drains into Rio Puerco in west-central New Mexico. Rio Puerco, in turn, discharges into Rio Grande approximately 60 miles southeast of the mine.

Average annual precipitation at Laguna is 9.46 inches based on 48 years of U. S. Weather Service data. Approximately 50-60 percent of this precipitation is the result of summer thunderstorms during the period July through September. Rainfall increases northward from Laguna to about 14 inches at the heads of Rio Paguate and Rio Moquino and about 30 inches near the summit of Mount Taylor.

Standing surface water bodies are rare owing to high evaporation rates and the scarcity of precipitation. Artificial stock ponds and irrigation holding reservoirs make up the majority of the water bodies.

3.1 WATERSHED CHARACTERISTICS

3.1.1 Rio Moquino

Rio Moquino heads in Seboyeta Canyon as springs issuing from the upper part of the Point Lookout Sandstone and traverses about 3 miles of Cretaceous sandstones and shales (Plate II). Rio Moquino has cut deeply into the sedimentary rocks and alluvium and the channel is steep and narrow within the canyon.

Just upstream of the village of Moquino, the channel of Seboyetita Creek joins Rio Moquino. Seboyetita Creek heads as spring flow in Bibo Canyon and traverses the same sedimentary rock sequence as Rio Moquino. Most of the base flow is diverted for irrigation about 3.3 miles downstream of the origin and the small amount of flow left in the channel disappears about 1 mile above the confluence (Section 3.2).

An ephemeral tributary to Rio Moquino drains the area east of Seboyeta Peak and joins Rio Moquino one-half mile north of the mine boundary. At the time observations were made on August 5, 1980, no surface water from this drainage was flowing into the Moquino. The Sohio mine tailings pond is located in this drainage, however the pond had no visible outlet and there was no evidence of surface leakage.

The course of Rio Moquino within the mine was relocated by placing excavated

material in and along both sides of the original channel (Anaconda, 1980, Plate 4.2-1). As observed from the U.S. Geological Survey (USGS) Moquino topographic quadrangle and an air photo dated 1951 (Anaconda, 1980, Plate 3.1-1), the pre-mining stream channel followed a meandering course through the mine. The present course of Rio Moquino is relatively straight, having been moved from its original location into a natural tributary to the east.

3.1.2 Rio Paguate

Rio Paguate heads in Bear Canyon and issues from a series of springs and seeps at the contact between the Quaternary-Tertiary basalts and the underlying Cretaceous sedimentary rocks. Downstream from the origin another spring-fed stream enters from a canyon to the northeast. Rio Paguate flows through the sedimentary rock sequence for a distance of about 3 miles. As the Paguate exits Bear Canyon, it flows into a broad area of colluvium. The stream then flows into the alluvium where some of the flow is diverted for irrigation. Downstream of the irrigation diversion, the gradient decreases and the channel becomes relatively wide and shallow. Just west of the mine, irrigation runoff is returned to Rio Paguate, and the channel becomes deeply incised in the alluvium.

Rio Paguate has been relocated by plan over a length of about 6,000 feet in the western portion of the mine to permit mining of the Jackpile

sandstone beneath the natural channel. The original channel was blocked by backfill and the stream has been diverted into a new channel to the south. The channel is constructed of compacted backfill, compacted impervious clay, and riprap with a design flow capacity of 7,000 cubic feet per second (Herkenhoff, 1973). The downstream end of the channel does not return to the original Rio Paguate channel, but discharges into an ephemeral drainage to the south. This diversion caused the confluence with Rio Moquino to move approximately 300 feet downstream of its pre-mining location.

Rio Paguate widens below its confluence with Rio Moquino. In this area, the underlying consolidated rock (Jackpile sandstone, Brushy Basin member of the Morrison Formation) is near the surface and the channel is much less incised. As the Paguate leaves the mine, ephemeral tributaries enter from the east and northeast, and the alluvium becomes thicker and the stream valley wider.

3.2 STREAMFLOW

During the period 1937-1941, the USGS gaged Rio Paguate 2 miles northwest of Paguate Village (Plate II). The average flow rate for that period was about 760 gpm.

Currently, the USGS is operating a recording gage on Rio Paguate at the Atchison, Topeka and Santa Fe Railway bridge, 1.4 miles south of the

confluence with Rio Moquino. The monitoring of this gage began in late March of 1976, and the average flow rate has been about 580 gpm.

The average flow rates of the two stations are not strictly comparable. First, the periods of record are different, and precipitation conditions during the periods may have been different. Second, land use between the two sites has changed, including the uranium mining operations commencing in 1952 and possible changes in irrigation above the mine area.

Factors that affect the streamflow between the two stations include: diversion and return of irrigation water, natural discharge of ground water from the Jackpile sandstone (HSI, 1981, Section 4.2) to the stream, evapotranspiration losses along the channel, and inflow of Rio Moquino and ephemeral streams.

Some general trends in streamflow can be gleaned from the USGS data. The months of moderate flow (about 450 to 1350 gpm) are January to March. During this period the area is subjected to winter frontal-storm activity and evapotranspiration is low. March and April show periods of elevated flow owing to snowpack runoff. June and July have the lowest average flow (less than 200 gpm) owing to the high evapotranspiration and low precipitation rates during these months. May is generally a transition period between the winter and spring runoff and summer base flow. Late July, August and September have short-term high peak flows which are caused

by thundershower activity. However, base flow during this period is low. October, November, and December are months of low to moderate flow (200 to 500 gpm) and are characterized by generally low precipitation and evapotranspiration rates.

HSI examined the streams above the Jackpile-Paguate Mine in detail by walking out the channels during the low base flow period of August and September, 1980. The following discusses the results of this survey.

Rio Moquino

Flow began at the head of Seboyeta Canyon, increasing in the area of the springs to about 400-500 gpm (September 11, 1980) (Plate II). About 2 miles downstream, part of the flow was diverted for irrigation. At the time of the survey, the flow in the main channel just north of the village of Moquino was estimated to be 2-3 gpm. Flow increased through Moquino, possibly due to underflow from Seboyetita Creek or from dispersed irrigation return flow.

Rio Moquino was intermittent across the upper part of the mine. This was due to discharge from the stream to permeable bed materials and indirect discharge from the stream by phreatophytes. The flow became continuous above the confluence with Rio Paguate due to discharge to the stream from the bed materials.

Seboyetita Creek

Springs and seeps at the head of Seboyetita Creek contribute water to the stream over a distance of approximately one-third of a mile. On August 23, 1980, the flow of the fully formed stream was estimated to be approximately 450 gpm and appeared to be constant until diverted for irrigation about 2.2 miles downstream from its origin. At this point, the flow in the main channel decreased and eventually ceased just downstream of sample location SC6 (Plate II).

Rio Paguate

Rio Paguate originates at the contact of Quaternary-Tertiary basalts and the underlying Cretaceous sedimentary rocks. Springs and seeps occur over a distance of about 0.7 mile along the drainage (Plate II). The total flow at the lower end of this seep area was estimated to be approximately 200 gpm on August 1, 1980. Within the seep area, some of the flow was diverted into three stock ponds in the channel. Below this point, discharge remained fairly constant until a spring-fed stream entered the Paguate from the northeast about 2.0 miles from its origin. The streamflow below the confluence was about 1,200 gpm and decreased gradually across the colluvium to about 800 gpm where it was diverted for irrigation. The flow left in the main channel after diversion was about 100 gpm. An irrigation return canal, 25 feet downstream from sample location RP11

west of Paguate Village (Plate II), increased the overall streamflow by approximately 80 gpm.

The flow of Rio Paguate decreased as it traversed the mine property to the vicinity of its confluence with Rio Moquino. In the area of the confluence, flow increased due to the discharge of ground water to the streams (Section 3.3). About one-quarter of a mile south of the mine, the flow ceased as a result of infiltration into the sediments of the stream bed. Aerial inspection of the channel on August 29, 1980 indicated that the channel was dry to Mesita Reservoir.

3.3 FLOW SURVEYS

HSI has conducted several flow surveys on Rio Moquino and Rio Paguate within the mine. Surveys were conducted October 29-November 1, 1977 (HSI, 1979), September 12-14, 1978 (HSI, 1979), and July 15-18, 1980. The surveys of 1977 and 1980 utilized 90° V-notch weirs to measure flow rates at specific points. The 1978 survey was a follow-up to the 1977 survey to identify gaining and losing stretches by visually estimating flows and to obtain additional water chemistry data. The 1977 and 1980 surveys are discussed below.

October-November 1977 Survey

Two weirs were installed on Rio Paguate, one at the western boundary of the mine and one just below the road ford near the south gate. Another

weir was installed on Rio Moquino at the northern boundary of the mine. The average net gain in surface flow through the mine at the time of this survey was 43 gpm (HSI, 1979). During the 1977 survey, Rio Moquino flowed without interruption from the northern mine boundary to the confluence with Rio Paguate. The channel of upper Rio Paguate was dry in two places, both within 2,500 feet of the confluence.

July 15-18, 1980 Survey

This survey included eight stations (Plate III). Two stations were established on Rio Moquino (RM); a weir was constructed on bedrock at the northern mine boundary, RM104, and the second station, RM105, was located at culverts under the main haul road about 300 feet upstream from the confluence with Rio Paguate. The flow at RM105 was diverted through a pipe and was measured with a bucket and stopwatch.

Four streamflow measuring sites were constructed on Rio Paguate (RP). Three of the stations, RP104, RP105, and RP106, were built in culverts by damming the downstream end of the culvert and diverting flow into a discharge pipe. A bucket and stopwatch were used to measure the flow. The fourth station, RP107, consisted of a weir constructed in the alluvium.

Two stations, RP108 and RP109, were used to measure the flow downstream from the confluence. At RP108, a weir was constructed in the alluvium, and the stage was measured with a staff gage. RP109 was located on bed-

rock (sandstone of the Brushy Basin Member of the Morrison Formation) below the ford crossing near the south gate. The stream was dammed and flow was diverted into a discharge pipe. A bucket and stopwatch were used to measure the flow.

Five measurements were taken at approximately the same time each day for four consecutive days at each of the stations. A mean flow rate was calculated for each measurement time. From these averages, a mean daily flow rate was calculated for each location (Plate III). These calculations show an average gain in flow through the confluence area of 8.7 gpm, a result of ground-water discharge to the streams (HSI, 1979 and 1981). These calculations also show an apparent average loss in flow through the mine at the time of this survey of 82.7 gpm, or about 54 percent of the total incoming flows. The loss is attributed to evapotranspiration. This is a minimum value for the loss because the calculation does not take into account the input to stream flow of ground water which is discharged from the Jackpile sandstone.

Hydrographs were constructed to observe diurnal changes in flow and to compare changes in flow between measurement points (Plate III). The decrease in flow from morning to afternoon along both streams indicates an increasing rate of evapotranspiration.

Hydrographs A and D (Plate III) show the effects of a thundershower that

occurred at approximately 3:00 p.m. on July 18, centered around the confluence of the streams. The measurements at stations RM105, RP108, and RP109 indicate an increase in flow as the runoff moved down the streams. The readings taken between 5:00 p.m. and 6:30 p.m. show that the runoff from the thunderstorm had passed and the flow had returned to rates recorded earlier in the day.

During the July 1980 survey, Rio Paguate flowed uninterrupted along its course in the mine. Rio Moquino, however, was dry in three reaches across the mine owing to infiltration and evapotranspiration. The flow resumed directly from the stream bed. Seeps were not observed on either bank, suggesting that in the intermittent sections of the Moquino the flow is regained from underflow in the stream deposits.

Summary

Available information on net gain and loss in flows through the mine area is summarized below:

Agency	Period	Flow Condition	Net Gain (+) or Loss (-)
HSI	7/15-18/80 survey	very low (Paguate 100 yards below road ford = 69.3 gpm)	(-) 82.7 gpm (average)
HSI	10/29-11/1/77 survey	low (Paguate at road ford = 250 gpm)	(+) 43 gpm (average)
USGS*	3/28/75	moderate (Paguate below mine = 400 gpm)	(+) 110 gpm
USGS*	12/17/74	moderate (Paguate below mine = 630 gpm)	(+) 50 gpm
USGS*	11/22/74	moderate (Paguate below mine = 650 gpm)	(+) 135 gpm

* Source, USGS, Albuquerque, New Mexico (referred to in Dames and Moore, 1976, Table 4.2-1).

The values for net gain and loss include the effects of gain in stream flow due to discharge of ground water from the Jackpile sandstone and loss in stream flow due to evapotranspiration along the channels.

3.4 STANDING WATER BODIES

Few standing water bodies occur in the vicinity of the mine because of low runoff and high evaporation rates. Irrigation holding ponds are common, and most are north of the villages of Paguate, Moquino, Bibo, and Seboyeta (Plate II). The ponds are created by placing earthen berms across small ephemeral drainages. These ponds are fed by diversions from Rio

Paguate, Rio Moquino, and Seboyetita Creek (Table 1). Two of the irrigation ponds, known as the Paguate Lakes, are located northwest of Paguate village and are stocked with trout. Two sewage evaporation ponds are located to the southwest and northeast of Paguate village.

Small stock ponds are constructed on ephemeral drainages throughout the area around the mine. Berms of alluvium are pushed across these drainages to collect water during periods of runoff. These stock ponds are normally dry by late summer or early fall.

Holding ponds occur within the mine in excavated pits and contain water that is pumped from the underground workings or from seepage in the open pits. During the history of the mine, these ponds have varied in number, location, area, and depth. The water is either used for dust suppression for the roads within the mine or allowed to evaporate in place. Rabbit Ear and P-10 holding ponds have been reported on previously (HSI, 1979). These ponds no longer exist.

Other mines in the Laguna area have ponds used in conjunction with their operations. The Sohio mine has a tailings pond on an ephemeral tributary to Rio Moquino about 2.4 miles northeast of Moquino village (Plate II).

Mesita Reservoir, south of the mine, had no surface water flowing into

Table 1. Summary of Standing Water Bodies not in the Jackpile-Paguate Mine Area, Survey of August 1-5, 1980.

Reference Number	Standing Water Body	Date	Source	Approximate Percent Full	Comments
SB-1	Mesita Reservoir	8/5	Rio Paguate	1	Mostly marsh area; no inflow at this time; sheep grazing
SB-2	Stock Pond	8/1	Well	Dry	
SB-3	Paguate Lake North	8/2	Rio Paguate Irrigation	50	
SB-4	Paguate Lake South	8/2	Rio Paguate Irrigation	50	
SB-5	Paguate Sewage Pond	8/1	Sewer System	75	Evaporation ponds
SB-6	Paguate Sewage Pond	8/5	Sewer System	80	Lush vegetation east of ponds
SB-7	Stock Pond	8/1	Intermittent Creek	Dry	
SB-8	Stock Pond	8/2	Rio Moquino	Dry	West end of dike is washed out
SB-9	Irrigation Pond	8/2	Seboyetita Creek	25	Irrigation canal
SB-10	Irrigation Pond	8/2	Rio Moquino	25	Irrigation canal
SB-11	Stock Pond	8/2	Ditch from Rio Moquino Springs in Pond	25	Upwelling of springs in northwest area of pond
SB-12	Stock Pond	8/2	Rio Moquino	Dry	
SB-13	Stock Pond	8/2	Seboyetita Creek	Dry	
SB-14	Stock Pond	8/2	Drainage NW of Pond	Dry	Newly renovated
SB-15	Stock Pond	8/2	Drainage	Dry	Dike is breached
SB-16	Stock Pond	8/5	Culvert trending NW-SE	Dry	
SB-17	Tailings Pond	8/5	Wells	60	Sohio

it at the time of observation, August 5, 1980. The reservoir's capacity to store water has been significantly reduced by sedimentation, the majority of which occurred prior to mining activity (Anaconda, 1980, p.32). Approximately 90 percent of the reservoir is now marsh land and is used primarily for grazing by domestic animals. A small pool of water existed at the concrete dam at the south end of the reservoir on August 5, 1980.

4.0 SURFACE WATER-GROUND WATER RELATIONSHIPS

4.1 INTERACTION BETWEEN SURFACE WATER AND GROUND WATER IN CONSOLIDATED ROCKS

The initial interaction between surface water and ground water occurs in the uppermost reaches of the streams above the spring source areas where the streams flow over volcanic rocks (Plate II). Surface flow in these upper reaches is intermittent, occurring during spring runoff of melting snow and during the periods of intense summer rainfall. Some of this surface water infiltrates into the volcanic rocks through fractures along the stream beds. The water is transmitted downward toward the underlying Cretaceous sedimentary rocks through fracture systems. Ground water moves laterally through fractures in the lower part of the basalts, through permeable materials which may occur at the interface with the sedimentary rocks, and through the uppermost permeable sedimentary rocks. This water is then released to the streams as springs at or near the contact of the volcanics and sedimentary rocks. These springs are the source of base flow for the perennial streams. The discharge of these springs probably varies seasonally, but measurements are not available to establish this variation.

Interaction also occurs as the streams traverse the Upper Cretaceous shales and sandstones in the canyons. During periods of spring runoff or intense rainfall runoff, water from the streams probably recharges

the sandstones to a limited extent. During low-flow periods, some of this water would be discharged back to the streams and, thereby, would contribute to the base flow of the streams.

From the mouths of the canyons to the mine boundary, the Mancos Shale predominates and little direct transfer of water occurs between the streams and the Mancos. However, interchange may occur where the Three Sisters Sandstones and Dakota Sandstone are in contact with the streams.

Within the mine, water in the Jackpile sandstone interchanges with water in the streams. This interaction occurs where the Jackpile is in contact with the streams or is directly overlain by stream deposits. The principal discharge area for the Jackpile sandstone ground-water system is in the vicinity of the confluence of Rio Paguate and Rio Moquino where the Jackpile is closest to the surface (HSI, 1981).

The reader is referred to the HSI report of 1981 for a complete discussion of the ground-water hydrology of the Jackpile-Paguate Mine. The findings of this report are included herein as Appendix A.

4.2 INTERACTION BETWEEN SURFACE WATER AND GROUND WATER IN UNCONSOLIATED SEDIMENTS

Alluvium and colluvium comprise the unconsolidated sediments that are in contact with the surface water of the Rio Paguate watershed. The relatively higher porosity and permeability of the unconsolidated materials

permit a greater degree of communication than is possible with the consolidated rocks.

Along the stream channels, unconsolidated stream deposits act as a buffer zone between surface water and ground water in the underlying consolidated rocks. During periods of medium to high flows, stream water enters the alluvium and probably locally recharges the Jackpile sandstone. During periods of low flow, the streams receive water from the alluvium. In turn, the alluvium receives water from the underlying Jackpile sandstone.

Interaction between the streams and unconsolidated sediments also occurs when surface flows are diverted for irrigation upstream of the mine. The water is spread on the fields and that which is not used by plants or evaporated from the soil surface, percolates through the soil and eventually returns to the streams as seepage.

Leakage from man-made ponds and waste disposal systems may also enter the shallow ground-water body and contribute to stream flow.

In the summer months, phreatophytes, which are particularly abundant along the lower stream reaches in the mine area, act as catalysts in the interaction between surface water and ground water. During the heat of the day, the plants remove large quantities of water from the alluvium by transpiration. This induces infiltration into the alluvium and stream

flow rates decrease (Plate III). At night, transpiration decreases and flows in the streams increase. In summary, transpiration and evaporation from the free water surface and wet stream alluvium combine to produce a diurnal fluctuation in flow. These processes also have the effects of precipitating mineral salts and concentrating dissolved chemical constituents in the surface and subjacent ground waters.

5.0 WATER QUALITY

The assessment of water quality is based on data collected by HSI. These data include: 1) an electrical conductivity survey of Rio Moquino, Seboyetita Creek, and Rio Paguate (Plate II, Figures 2-4); 2) a chemical and radiological survey of surface water (Plate IV, Tables 2 and 3) and ground water (Plate V, Tables 5 and 6) on and off the mine; 3) results of a laboratory dissolution investigation using distilled water and salt deposits collected along the Moquino and Paguate and materials derived from several stockpiles along the Paguate (Section 5.1.4); and 4) results of a laboratory equilibration investigation using waste dump and protore materials and P-10 underground water (Section 5.2.4).

This assessment is generally applicable to base flow conditions. The streams are at base flow for most of the year (Section 3.2), and this is the flow condition generally associated with peak concentrations of dissolved chemical constituents.

5.1 SURFACE WATER

The chemical quality of the streams generally degrades as they flow from their sources in the canyons to the confluence of Rio Moquino and Rio Paguate. This degradation is related primarily to the geologic materials traversed by the streams and secondarily to the influences of man. Plate II shows the sample locations and values obtained from the electrical

conductivity (EC) survey. Figures 2 through 4 show the relationship of EC to external influences as the streams progress downstream. Plate IV graphically depicts the chemistry of the streams at their sample points by showing the major cations and anions. The chemical and radiologic data upon which this assessment is based are listed in Tables 2 and 3.

5.1.1 Rio Moquino

Surveys of the Moquino were taken on August 2, 1980 (chemical-samples RM100-RM104, Table 2) and September 11, 1980 (EC-RM1-RM11, Plate II). Near its low-flow source, Rio Moquino water was a calcium bicarbonate type with a total dissolved solids concentration (TDS) of 259 milligrams per liter (mg/l) (RM100, Table 2; Plate IV) and an EC of 360 micromhos per centimeter at 25° C (μm) (RM1, Figure 2).

As Rio Moquino traversed the Upper Cretaceous sedimentary rocks of Seboyeta Canyon, the chemical composition of the water changed very little. However, just below RM3 (RM101 of the chemical survey), streamflow was diverted for irrigation and the small amount of flowing water left in the main channel downstream at RM4 showed an increase in EC to 850 μm (Figure 2). The chemical sample taken farther downstream at RM102 (RM5 of the EC survey) showed a change in water chemistry to a predominantly calcium sulfate type and a degradation in TDS to 999 mg/l (Table 2, Plate IV). EC at RM5 was 1150 μm (Figure 2, Plate II). The degradation between RM3

Table 2. Dissolved Constituents, Rio Paguate, Rio Moquino, and Seboyetita Creek, Jackpile-Paguate Mine Area, New Mexico, August 1, 2, 4, 1980.

Constituent	Detection Limit	8/2/80 Rio Moquino RM 100	RM 101	RM 102	RM 103	RM 104
Temperature, field (Celsius)		17.0	22.0	20.0	31.3	26.5
pH, lab		8.0	8.5	7.9	8.3	8.3
Total Dissolved Solids (evap/calc)		230/259	193/201	972/999	1040/1032	1630/1649
Electrical Conductivity, lab		324	317	1320	1500	2540
HCO_3	0.1	236	115	306	108	159
CO_3	0.1	ND	25	ND	13	13
Cl	3.0	14	9.8	11	22	21
SO_4	4.0	ND	5.0	500	626	1040
F	0.1	0.3	0.4	0.3	0.4	0.4
NO_3	0.1	ND	ND	0.2	ND	ND
PO_4	0.03	ND	ND	ND	ND	ND
Na	1.0	35	20	106	100	225
K	1.0	10	10	12	18	20
Ca	1.0	44	34	144	121	121
Mg	1.0	3.4	7.6	49	60	111
SiO_2	1.0	37	32	25	18	19
As	0.01	ND	ND	ND	ND	ND
Ba	0.05	0.12	0.13	0.62	0.43	0.51
Be	0.01	ND	ND	ND	ND	ND
Cd	0.002	ND	ND	0.002	ND	ND
Cr	0.02	ND	ND	ND	ND	ND
Cl	0.01	---	---	---	---	---
Pb	0.05	ND	ND	ND	ND	ND
Hg	0.0002	ND	ND	ND	ND	ND
Se	0.002	0.002	ND	ND	ND	0.002
Ag	0.005	ND	ND	ND	ND	0.006
Cu	0.005	ND	ND	ND	0.024	ND
Fe	0.01	0.01	ND	0.02	0.02	0.01
Mn	0.005	0.007	ND	0.011	0.011	0.009
Phenols	0.005	---	---	---	---	---
Zn	0.01	ND	ND	ND	ND	ND
Al	0.1	ND	ND	ND	ND	ND
B	0.05	ND	0.17	0.24	0.13	0.23
Co	0.01	ND	ND	ND	ND	ND
Mo	0.05	ND	ND	ND	ND	ND
Ni	0.02	ND	ND	0.03	0.02	0.03
V	0.05	ND	ND	ND	ND	ND
Radiologic						
^{226}Ra (pCi/l $\pm$ 2σ)	0.03	$0.13^{\pm}0.03$	$0.05^{\pm}0.03$	$0.04^{\pm}0.03$	$0.04^{\pm}0.03$	$0.19^{\pm}0.03$
^{228}Ra (pCi/l $\pm$ 2σ)	1 to 2	ND	ND	ND	ND	ND
U(mg/l $\pm$ 2σ)	0.01	ND	ND	ND	ND	ND

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in µmhos/cm @ 25°C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analysis by LFE Environmental Analysis Laboratories, Richmond, California.

See Plate IV for chemical quality diagrams.

Table 2. Dissolved Constituents, Rio Paguate, Rio Moquino, and Seboyetita Creek, Jackpile-Paguate Mine Area, New Mexico, August 1, 2, 4, 1980 (Cont'd).

Constituent	Detection Limit	8/4/80 Seboyetita Creek SC 100	SC 101
Temperature, field (Celsius)		18.2	26.5
pH, lab		8.0	8.3
Total Dissolved Solids (evap/calc)		184/203	580/572
Electrical Conductivity, lab		286	907
HCO_3	0.1	160	159
CO_3	0.1	ND	6.0
Cl	3.0	11	25
SO_4	4.0	10	267
F	0.1	0.2	0.2
NO_3	0.1	ND	ND
PO_4	0.03	ND	ND
Na	1.0	10	28
K	1.0	13	11
Ca	1.0	23	102
Mg	1.0	15	26
SiO_2	1.0	41	28
As	0.01	ND	ND
Ba	0.05	0.33	0.17
Be	0.01	ND	ND
Cd	0.002	ND	ND
Cr	0.02	ND	ND
Cl	0.01	---	---
Pb	0.05	ND	ND
Hg	0.0002	ND	ND
Se	0.002	ND	ND
Ag	0.005	ND	ND
Cu	0.005	ND	0.005
Fe	0.01	0.01	0.02
Mn	0.005	0.008	0.007
Phenols	0.005	---	---
Zn	0.01	ND	ND
Al	0.1	ND	ND
B	0.05	0.30	0.25
Co	0.01	ND	ND
Mo	0.05	ND	ND
Ni	0.02	ND	ND
V	0.05	ND	ND
Radiologic			
^{226}Ra (pCi/l $\pm$ 2σ)	0.03	0.05$\pm$0.03	0.06$\pm$0.03
^{228}Ra (pCi/l $\pm$ 2σ)	1 to 2	ND	ND
U(mg/l $\pm$ 2σ)	0.01	ND	ND

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in µmhos/cm @ 25°C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analysis by LFE Environmental Analysis Laboratories, Richmond, California.

See Plate IV for chemical quality diagrams.

Table 2. Dissolved Constituents, Rio Paguate, Rio Moquino, and Seboyetita Creek, Jackpile-Paguate Mine Area, New Mexico, August 1, 2, 4, 1980 (Cont'd).

Constituent	Detection Limit	8/1/80 Rio Paguate RP 100	RP 101	RP 102	RP 103
Temperature, field (Celsius)		17.5	19.0	22.0	25.3
pH, lab		7.4	8.2	8.3	8.3
Total Dissolved Solids (evap/calc)		162/177	183/191	288/295	440/469
Electrical Conductivity, lab		238	265	432	680
HCO_3	0.1	140	153	159	293
CO_3	0.1	ND	ND	13	19
Cl	3.0	11	16	29	18
SO_4	4.0	ND	ND	38	100
F	0.1	0.2	0.2	0.2	0.4
NO_3	0.1	ND	ND	ND	ND
PO_4	0.03	ND	ND	ND	ND
Na	1.0	15	21	20	30
K	1.0	10	10	11	11
Ca	1.0	22	20	36	89
Mg	1.0	5.4	11	21	26
SiO_2	1.0	44	37	48	30
As	0.01	ND	ND	ND	ND
Ba	0.05	0.10	0.12	0.15	0.32
Be	0.01	ND	ND	ND	ND
Cd	0.002	0.002	ND	ND	ND
Cr	0.02	ND	ND	ND	ND
CN	0.01	---	---	---	---
Pb	0.05	ND	ND	ND	0.01
Hg	0.0002	ND	ND	ND	ND
Se	0.002	0.002	0.002	ND	ND
Ag	0.005	ND	ND	ND	ND
Cu	0.005	0.22	0.005	0.016	ND
Fe	0.01	0.10	0.02	0.02	0.01
Mn	0.005	0.045	0.008	0.006	0.015
Phenols	0.005	---	---	---	---
Zn	0.01	ND	ND	ND	ND
Al	0.1	ND	ND	ND	ND
B	0.05	0.10	0.28	0.30	1.5
Co	0.01	ND	ND	ND	ND
Mo	0.05	ND	ND	ND	ND
Ni	0.02	ND	ND	ND	ND
V	0.05	ND	ND	ND	ND
Radiologic					
^{226}Ra (pCi/l $\pm$ 2σ)	0.03	0.16±0.03	ND	0.04±0.03	0.05±0.03
^{228}Ra (pCi/l $\pm$ 2σ)	1 to 2	ND	ND	ND	ND
U(mg/l $\pm$ 2σ)	0.01	ND	ND	ND	ND

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in μmhos/cm @ 25°C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analysis by LFE Environmental Analysis Laboratories, Richmond, California.

See Plate IV for chemical quality diagrams.

EXPLANATION

RM1-RM13 ⊙ EC DETERMINATION - Plate II.

(RM100)-(RM105) CHEMICAL SAMPLE - Tables 2 and 3, Plate IV.

GEOLOGY

Kpu	Upper part of Point Lookout Sandstone
Kmsa	Satan Tongue of Mancos Shale
Kph	Hosta Tongue of Point Lookout Sandstone
Kcg	Gibson Coal Member of Crevasse Canyon Formation
Kcd	Dalton Sandstone Member of Crevasse Canyon Formation
Kmm	Mulatto Tongue of Mancos Shale
Kcdi	Dilco Coal Member of Crevasse Canyon Formation
Kg	Gallup Sandstone
Km	Mancos Shale
Kms_3	Third Sister Sandstone of Mancos Shale
Kms_2	Second Sister Sandstone of Mancos Shale
Kms_1	First Sister Sandstone of Mancos Shale
Kd	Dakota Sandstone
Jmj	Jackpile sandstone of Morrison Formation
Jmb	Brushy Basin Member of Morrison Formation

sh	shale
slst	siltstone
mdst	mudstone
ls	limestone

Figure 2. Relation of Electrical Conductivity to Geologic and Man-Made Influences on Rio Moquino, New Mexico, September 11, 1980.

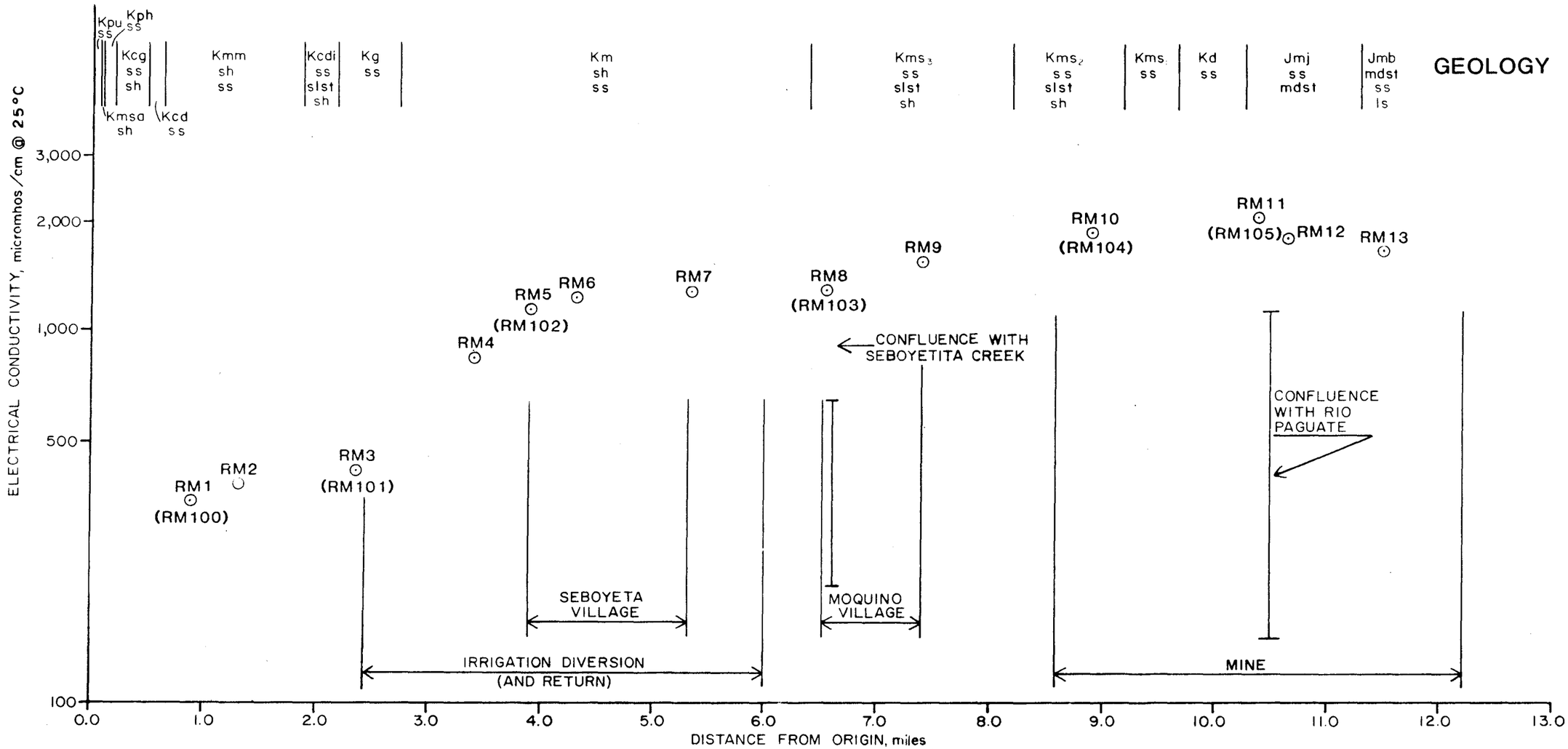


Figure 2. Relation of Electrical Conductivity to Geologic and Man-Made Influences on Rio Moquino, New Mexico, September 11, 1980

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and RM5 may be the result of irrigation return flow, concentration by evaporation of the very low flows, or dissolution of chemical constituents from the Mancos Shale.

As Rio Moquino traversed the alluvium between RM5 and RM8 (RM103 of chemical survey), little degradation occurred in TDS and the chemical type remained calcium sulfate with a decrease in the proportion of bicarbonate. The confluence of Rio Moquino and Seboyetita Creek is just below RM8 and the increase in EC between RM8 and RM9 may be attributable to underflow from Seboyetita. However, the gradual degradation in EC between RM8 (RM103), 9, and 10 (RM104) may also be correlated to the stream's traverse across sediments derived from the Three Sisters Sandstones. The chemistry of Rio Moquino water also made an abrupt change in this reach. RM103 was a calcium sulfate water whereas RM104, just within the mine boundary, was a mixed cation sulfate type, showing an increase in sodium and magnesium.

The water chemistry of Rio Moquino within the mine has been surveyed on three occasions by HSI. The first two of these surveys are discussed in a previous report (HSI, 1979). The third survey was on July 18, 1980, the final day of the stream flow survey of July 15-18, 1980 (Section 3.3).

HSI found on July 18, 1980 that the Moquino increased in TDS from 1617 mg/l to 2451 mg/l between RM104 and RM105 (Table 3). The water type at

Table 3. Dissolved Constituents, Rio Paguate and Rio Moquino, Jackpile-Paguate Mine, New Mexico, July 18, 1980.

Constituent	Detection Limit	7/18/80 Rio Moquino RM 103	RM 104	RM 105
Temperature, field (Celsius)		15.0	17.0	16.0
pH, lab		8.3	7.8	8.3
Total Dissolved Solids (evap/calc)		1170/1080	1600/1617	2590/2451
Electrical Conductivity, lab		1520	2260	2950
HCO_3	0.1	284	242	260
CO_3	0.1	ND	ND	18
Cl	3.0	11	15	28
SO_4	4.0	583	1000	1550
F	0.1	0.3	0.5	0.8
NO_3	0.1	ND	ND	ND
PO_4	0.03	ND	ND	ND
Na	1.0	109	205	330
K	1.0	8.0	11	17
Ca	1.0	136	111	198
Mg	1.0	67	129	160
SiO_2	1.0	25	26	20
As	0.01	ND	ND	ND
Ba	0.05	0.70	0.20	0.90
Be	0.01	ND	ND	ND
Cd	0.002	0.004	ND	0.006
Cr	0.02	ND	ND	ND
CN	0.01	---	---	---
Pb	0.05	ND	ND	ND
Hg	0.0002	0.0011	ND	0.0007
Se	0.002	ND	ND	ND
Ag	0.005	ND	ND	0.020
Cu	0.005	0.015	0.025	0.015
Fe	0.01	0.05	ND	0.05
Mn	0.005	0.025	0.10	0.080
Phenols	0.005	---	---	---
Zn	0.01	ND	0.02	0.01
Al	0.1	ND	0.1	0.1
B	0.05	0.12	0.12	0.20
Co	0.01	ND	ND	ND
Mo	0.05	ND	ND	ND
Ni	0.02	ND	ND	0.02
V	0.05	ND	ND	ND
Radiologic				
^{226}Ra (pCi/l $\pm$ 2σ)	0.03	0.07$\pm$0.03	0.05$\pm$0.03	0.93$\pm$0.04
^{228}Ra (pCi/l $\pm$ 2σ)	1 to 2	ND	ND	ND
U(mg/l $\pm$ 2σ)	0.01	ND	ND	0.07±0.01

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in umhos/cm @ 25°C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analysis by LFE Environmental Analysis Laboratories, Richmond, California.

See Plate IV for chemical quality diagrams.

Constituent	Detection Limit	7/18/80 Rio Paguate RP 103	RP 104	RP 107	RP 108	RP 109
Temperature, field (Celsius)		14.0	17.5	17.5	17.0	18.0
pH, lab		8.0	7.8	7.9	7.9	7.7
Total Dissolved Solids (evap/calc)		614/613	510/549	581/605	1340/1228	1630/1586
Electrical Conductivity, lab		924	810	853	2070	2360
HCO_3	0.1	363	331	274	319	293
CO_3	0.1	ND	ND	ND	ND	ND
Cl	3.0	11	8.0	10	15	20
SO_4	4.0	189	180	250	665	925
F	0.1	0.3	0.3	0.3	0.5	0.6
NO_3	0.1	ND	ND	ND	ND	ND
PO_4	0.03	ND	ND	ND	ND	ND
Na	1.0	44	45	60	135	205
K	1.0	3.3	3.3	3.3	6.0	8.5
Ca	1.0	115	65	58	125	135
Mg	1.0	30	46	53	93	121
SiO_2	1.0	41	38	35	30	25
As	0.01	ND	ND	ND	ND	ND
Ba	0.05	0.65	0.90	0.75	0.50	0.55
Be	0.01	ND	ND	ND	ND	ND
Cd	0.002	0.002	0.004	ND	0.008	ND
Cr	0.02	ND	ND	ND	ND	ND
Cl	0.01	---	---	---	---	---
Pb	0.05	ND	ND	ND	ND	ND
Hg	0.0002	0.0008	ND	ND	0.0005	ND
Se	0.002	ND	ND	ND	ND	ND
Ag	0.005	0.005	ND	ND	ND	ND
Cu	0.005	0.005	ND	ND	0.005	ND
Fe	0.01	0.04	ND	ND	ND	ND
Mn	0.005	0.030	0.005	0.025	0.17	0.10
Phenols	0.005	---	---	---	---	---
Zn	0.01	0.01	0.01	ND	0.20	ND
Al	0.1	ND	ND	ND	0.2	ND
B	0.05	0.05	0.15	0.10	0.05	0.20
Co	0.01	ND	ND	ND	0.02	ND
Mo	0.05	ND	ND	ND	ND	ND
Ni	0.02	ND	ND	ND	ND	ND
V	0.05	ND	0.05	ND	ND	ND
Radiologic						
^{226}Ra (pCi/l $\pm$ 2σ)	0.03	0.04 ± 0.03	0.09 ± 0.03	1.5 ± 0.09	2.3 ± 0.1	5.9 ± 0.3
^{228}Ra (pCi/l $\pm$ 2σ)	1 to 2	ND	ND	ND	ND	ND
U(mg/l $\pm$ 2σ)	0.01	ND	ND	0.02 ± 0.01	0.1 ± 0.01	$0.17 \pm .01$

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in µmhos/cm @ 25°C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analysis by LFE Environmental Analysis Laboratories, Richmond, California.

See Plate IV for chemical quality diagrams.

both stations was a mixed cation sulfate type continuing the well-established trend from far upstream of increase in TDS and in relative concentrations of magnesium, sodium, and sulfate. The proportions of ions were essentially the same at RM104 and RM105 (Plate IV), suggesting that the chemical degradation across the mine was due primarily to concentration by evaporation and transpiration.

An EC survey on July 13, 1980 showed a greater than expected degradation in the lowermost reach of the Moquino (Plate II). Survey notes indicate a light rain was falling when station C (EC, 2100 µm) was sampled at 2:45 p.m. By 3:00 p.m., light to moderate rain was falling at Station D (EC, 2100 µm) and it was still raining at station E (EC, 2800 µm) at 3:35 p.m. Station F was sampled at 3:50 p.m. and shows the greatest amount of degradation (EC, 4400 µm), about an hour after the first report of rain. This degradation was possibly a result of dissolution of previously precipitated salts as the stream stage rose (Section 5.1.4). This type of runoff event, as well as the resultant degradation of water chemistry, is of short duration.

The radiologic content of the water in Rio Moquino is fairly low throughout its course with no uranium detected and generally less than 0.1 picocurie per liter (pCi/l) of Ra-226 at all sampling stations except RM105 immedi-

ately above the confluence with Rio Paguate (Tables 2 and 3). Concentrations of Ra-228 at all Moquino sampling sites were below the detection limit of 1 to 2 pCi/l.

RM105 shows a uranium concentration of 0.07 mg/l and Ra-226 of 0.93 pCi/l (Table 3). However, without knowing the concentrations of radiological constituents prior to mining activities, it is difficult to say if this is more than the stream would have increased under natural conditions as it flowed over the Jackpile sandstone at and immediately above RM105.

5.1.2 Seboyetita Creek

Surveys of Seboyetita Creek were taken on August 4, 1980 (chemical-samples SC100 and SC101, Table 2)) and August 23, 1980 (EC-SC1-SC6, Plate II). During base flow periods, Seboyetita Creek originates as spring flow in the upper part of the Point Lookout Sandstone. The water in this reach was a calcium magnesium bicarbonate type with TDS content of 203 mg/l (SC100, Table 2; Plate IV) and an EC of 260 µm (SC3, Figure 3).

The water picked up very little dissolved constituents down Bibo Canyon as indicated by the consistent readings of EC between SC1 and SC3 (Plate II, Figure 3). At SC4 there was a slight increase in EC corresponding to the stream's traverse over the Mancos Shale. Just below SC4, water from Seboyetita Creek was diverted for irrigation. The rise in EC between SC4 and SC5 could be the result of irrigation return flow which had picked

EXPLANATION

SC1-SC6
⊙
EC DETERMINATION - Plate II.

(SC100)&(SC101)
CHEMICAL SAMPLE - Table 2, Plate IV.

GEOLOGY

Kpu	Upper part of Point Lookout Sandstone
Kmsa	Satan Tongue of Mancos Shale
Kph	Hosta Tongue of Point Lookout Sandstone
Kcg	Gibson Coal Member of Crevasse Canyon Formation
Kcd	Dalton Sandstone Member of Crevasse Canyon Formation
Kmm	Mulatto Tongue of Mancos Shale
Kcdi	Dilco Coal Member of Crevasse Canyon Formation
Kg	Gallup Sandstone
Km	Mancos Shale

ss	sandstone
sh	shale
slst	siltstone

Figure 3. Relation of Electrical Conductivity to Geologic and Man-Made Influences on Seboyetita Creek, New Mexico, August 23, 1980.

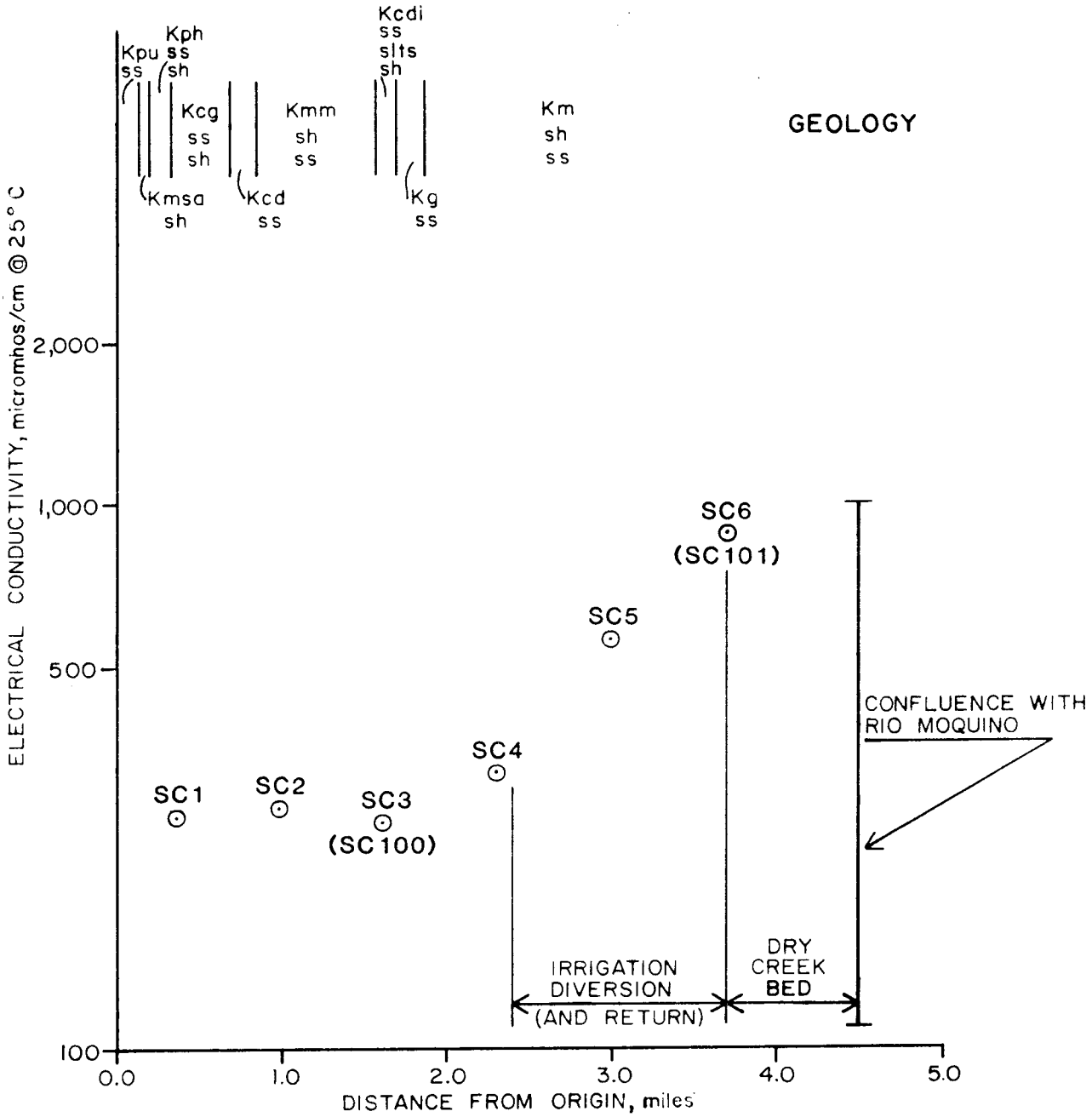

Figure 3. Relation of Electrical Conductivity to Geologic and Man-Made Influences on Seboyetita Creek, New Mexico, August 23, 1980.

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up dissolved constituents as it moved through the fields. Below SC5, very little flow occurred in the stream and it was nearly stagnant in places, allowing concentration of the dissolved constituents by evaporation. This can be seen by the increase in EC at SC6. Chemical sample SC101 was taken at location SC6 and the analysis (Table 2, Plate IV) indicates a calcium sulfate water. This water type may be the result of irrigation return flow or may be correlated to the stream's traverse through gypsiferous Mancos-derived sediments.

At the time of our surveys, surface flow in Seboyetita Creek stopped just below SC6, and the stream was dry to its confluence with Rio Moquino.

5.1.3 Rio Paguate

Surveys of the Paguate were taken on August 1, 1980 (chemical samples RP100-RP103, Table 2) and September 5-6, 1980 (EC-RP1-RP17, Plate II). At its low flow origin, Rio Paguate water was a calcium bicarbonate type much like Seboyetita Creek and Rio Moquino (RP100, Table 2; Plate IV). It was, however, lower in TDS than the other two, probably owing to its origin as spring flow at the contact of Tertiary basalts and underlying Cretaceous sedimentary rocks, rather than flowing directly from the sedimentary rocks. The Paguate water did not degrade significantly or change chemical composition between RP1 (RP100) and RP7 (RP101) (Figure 4, Table 2, Plate IV). Below RP7, the Paguate flows across colluvium, most of which is of volcanic origin. The colluvium is intermixed with Mancos

EXPLANATION

RP1-RP17
⊙
(RP100)-(RP104)
(RP107)-(RP109)

EC DETERMINATION - Plate II.

CHEMICAL SAMPLES - Tables 2 and 3.

GEOLOGY

Qc	Colluvium
Qtb_3	Basalt Flow
Qtb_2	Basalt Flow
Kcd	Dalton Sandstone Member of Crevasse Canyon Formation
Kcdi	Dilco Coal Member of Crevasse Canyon Formation
Kg	Gallup Sandstone
Km	Mancos Shale
Kms_3	Third Sister Sandstone of Mancos Shale
Kms_2	Second Sister Sandstone of Mancos Shale
Kms_1	First Sister Sandstone of Mancos Shale
Kd	Dakota Sandstone
Jmj	Jackpile sandstone of Morrison Formation
Jmb	Brushy Basin Member of Morrison Formation

ss	sandstone
sh	shale
slst	siltstone
mdst	mudstone
ls	limestone

Figure 4. Relation of Electrical Conductivity to Geologic and Man-Made Influences on Rio Paguate, New Mexico, September 5-6, 1980.

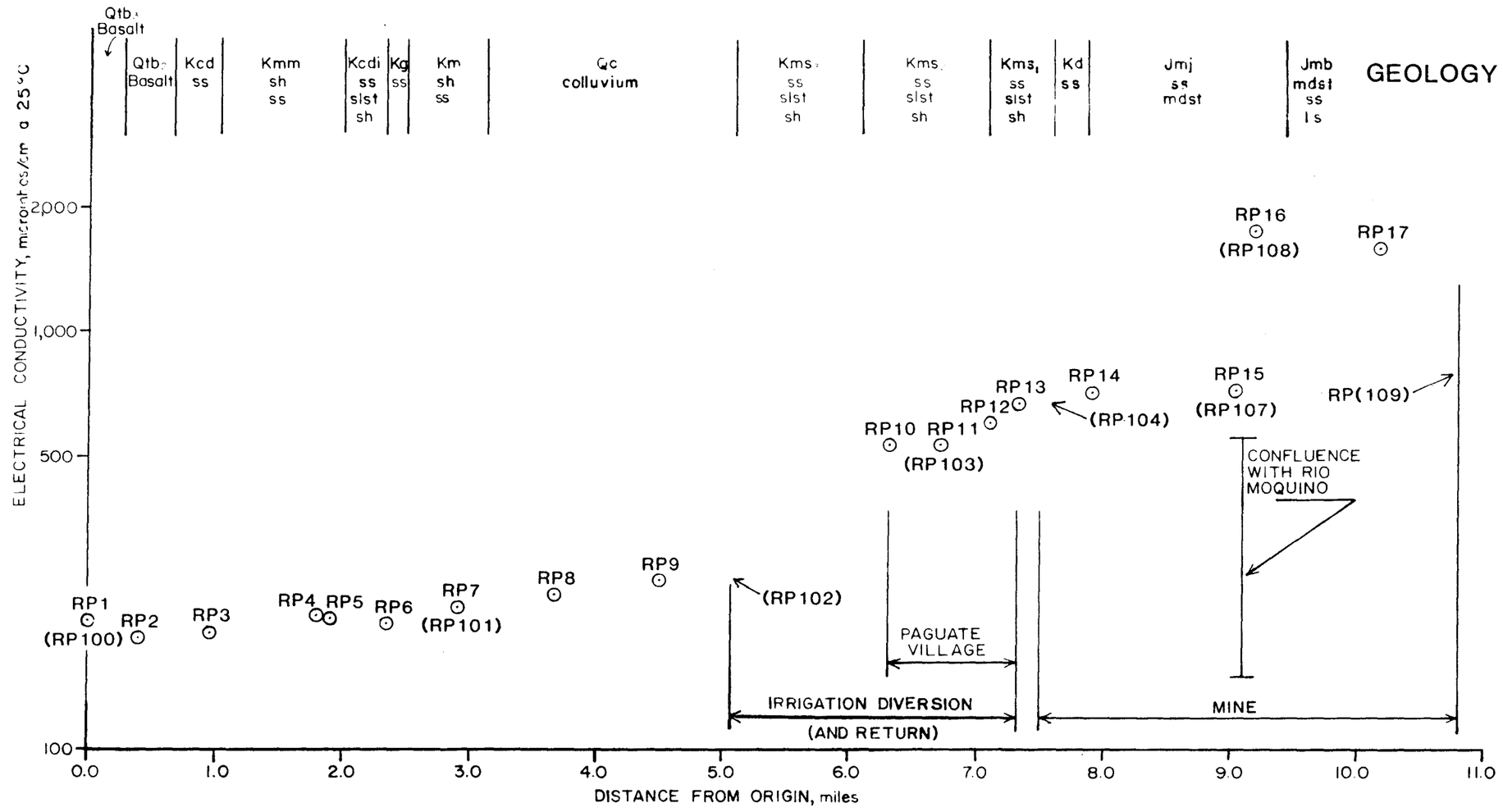

Figure 4. Relation of Electrical Conductivity to Geologic and Man-Made Influences on Rio Paguate, New Mexico, September 5-6, 1980.

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Shale, which may account for the slight degradation in EC from RP7 to RP9 (Figure 4). Below RP9, water was diverted for irrigation, leaving only a small flow in the main channel. Chemical sample RP102, taken just above the diversion and below RP9, showed an increase in TDS of about 100 mg/l over RP101 (Table 2). The EC value at RP10, approximately two miles downstream from RP9, was 540 µm, which is more than double the value at RP9 (Plate II). This increase was probably due to evaporation of the extremely low flow left in the main channel below the diversion, but it may also have been related to seepage from irrigated fields.

The Paguate degraded further as it passed by Paguate village, receiving inflow from irrigation returns and flowing through man-made debris dumped into the channel at several locations. The chemistry at RP103, just above the irrigation return, indicates a calcium bicarbonate type water. The EC at RP13 just above the mine boundary was 675 µm, probably degraded by irrigation return.

A water chemistry survey of Rio Paguate within the mine was taken by HSI on July 18, 1980. The water at station RP104 (Table 3), just inside the mine boundary, was a magnesium calcium bicarbonate type with higher proportions of magnesium and sulfate than were found at RP103 (Plate IV). The chemical degradation above the confluence within the mine, between RP104 and RP107, was minimal. RP107 increased in proportions of magnesium and sulfate and was slightly higher in TDS relative to RP104 (Plate IV,

Table 3). This continued the trend from upstream of increase in dissolved constituents and in concentrations of magnesium and sulfate.

During periods of extremely low flow, as in the summer of 1978, the Paguate becomes intermittent within one-half mile of the confluence (HSI, 1979, p.39-40), and the water quality at RM107 can become severely degraded. This degradation may be due to relatively poor quality water from Rio Moquino moving southward in the subsurface in alluvium and then returning to the surface as flow in Rio Paguate immediately above the confluence. Water samples taken at RP107 (Rio Paguate) and RM105 (Rio Moquino) in the summer of 1978 were nearly identical in chemical composition (mixed cation sulfate type) with TDS concentrations of 2,554 and 2,540 mg/l, respectively (HSI, 1979, p.36).

Below the confluence of the Moquino and Paguate (RP108), the water quality of Rio Paguate is usually worse than the Paguate above the confluence (RP107) and usually better than the Moquino above the confluence (RM105). This situation is due to mixing of the two usually different waters. RP108 and RP109 are generally dilute copies of the mixed cation sulfate type of water typical of Rio Moquino. The stronger influence of the Moquino water is due to the greater chemical flux of the Moquino relative to the Paguate.

Rio Paguate had relatively low concentrations of radiological constituents

from its source to RP104 (Tables 2 and 3). Ra-226 concentrations for the most part were less than 0.1 pCi/l. Uranium and Ra-228 concentrations were below the detection limits of 0.01 mg/l and 1 to 2 pCi/l, respectively. At RP107, the concentration of Ra-226 increased sharply and uranium was just above the detection limit at 0.02 mg/l (Table 3). The radiologic analyses for RP108 and RP109 show increasing concentrations of uranium and Ra-226. Concentration of Ra-228 was below detection limit at all sample points.

5.1.4 Laboratory Dissolution Investigation

Water quality in the vicinity of the confluence is degraded to a slight degree along both Rio Paguate and Rio Moquino. HSI conducted laboratory experiments to determine if the degradation is attributable to either dissolution of salt crusts or dissolution of minerals present in uranium-bearing materials in and along the stream beds.

Streambed Salts

Whitish to grayish salts of natural origin occur as crusts on rocks and bank materials. During periods of constant and declining stream stage, water in the stream deposits is brought to the surface by capillary action where salts are precipitated by evaporation. Remobilization by dissolution of the salts occurs during periods of rising stream stage.

Three salt samples, one each from Rio Paguate (#1) and Rio Moquino (#2) above the confluence and one from Rio Paguate (#3) below the confluence, were equilibrated with 4,000 ml of distilled water for approximately 65 hours on a reciprocating shaker. The supernatant water was clarified by filtration through a 0.45 micron filter and analyzed.

Results indicate that the salts are magnesium sodium (#1, 3) and magnesium aluminum (#2) sulfates (Table 4). These salts are highly soluble, with the fraction of solids dissolved during the experiments ranging from 0.36 to 0.63 (Table 4).

Because of the relatively minor amount of salts present in the streambed and their relatively high solubility, probably the only time that dissolution of salts has a perceptible effect on quality of stream water is during the early stages of a rapid increase in stream flow following an extended period of stable flow. The Moquino survey of July 18, 1980 showed such a brief increase in EC associated with a rainfall event (p.15, Plate III).

Uranium-Mineralized Rock Material

Samples of uranium-mineralized rock material were collected from small alluvial fans at the southern base of ore stockpiles 1C and 2D. The samples were combined and equilibrated with 7200 ml of distilled water on a reciprocating shaker for approximately 65 hours. The supernatant water was then filtered through a 0.45 micron filter and analyzed.

Table 4. Results of Laboratory Dissolution Experiments of Stream Salt Crusts and Ore Stockpile Materials, Jackpile-Paguate Mine, New Mexico.

	Salt Sample #1 Rio Paguate above confluence with Rio Moquino 9-13-78	Salt Sample #2 Rio Moquino above confluence with Rio Paguate 9-13-78	Salt Sample #3 Rio Paguate below confluence with Rio Moquino 9-13-78	Material Sample #4 Material washed from ore stockpiles 1C & 2D 9-13-78
Equilibration:				
dry solid, g	16.6 (salt)	132. (salt)	35. (salt)	2,466. (material)
distilled water, ml.	4,000	4,000	4,000	7,200
dissolved solid, g	8.3	47.27	22.20	6.31
fraction solid dissolved	0.50	0.36	0.63	0.0026
Supernatant Water:				
pH	9.55	3.18	9.30	4.38
TDS (calc.), mg/l	2,068	11,817*	5,551	876**
Elec. Cond., µmhos/cm @ 25°C	2,800	8,550	6,250	1,220
	mg/l	mg/l	mg/l	mg/l
HCO_3^-	44.3	---	43.0	---
$CO_3^=$	---	---	---	---
Cl^-	20	25	72	2
$SO_4^=$	1,500	10,300	4,000	650
Na^+	228	257	925	11.2
K^+	7	0.6	16.4	7.2
Ca^{++}	12.8	24.8	31	111
Mg^{++}	218	1,210	485	77
Uranium, mg/l	1.89±0.09	0.52±0.03	0.86±0.04	5.9±0.30
Ra-226, pCi/l	3.4 ±0.2	0.67±0.07	3.5 ±0.2	93. ±5.

Note: *TDS includes Al^{+3} = 760 mg/l, Mn^{++} = 41 mg/l, and SiO_2 = 3.5 mg/l.
**TDS includes Al^{+3} = 6.5 mg/l, Mn^{++} = 2.45 mg/l, and SiO_2 = 9 mg/l.
Other equilibrations showed negligible Al^{+3} and Mn^{++}, and SiO_2 was not determined.
Equilibrations and chemical analyses by Water Chemistry Laboratory, Desert Research Institute, Reno, NV.
Radiological analyses by LFE Environmental Laboratories, Richmond, CA.

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The analysis shows that the supernatant water is a magnesium calcium sulfate type with a TDS of 876 mg/l (Table 4). The fraction of rock material dissolved during the experiment was 0.0026.

The ratio of mineralized material to water and the period of exposure to the water were probably higher and longer in the dissolution experiment than would occur under field conditions. This bias in experimental characteristics would tend to maximize the laboratory dissolution of both chemical and radiological species. Thus, the concentrations of radiological and chemical species would tend to be maxima, and the actual mobilization under field conditions would tend to be less.

The above evidence indicates that mobilization of chemical species from mineralized rock material, either in the stream beds or as a result of water running off of piles of broken mineralized rock, is not responsible for the observed increase in chemical loading of the streams across the mine.

Conclusions

It is reasonable to conclude from these experiments and the field evidence that streambed salts could contribute to a brief, low-level degradation of chemical and radiological quality of water during periods of rising stream stage. These salts are deposited as a result of normal stream-related processes and do not appear to be related directly to the mining

operation.

The experimental evidence further suggests that contact of water and uranium-mineralized rock material does not contribute to chemical degradation of the water. However, the increases in uranium and Ra-226 concentrations (Table 4, #4) suggest that the observed increases in concentrations of these radiological constituents in the field may be attributed, at least in part, to dissolution from uranium-bearing materials in the stream sediments. How much of this effect would be attributable to the Anaconda mining operation and how much would be attributable to Jackpile sandstone materials which naturally occur in the stream sediments is not clear.

5.2 GROUND WATER

HSI has collected extensive ground-water quality data at the Jackpile-Paguate mine. These data include analyses of chemical and radiological constituents of water samples from eleven 2-inch test wells (HSI, 1979, pp.11-14), sixteen 5-inch M-series wells (Table 5), and four off site wells (Table 6). Locations for the samples of Tables 5 and 6 are shown in Plate V.

HSI also conducted laboratory equilibration experiments to determine the effect of mixing various representative reclaimed mine materials with representative native Jackpile sandstone water collected from the under-

Table 5. Dissolved Constituents, M-Series Wells, Jackpile-Paguate Mine Area, New Mexico.

Constituent	Detection Limit	7-18-80 M-1	11-3-80 M-1P	7-27-80 M-2	10-9-80 M-2P	7-25-80 M-3	10-30-80 M-3P
Temperature, field (Celsius)		18.0	18.0	---	15.75	---	16.5
pH, lab		8.1	8.1	8.0	7.9	8.3	8.2
Total Dissolved Solids (evap/calc)		894/833	880/880	1030/964	643/628	718/683	530/694
Electrical Conductivity, lab		1330	1290	1730	980	1070	755
Producing zone		Jmj	Jmj	Jmj	Jmj	Jmj	Jmj
HCO_3	0.1	446	440	363	403	343	355
CO_3	0.1	ND	ND	ND	ND	19	ND
Cl	3.0	12	8.2	15	5.5	12	4.8
SO_4	4.0	280	330	425	176	220	125
F	0.1	1.2	1.0	1.0	0.9	0.8	0.6
NO_3	0.1	ND	ND	0.2	ND	ND	ND
PO_4	0.03	ND	ND	ND	ND	ND	0.04
Na	1.0	280	305	300	215	230	190
K	1.0	4.0	7.3	3.0	2.7	3.0	3.0
Ca	1.0	15	4.9	12	13	6.0	1.6
Mg	1.0	4.5	4.8	15	4.6	8.0	1.0
SiO_2	1.0	16	14	12	12	15	13
As	0.01	ND	ND	ND	ND	0.01	ND
Ba	0.05	0.55	0.06	0.05	0.18	0.20	ND
Be	0.01	ND	---	ND	ND	ND	---
Cd	0.002	0.006	ND	0.002	ND	ND	ND
Cr	0.02	ND	ND	ND	ND	ND	ND
CN	0.01	---	---	---	---	---	---
Pb	0.05	ND	ND	0.01	0.01	ND	ND
Hg	0.0002	ND	ND	0.0020	ND	ND	ND
Se	0.002	ND	ND	ND	ND	ND	ND
Ag	0.005	ND	ND	ND	0.006	ND	ND
Cu	0.005	0.050	ND	0.005	0.010	ND	ND
Fe	0.01	ND	0.06	ND	0.07	ND	0.06
Mn	0.005	0.030	0.085	0.041	0.090	0.065	0.021
Phenols	0.005	---	---	---	---	---	---
Zn	0.01	ND	0.04	0.53	0.14	0.024	ND
Al	0.1	ND	ND	ND	ND	ND	ND
B	0.05	0.06	0.34	0.70	0.28	0.08	0.28
Co	0.01	0.01	ND	0.02	0.02	ND	ND
Mo	0.05	ND	ND	0.05	0.05	ND	ND
Ni	0.02	ND	ND	ND	0.03	ND	ND
V	0.05	ND	ND	ND	ND	ND	ND
Radiologic							
^{226}Ra (pCi/l ± 2σ)	0.03	5.1±0.3	22±1	0.31±0.05	0.61±0.05	0.05±0.03	ND
^{228}Ra (pCi/l ± 2σ)	1 to 2	ND	ND	ND	ND	ND	ND
U(mg/l ± 2σ)	0.01	ND	ND	ND	ND	ND	ND

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in µmhos/cm @ 25°C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analysis by LFE Environmental Analysis Laboratories, Richmond, California.

P denotes sample taken by pumping. Other samples were taken by air lifting.

See Plate V for chemical quality diagrams.

Producing zone: Jmj-Jackpile sandstone, Qal-alluvium.

Table 5. Dissolved Constituents, M-Series Wells, Jackpile-Paguate Mine, New Mexico (Cont'd).

Constituent	Detection Limit	7-31-80 M-4	8-3-80 M-4A	8-2-80 M-4B	7-17-80 M-5	7-19-80 M-6
Temperature, field (Celsius)		16.3	---	---	---	16.5
pH, lab		7.3	7.6	7.5	8.3	8.3
Total Dissolved Solids (evap/calc)		2130/2114	1040/997	1730/1794	1020/1048	892/842
Electrical Conductivity, lab		3200	1500	2600	1570	1410
Producing zone		Jmj(?)	Jmj	Qal	Jmj	Jmj
HCO_3	0.1	446	457	452	381	414
CO_3	0.1	ND	ND	ND	18	19
Cl	3.0	33	22	27	18	12
SO_4	4.0	1230	400	938	437	280
F	0.1	0.7	0.7	0.8	1.1	1.3
NO_3	0.1	ND	ND	ND	ND	ND
PO_4	0.03	ND	ND	ND	ND	ND
Na	1.0	208	160	294	340	295
K	1.0	23	13	22	8.0	3.3
Ca	1.0	216	113	233	18	6.0
Mg	1.0	163	45	36	5.6	6.1
SiO_2	1.0	20	17	20	14	15
As	0.01	ND	ND	ND	ND	ND
Ba	0.05	0.74	0.52	0.08	0.35	0.15
Be	0.01	ND	ND	ND	ND	ND
Cd	0.002	0.003	0.002	0.003	0.16	0.004
Cr	0.02	ND	ND	ND	ND	ND
CN	0.01	---	---	---	---	---
Pb	0.05	0.03	0.01	0.03	0.13	ND
Hg	0.0002	ND	ND	ND	0.0006	0.0005
Se	0.002	0.003	0.002	0.004	ND	ND
Ag	0.005	ND	ND	ND	0.040	ND
Cu	0.005	0.012	ND	0.008	0.010	ND
Fe	0.01	0.11	0.44	0.11	0.02	ND
Mn	0.005	0.093	0.064	0.068	0.085	0.035
Phenols	0.005	---	---	---	---	---
Zn	0.01	0.02	0.06	0.06	0.30	0.32
Al	0.1	ND	ND	ND	ND	ND
B	0.05	0.20	0.12	0.51	0.61	0.38
Co	0.01	ND	ND	ND	ND	0.02
Mo	0.05	ND	ND	ND	ND	ND
Ni	0.02	0.05	0.03	0.05	ND	ND
V	0.05	ND	ND	ND	ND	ND
Radiologic						
^{226}Ra (pCi/l ± 2σ)	0.03	2.1±0.1	3.5±0.2	0.09±0.03	0.33±0.04	0.28±0.03
^{228}Ra (pCi/l ± 2σ)	1 to 2	ND	ND	ND	ND	ND
U(mg/l ± 2σ)	0.01	0.78±0.04	0.02±0.01	0.87±0.04	ND	ND

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in μmhos/cm @ 25°C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analysis by LFE Environmental Analysis Laboratories, Richmond, California.

P denotes sample taken by pumping. Other samples were taken by air lifting.

See Plate V for chemical quality diagrams.

Producing zone: Jmj-Jackpile sandstone, Qal-alluvium.

Table 5. Dissolved Constituents, M-Series Wells, Jackpile-Paguate Mine, New Mexico (Cont'd).

Constituent	Detection Limit	7-22-80 M-8	7-29-80 M-10	10-4-80 M-10P	10-16-80 M-14P	8-18-80 M-16	10-7-80 M-16P
Temperature, field (Celsius)		17.0	16.6	18.4	18.0	18.5	19.0
pH, lab		8.0	7.7	7.9	7.6	7.2	7.8
Total Dissolved Solids (evap/calc)		1130/1052	1380/1270	1160/1171	1700/1767	534/512	1360/1403
Electrical Conductivity, lab		1730	2030	1820	2500	780	2130
Producing zone		Jmj	Jmj	Jmj	Jmj	Jmj	Jmj
HCO_3	0.1	427	350	438	468	401	456
CO_3	0.1	ND	ND	ND	ND	ND	ND
Cl	3.0	18	12	16	25	17	14
SO_4	4.0	450	660	510	920	83	672
F	0.1	1.3	0.9	1.2	0.6	0.9	0.9
NO_3	0.1	ND	ND	ND	ND	0.6	ND
PO_4	0.03	ND	ND	ND	ND	ND	ND
Na	1.0	305	320	390	418	180	390
K	1.0	3.3	3.0	3.7	8.5	10	6.5
Ca	1.0	36	54	16	97	8.2	54
Mg	1.0	14	34	4.9	52	3.7	25
SiO_2	1.0	13	13	12	12	11	14
As	0.01	ND	ND	ND	ND	ND	ND
Ba	0.05	0.45	0.11	0.18	0.73	0.10	0.45
Be	0.01	ND	ND	ND	ND	ND	ND
Cd	0.002	0.004	0.003	ND	0.002	0.002	ND
Cr	0.02	ND	ND	ND	ND	ND	ND
CN	0.01	---	---	---	---	---	---
Pb	0.05	ND	0.02	0.02	0.03	0.03	0.02
Hg	0.0002	0.0002	0.0019	0.0002	ND	ND	ND
Se	0.002	ND	ND	ND	ND	ND	ND
Ag	0.005	ND	ND	ND	ND	ND	0.011
Cu	0.005	0.030	ND	ND	0.007	0.005	0.006
Fe	0.01	ND	ND	0.10	0.64	ND	0.41
Mn	0.005	0.11	0.18	0.044	0.39	0.033	0.19
Phenols	0.005	---	---	---	---	---	---
Zn	0.01	0.34	0.31	0.80	1.5	0.07	0.27
Al	0.1	1.2	ND	ND	ND	ND	ND
B	0.05	0.09	0.25	0.41	0.42	0.30	0.41
Co	0.01	ND	0.04	0.06	0.07	ND	0.06
Mo	0.05	ND	ND	ND	ND	ND	ND
Ni	0.02	ND	0.02	0.05	0.08	ND	0.05
V	0.05	ND	ND	ND	ND	ND	ND
Radiologic							
^{226}Ra (pCi/l ± 2σ)	0.03	0.53±0.03	5.0±0.02	0.06±0.03	0.12±0.03	0.07±0.04	0.04±0.03
^{228}Ra (pCi/l ± 2σ)	1 to 2	ND	ND	ND	ND	ND	ND
U(mg/l ± 2σ)	0.01	0.02±0.01	0.06±0.01	0.03±0.01	ND	ND	ND

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in µmhos/cm @ 25°C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analysis by LFE Environmental Analysis Laboratories, Richmond, California.

P denotes sample taken by pumping. Other samples were taken by air lifting.

See Plate V for chemical quality diagrams.

Producing zone: Jmj-Jackpile sandstone, Qal-alluvium.

Table 5. Dissolved Constituents, M-Series Wells, Jackpile-Paguate Mine, New Mexico (Cont'd).

Constituent	Detection Limit	10-1-80 M-21P	7-24-80 M-22	8-6-80 M-23	2-8-81 M-24P
Temperature, field (Celsius)		21.3	---	---	---
pH, lab		8.3	7.8	8.1	7.6
Total Dissolved Solids (evap/calc)		368/389	981/962	1090/1107	3640/4031
Electrical Conductivity, lab		673	1590	1700	5050
Producing zone		Jmj	Jmj	Jmj	Backfill
HCO_3	0.1	345	414	438	770
CO_3	0.1	11	ND	ND	ND
Cl	3.0	ND	14	29	50
SO_4	4.0	40	380	448	2010
F	0.1	1.0	1.3	1.3	0.7
NO_3	0.1	ND	ND	ND	ND
PO_4	0.03	0.03	ND	ND	ND
Na	1.0	150	305	380	915
K	1.0	2.0	3.7	8.0	23
Ca	1.0	3.3	26	9.8	155
Mg	1.0	1.0	12	4.6	95
SiO_2	1.0	11	15	9.9	12
As	0.01	ND	0.01	ND	ND
Ba	0.05	0.07	0.25	0.05	0.21
Be	0.01	ND	ND	ND	---
Cd	0.002	ND	0.002	0.003	ND
Cr	0.02	ND	ND	ND	ND
CN	0.01	---	---	---	---
Pb	0.05	0.01	ND	ND	ND
Hg	0.0002	0.0004	0.0015	ND	---
Se	0.002	ND	0.002	0.002	ND
Ag	0.005	ND	ND	ND	0.005
Cu	0.005	0.007	0.005	ND	ND
Fe	0.01	0.13	ND	ND	0.28
Mn	0.005	0.017	0.21	0.024	0.074
Phenols	0.005	---	---	---	---
Zn	0.01	0.02	0.64	0.49	0.25
Al	0.1	ND	0.2	ND	ND
B	0.05	0.25	0.25	0.49	0.96
Co	0.01	0.02	ND	ND	ND
Mo	0.05	ND	ND	ND	ND
Ni	0.02	ND	ND	0.02	ND
V	0.05	ND	ND	ND	ND
Radiologic					
^{226}Ra (pCi/l ± 2σ)	0.03	1.68±0.08	0.52±0.03	0.99±0.05	1.22±0.08
^{228}Ra (pCi/l ± 2σ)	1 to 2	3±1	ND	ND	2±1
U(mg/l ± 2σ)	0.01	0.02±0.01	0.03±0.01	0.36±0.02	0.03±0.01

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in umhos/cm @ 25°C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analysis by LFE Environmental Analysis Laboratories, Richmond, California.

P denotes sample taken by pumping. Other samples were taken by air lifting.

See Plate V for chemical quality diagrams.

Producing zone: Jmj-Jackpile sandstone, Qal-alluvium.

Table 6. Dissolved Constituents, Off-Site Wells, Jackpile-Paguate Mine Area, New Mexico.

Constituent	Detection Limit	7-30-80 Paguate Village PV	8-6-80 Seboyeta Village SV	8-6-80 Moquino Village MV	8-6-80 Bibo Village BV
Temperature, field (Celsius)		---	25.0	24.0	25.0
pH, lab		7.6	7.7	8.2	8.0
Total Dissolved Solids (evap/calc)		408/474	304/312	428/425	575/566
Electrical Conductivity, lab		600	475	745	929
Producing zone		Jmj	Jmj	Jmj	Jmj
HCO_3	0.1	267	236	350	343
CO_3	0.1	ND	ND	ND	ND
Cl	3.0	ND	15	9.1	22
SO_4	4.0	170	45	64	149
F	0.1	ND	0.4	0.6	0.6
NO_3	0.1	ND	ND	ND	ND
PO_4	0.03	ND	ND	ND	ND
Na	1.0	18	80	137	175
K	1.0	3.3	9.0	7.0	9.0
Ca	1.0	62	11	16	13
Mg	1.0	47	13	5.9	9.5
SiO_2	1.0	42	22	13	19
As	0.01	ND	ND	ND	ND
Ba	0.05	0.13	0.10	0.10	0.06
Be	0.01	ND	ND	ND	ND
Cd	0.002	ND	0.002	ND	ND
Cr	0.02	ND	ND	ND	ND
CN	0.01	---	---	---	---
Pb	0.05	ND	ND	ND	0.02
Hg	0.0002	0.0003	ND	ND	ND
Se	0.002	ND	ND	ND	0.002
Ag	0.005	ND	ND	ND	ND
Cu	0.005	ND	ND	0.007	ND
Fe	0.01	ND	0.02	ND	0.01
Mn	0.005	0.008	0.007	ND	0.005
Phenols	0.005	---	---	---	---
Zn	0.01	0.01	0.02	0.05	0.17
Al	0.1	ND	ND	ND	ND
B	0.05	0.30	0.15	0.14	0.12
Co	0.01	0.01	ND	ND	ND
Mo	0.05	ND	0.05	ND	ND
Ni	0.02	ND	0.02	ND	ND
V	0.05	ND	ND	ND	ND
Radiologic					
^{226}Ra (pCi/l ± 2σ)	0.03	0.24±0.04	0.42±0.03	0.27±0.03	0.39±0.03
^{228}Ra (pCi/l ± 2σ)	1 to 2	ND	ND	ND	ND
U(mg/l ± 2σ)	0.01	0.78±0.04	ND	ND	ND

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in µmhos/cm @ 25° C.

ND, less than detection limit. Detection limit for radiologic constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analyses by LFE Environmental Analysis Laboratories, Richmond, California.

Producing zone: Jmj = Jackpile sandstone.

ground portion of the Jackpile-Paguate mine (Section 5.2.4). Data (Table 7) assisted in projection of ground-water quality in backfill materials under reclamation conditions.

5.2.1 Jackpile Sandstone

The Jackpile sandstone is predominantly composed of quartz grains with some feldspar fragments and a calcite or kaolinite cement.

The typical ground water contained in the Jackpile sandstone is a sodium sulfate bicarbonate type, and, less frequently, a sodium bicarbonate sulfate type (Plate V). TDS concentrations for thirteen Jackpile sandstone wells in the mine area range from 389 to 1767 mg/l and average 995 mg/l (Table 5).

No apparent pattern appears to exist in the distribution of TDS in the mine area except that waters from wells near Rio Moquino are relatively concentrated in dissolved constituents (Plate V). The water of Well M-4 near the confluence is a mixed cation sulfate type of high TDS (Table 5) that is nearly identical to Rio Moquino water sampled nearby (Table 3, RM105). This suggests that the M-4 water originates as recharge from Rio Moquino and is not representative of the Jackpile sandstone.

Water in the Paguate Village well (Table 6) does not resemble other Jackpile sandstone waters in the vicinity of the mine either in ionic type or concentration of TDS. This water may reflect admixture of Rio Paguate

water. Waters from Jackpile sandstone wells in Seboyeta, Moquino, and Bibo Villages are lower in TDS than the average for the mine area (Table 6).

The average uranium and radium-226 concentrations for water from the thirteen Jackpile sandstone wells within the mine area are 0.04 mg/l and 2.36 pCi/l, respectively (Table 5). Minor chemical constituents are at low concentrations.

5.2.2 Alluvium

Several of the wells installed by HSI are perforated in the alluvium. These wells, M-4B and old test wells 1 and 10 (HSI, 1979), produce water that is enriched in calcium and magnesium in comparison to the typical Jackpile sandstone water. These waters are generally higher in TDS than the typical Jackpile sandstone waters, averaging 1332 mg/l (Table 5; HSI, 1979, Table 1). The water from these wells is a mixture of Jackpile sandstone water from below and surface water from Rio Moquino and Rio Paguate. Depending on the time of year and flow conditions in the Jackpile sandstone and the contributing streams, the proportionate contribution of surface water and ground water can change significantly, causing the chemistry of the mixed alluvial ground water to vary.

5.2.3 Backfill Material

Chemistry of ground water in backfill material is virtually unknown. Only one well, M24, is completed in saturated backfill (Table 5). Another well, M17, was drilled on backfill over what had been a pond prior to backfilling. However, no ground water was found during drilling of this well. The water had either been displaced by the backfilling or absorbed by the backfill material.

Well M24 was drilled over what previously was the western P-10 pond. The ground water encountered is essentially stagnant in that it is not flowing through the backfill or receiving recharge from the Jackpile sandstone. On February 8 and 9, 1981, M24 was pumped for 24 hours and a sample was taken for chemical and radiological analysis. The chemistry shows a sodium sulfate type of water (Table 5) very similar in character to the water from the P-10 pond before backfilling (HSI, 1979, Table 1), but much higher in TDS (4031 mg/l versus 1219 mg/l). The high TDS content from M24 is probably a result of concentration by evaporation of the P-10 pond water prior to the backfilling. The last sample taken from the P-10 pond was in December 1977, however, the pond was not backfilled until about 1 1/2 years later. During this period water was not discharged to the pond, thus allowing ample time to concentrate the dissolved constituents. Rabbit Ear pond experienced much the same type of concentration by evaporation, going from 2067 mg/l TDS in May of 1975 to 4888 mg/l TDS

in December of 1977 (HSI, 1979, Tables 1 and 3).

The water quality of M24 is not indicative of the water quality that can be expected in backfill material when post-mining equilibrium conditions are reached.

5.2.4 Laboratory Equilibration Investigation

In order to evaluate the possible chemistry of water in the backfill, HSI performed laboratory experiments designed to simulate post-mining equilibrium conditions. The experiment consisted of mixing four representative backfill materials with representative indigenous Jackpile ground water and analyzing the chemically equilibrated water.

Backfill materials used in the experiment were non-ore bearing Jackpile sandstone (Jackpile sandstone), non-economic ore bearing Jackpile sandstone (protore), and a tan sandstone (Dakota sandstone) and a carbonaceous shale (Dakota shale) of the Dakota Sandstone. Samples were collected from the southern portion of the Paguate mine.

Ground water used in the experiment was obtained from roof seepage in an advancing drift in the extreme southern portion of the P-10 underground mine south of the South Paguate Pit. The ground water was analyzed for chemical and radiological constituents (Table 7).

All backfill samples were ground to pass through a 10-mesh screen (0.065-

Table 7. Dissolved Constituents, P-10 Underground Water and Simulated Reclaimed Waters, Jackpile-Paguate Mine, New Mexico.

Constituent	Detection Limit	P-10 Underground	Jackpile Sandstone	Protore	Dakota Sandstone	Dakota Shale
pH, lab		8.5	7.6	8.3	8.3	8.3
Total Dissolved Solids (evap/calc)		/557	816/880	1110/1051	1020/1021	1280/1256
Electrical Conductivity, lab		950	1340	1520	1580	1920
HCO_3	0.1	347	421	391	296	296
CO_3	0.1	18	ND	12	12	24
Cl	3.0	11	16	18	20	19
SO_4	4.0	130	280	443	480	625
F	0.1	1.0	0.5	1.8	4.0	2.7
NO_3	0.1	0.2	16	3.5	0.4	ND
PO_4	0.03	ND	ND	ND	ND	ND
Na	1.0	200	270	280	210	390
K	1.0	2.7	4.0	7.0	1.0	8.0
Ca	1.0	6.6	16	46	98	25
Mg	1.0	2.7	4.9	24	22	7.3
SiO_2	1.0	12	7.7	10	13	7.9
As	0.01	ND	0.02	0.02	ND	ND
Ba	0.05	0.15	0.20	0.30	0.45	0.20
Be	0.01	---	---	---	---	---
Cd	0.005	0.005	ND	ND	ND	ND
Cr	0.01	ND	ND	ND	ND	ND
CN	0.01	---	---	---	---	---
Pb	0.01	0.03	ND	0.010	0.010	ND
Hg	0.0002	0.0006	ND	ND	ND	ND
Se	0.0002	ND	0.014	0.005	0.003	ND
Ag	0.005	0.005	ND	ND	ND	ND
Cu	0.005	0.015	0.020	0.010	0.010	0.005
Fe	0.01	0.10	0.09	0.06	0.06	0.03
Mn	0.02	0.03	ND	ND	ND	ND
Phenols	0.005	---	---	---	---	---
Zn	0.01	0.16	ND	ND	ND	ND
Al	0.1	0.10	ND	ND	ND	ND
B	0.05	0.50	0.36	0.38	0.62	0.60
Co	0.01	0.03	ND	ND	0.01	ND
Mo	0.05	0.05	2.5	0.25	0.10	0.50
Ni	0.01	0.02	ND	0.01	0.02	ND
V	0.05	ND	ND	ND	ND	ND
Radiologic						
^{226}Ra (pCi/l ± 2σ)	0.03	26±1.0	0.12±0.03	52±3.0	0.38±0.04	1.11±0.08
^{228}Ra (pCi/l ± 2σ)	1 to 2	ND	ND	ND	ND	ND
U(mg/l ± 2σ)	0.01	0.22±0.01	ND	22±1	0.21±0.01	0.03±0.01

Note: All chemical analyses are in mg/l except pH which is in units and electrical conductivity which is in µmhos/cm @ 25° C.

ND, less than detection limit. Detection limit for radiological constituents is 2σ counting statistics.

Chemical analysis by The Industrial Laboratories Company, Denver, Colorado.

Radiologic analyses by LFE Environmental Analysis Laboratories, Richmond, California.

inch openings). The Jackpile ground water was then mixed with each of the four backfill samples in a 1:1 weight ratio. The mixtures were stirred and pH and electrical conductivity were monitored. This process was repeated until the pH and conductivity of the solutions stabilized, indicating an equilibrium had been reached. The supernatant waters were then extracted and analyzed for chemical and radiological constituents.

The experiment was designed to simulate a worst case condition. The materials were ground to a much finer degree than would typically be found in the backfilled pits, allowing much more surface area for reaction with the ground water. Only one equilibration was used - presumably second and later equilibrations simulating the through-flow of ground water would have shown a lesser degree of change in water chemistry. Offsetting this effect, water was mixed on a 1:1 weight ratio, far exceeding actual backfill conditions and, thus, providing a high degree of dilution of constituents dissolved from the simulated backfill materials.

The P-10 underground water used for the experiment was a sodium bicarbonate sulfate type (Table 7), similar to several samples of Jackpile sandstone ground water found in the western part of the mine area. The simulated reclaimed Jackpile sandstone water is chemically similar to the P-10 underground water with an increase in the proportion of sulfate and an overall increase in TDS. Nitrates were also high in this water, probably owing

to the use of nitrate-based explosives in the mining operations.

The simulated reclaimed protore water is a sodium sulfate bicarbonate type similar in chemistry and concentration to water from well M1 (Table 5) which penetrates an ore-bearing zone within the Jackpile sandstone. The simulated reclaimed Dakota sandstone water is a sodium calcium sulfate bicarbonate type chemically similar and of similar concentration to water from old test well 10 (HSI, 1979, Table 1). The simulated reclaimed Dakota shale water is a sodium sulfate type very similar, although much less concentrated, to the water from M24 (Table 5).

Except for the protore sample, concentrations of uranium and radium-226 in the simulated reclaimed waters are lower than in the raw P-10 underground water. The increase in concentration of radiological constituents for the protore water is to be expected.

The simulated reclaimed waters are higher in TDS than the P-10 underground water. Their TDS concentrations, however, all fall within the range observed for Jackpile sandstone water within the mine area. All of the samples could also be correlated chemically to chemical types of ground water found within the mine. These experiments, then, would indicate that even under the worst case conditions, degradation of ground water by reaction with the backfill materials could be expected to fall within the limits already observed for ground water within the mine area.

5.2.5 Ground Water South of Jackpile-Paguate Mine

The chemical quality of ground water south of the Jackpile-Paguate mine was not assessed in this investigation, primarily because sample points were not made available to HSI. However, chemistry data for wells in this area available from the USGS and BIA are included in Appendix B for future reference and comparison. None of the wells in question appear to be completed in the Jackpile sandstone.

6.0 EFFECTS OF MINING AND RECLAMATION

The effects of mining and reclamation on the hydrology of the Jackpile-Paguate mine can be evaluated with precision only if the pre-mining hydrologic conditions are known. Some information relating to pre-mining hydrology does exist in the form of aerial photographs taken before mining and USGS topographic maps that show early mining conditions. We also know, qualitatively at least, that prior to mining, the area had a background surface radioactivity higher than the surrounding terrain (Anaconda, 1980, Plate 3.2-1). Some of the radioactive anomalies were in the streambeds and, in fact, the initial mining included removal of petrified, uranium-bearing tree trunks from the Rio Moquino channel (R. D. Lynn, Anaconda, personal communication, 1980). However, the lack of specific pre-mining hydrologic data, such as surface water flow measurements or water chemistry analyses, precludes any quantitative evaluation of the effects of mining and reclamation on the surface water hydrology and water chemistry of the area. Thus, the following section is necessarily based on inferences of what the pre-mining conditions were and our best judgement of the subsequent effects.

A previous report (HSI, 1981) discusses the ground-water hydrology of the mine area and the effects of mining and reclamation on occurrence and movement of ground water.

6.1 SURFACE WATER HYDROLOGY

As a result of mining activities, the courses across the mine of both Rio Moquino and Rio Paguate have been altered. The course of Rio Moquino has been changed by the placement of excavated materials in the original channel and re-routing of the stream into a parallel drainage to the east. The effect of these alterations is to straighten a formerly meandering channel. This more direct route decreases the distance the stream has to travel, thus increasing the gradient and the average flow velocity of the stream in this local area.

Rio Paguate has been re-routed in several places. In the area of RP105 (Plate III), the channel was moved to the south to accommodate mining in the North Paguate pit (Herkenhoff, 1973). The new channel was constructed on backfill material and instead of returning to the main channel below the diversion, the channel was diverted into a parallel drainage south of the former channel. The main effect of re-routing of the Paguate is that near the confluence with Rio Moquino, the new channel has to make a sharp northerly turn around an alluvial block to intersect Rio Moquino. Over a period of years, it is likely that high flows down the Rio Paguate may breach the existing block and move the confluence farther downstream.

Reclamation activities should not have much effect on streamflow in Rio Paguate. There may be a very slight increase in flow when groundwater levels in the Jackpile sandstone and backfill materials recover

and ground water begins discharging to the stream deposits near the reconstructed portion of the channel (HSI, 1981). Along Rio Moquino, reclamation plans call for the repositioning of some of the dumps.

6.2 WATER QUALITY

6.2.1 Surface Water

Degradation of chemistry of surface water due to mining does not appear to be substantial. Rio Paguate at base flow degrades only slightly in major chemical constituents across the mine to its confluence with Rio Moquino. This degradation is probably due to concentration by the natural processes of evaporation and transpiration as the stream passes through an area of abundant phreatophytes.

Rio Paguate also shows an increase in concentration of radiologic constituents across the mine. Some of the degradation may be natural, as the first discovery of uranium was near Rio Paguate. Some of the radiologic constituents may come from runoff or leaching of stockpiles of ore and protore adjacent to the stream channel. It is unlikely that ground water discharged from the Jackpile sandstone directly degrades the stream in radiologic constituents because water samples taken from the Jackpile sandstone generally have lower concentrations of uranium and radium-226 than occur in the surface water.

Rio Moquino degrades somewhat in major chemical constituents through the mine. Some of this increase in concentrations may be due to the materials introduced into the stream when the course was altered by encroachment of dumps. However, the water entering the mine upstream is of the same chemical type as the water above the confluence with Rio Paguate and the increase in concentration of chemical constituents is probably as much or more a result of evapotranspiration effects as the low flows become intermittant across the mine than it is of mining activities.

Our laboratory dissolution investigations suggest that occasional mobilization of radiologic constituents from mineralized rock material by surface runoff is insufficient to account for the increases in radioactivity observed in the streams. Also, as stated previously, surface radioactivity anomalies existed along stream channels in the area prior to mining operations. The increase in radiologic constituents attributable to mining cannot be determined with precision.

The water chemistry surveys for the streams above the mine show a continuing degradation in chemical and radiologic constituents downstream. The degradation through the mine is a continuation of these trends.

6.2.2 Ground Water

Ground water in the Jackpile sandstone has probably not been degraded by mining. The mining activities do not utilize water or any other solution

that would mix with the existing ground water. Also, ground water levels have been drawn down to a point where little chance exists for interaction with surface operations. HSI (1979) has shown that there was no interaction between the Rabbit Ear and P-10 surface holding ponds and the Jackpile ground-water body.

Our laboratory equilibration investigations showed that even in a worst case situation, the degradation of ground water that may be attributable to backfill materials should result in water no worse than what is currently found in water from wells at other places in the mine area. The amount and type of degradation at any point in the backfill will be dependent upon the type of redeposited material and the position of the redeposited material in relation to the level of ground water and the direction of flow.

7.0 SOURCES OF INFORMATION

Publications

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Files

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Bureau of Indian Affairs, Ground-Water Quality Data for the Laguna Indian Reservation, New Mexico.

U.S. Geological Survey, Ground-Water Quality Data for Valencia County, New Mexico.

Personal Communications

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APPENDIX A

FINDINGS OF REPORT OF FEBRUARY 26, 1981
REGARDING GROUND-WATER HYDROLOGY
OF THE JACKPILE-PAGUATE MINE

1.0 FINDINGS

1. The Jackpile sandstone of the Morrison Formation ranges in thickness from zero to 230 feet and dips to the north-northwest at about one degree through the Jackpile-Paguate Mine area.

2. The Jackpile contains ground water. The original water levels have been lowered by the mining activities as a result of seepage at pit walls and underground workings. The Jackpile is isolated hydraulically from other water-containing units by shales and mudstones, above and below.

   Pumping of hydrologic test wells shows that the Jackpile yields in the range of less than one gpm to about ten gpm. The Jackpile is a poor aquifer of extremely limited potential for use.

3. Pumping of seven representative pairs of test and observation wells shows the following average hydraulic properties for the observation wells:

transmissivity	16.8 ft^2/day
hydraulic conductivity	0.22 ft/day
storage coefficient	2.1×10^{-4}

4. Recharge to the Jackpile occurs primarily southwest of the mine, along the upper Rio Paguate, and to a lesser extent along the Rio Moquino and Arroyo Pedro Padilla. Discharge from the Jackpile occurs to the Rio Paguate in the vicinity of its confluence with the Rio Moquino and to a minor extent to the upper portion of Oak Canyon.

   Under pre-mining and reclamation conditions a total of about 30 gpm moves through the Jackpile ground-water system in the mine area. Nearly all of this moves through the South Paguate portion of the mine.

5. Mined materials redeposited in the open pits are two to three orders of magnitude more permeable than the undisturbed Jackpile sandstone. As a result, ground water from the southwest will move through the relatively permeable backfill material of the South Paguate pit and will discharge on the north to backfill and alluvial materials beneath the Rio Paguate.

   Time for reestablishment of the South Paguate portion of the flow system is a minimum of 52 years.

6. Backfill in the North Paguate and Jackpile pits will become water-saturated to partial depth, but the volume of ground water passing through this portion of the system will be relatively small.

APPENDIX B

GROUND-WATER QUALITY DATA

SOUTH AND WEST OF JACKPILE-PAGUATE MINE

NEW MEXICO

GROUND-WATER QUALITY DATA SOUTH AND WEST OF JACKPILE-PAGUATE MINE

The water from wells and springs west and south of the mine is from a variety of geologic units, including the Chinle Formation, Entrada Sandstone, Morrison Formation, Dakota Sandstone, Mancos Shale, volcanic rocks, and alluvium. The TDS concentrations range from 143 to 18,900 mg/l and average about 1,585 mg/l. A computerized listing of the available water chemistry data is given in Table A. Under the heading "Sample Number, Agency", the collecting agency and analyzing agencies are given. The abbreviations for collecting agencies are; ACL-Acoma Canoncito Laguna Hospital, GS-U.S. Geological Survey. The abbreviations for analyzing agency are; N-New Mexico State Department of Health.

Water from the Chinle Formation is high in sodium, chloride, and sulfates. Water from the alluvium is primarily a sodium sulfate type. The springs in the area are predominantly calcium or calcium magnesium bicarbonate types.

The range of TDS in ground water south of the Jackpile-Paguate mine is much greater than the range of TDS in the water from the Jackpile sandstone. The average TDS is also much higher, 1,585 mg/l versus 995 mg/l.

Radiologic analyses are available for only three wells south of the mine. These analyses show concentrations of RA-226 of 0.09 to 0.19 pCi/l and uranium concentrations of 0.007 to 0.1 mg/l.

The data in this appendix are from provisional files of the U.S. Geological Survey in Albuquerque and from files of the Acoma Canoncito Laguna (ACL) hospital in Acomita (BIA). Data are as complete as we could obtain, however, locations of most of the wells and springs from the ACL hospital files are vague. Numerous attempts were made to obtain more accurate locations, but our calls were unanswered. Approximate locations of samples and TDS concentrations are shown in Plate A.

A request for well information was also made of the Governor of Laguna. He presented the request to the tribal council, who voted not to release any data to us. Requests for access to wells for the purposes of measuring water levels and sampling waters for analysis were ignored.

Table B.

Ground-Water Quality Data

South and West of Jackpile-Paguate Mine

New Mexico

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

		LG09 PAGUATE WELL LG100 - ACL-N 07/19/56 1200			LG09 PAGUATE WELL LG102 - ACL-B 01/20/75 1200			LG10 PAGUATE LORENZO WELL LG101 - ACL-N 07/25/62 1200		
SAMPLE POINT										
LOCATION DATA										
SAMPLE NUMBER, AGENCY										
COLLECTION DATE, TIME										
WATER LEVEL										
TEMPERATURE (C)		28.00								
PH (F=FIELD, L=LAB)		7.60L			7.50L			7.60L		
TDS (SUM OF GROSS, MG/L)		412.60			425.68			326.10		
TDS (BY EVAP., MG/L)		350.00			380.00			294.00		
TDS (BY CALC., MG/L)		317.04			313.08			239.69		
TDS (SUM-SIO2, MG/L)		412.60			425.68			326.10		
SP.COND. (UMHOS/CM@25C)					530.00L			430.00L		
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		188.00	3.081	.534	221.52	3.631	.631	170.00	2.786	.656
CO3--		0.00	0.000	0.000	7.20	.240	.042	0.00	0.000	0.000
CL-		11.00	.310	.054	8.87	.250	.043	5.00	.141	.033
SO4--		113.00	2.353	.408	77.33	1.610	.280	62.00	1.291	.304
F-		.40	.021	.004	.30	.016	.003	.20	.011	.002
NO3-		.20	.003	.001	.25	.004	.001	1.20	.019	.005
PO4---					.11	.003	.001			
TOTAL ANIONS		312.60	5.769		315.58	5.754		238.40	4.248	
NA+		0.00	0.000	0.000	24.60	1.070	.183	18.00	.783	.168
K+					3.13	.080	.014	4.70	.120	.026
CA++		74.00	3.693	.633	64.13	3.200	.547	49.00	2.445	.524
MG++		26.00	2.139	.367	18.24	1.500	.256	16.00	1.316	.282
TOTAL CATIONS		100.00	5.831		110.10	5.851		87.70	4.664	
SIO2	(MG/L)									
TOTAL EPM			11.600			11.605			8.913	
ANIONS / CATIONS			.989			.984			.911	
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)		0.0000						.9200	
MN	(MG/L)								0.0000	
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)									
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG			1.727			2.133			1.858	
NA / K						13.371			6.515	
CA+MG / NA+K						4.087			4.164	
HCO3+CO3 / CL+SO4			1.157			2.081			1.946	
SO4 / CL			7.582			6.434			9.152	

SUMMARY OF WATER CHEMISTRY ANALYSIS REPORT DATE 05/05/81

	LG11 PAGUATE PUBLIC WELL			LG12 PAGUATE NEW WATER SYSTEM			LG13 PAGUATE 70FT WELL		
SAMPLE POINT LOCATION DATA	LG103 - ACL-N			LG104 - ACL-N			LG105 - ACL-N		
SAMPLE NUMBER, AGENCY									
COLLECTION DATE, TIME	07/05/63 1200			04/14/66 1200			01/14/73 1200		
WATER LEVEL									
TEMPERATURE (C)									
PH (F=FIELD, L=LAB)	8.20L			9.00L			7.60L		
TDS (SUM OF GROSS, MG/L)	368.40			518.00			478.55		
TDS (BY EVAP., MG/L)	325.00			348.00			416.00		
TDS (BY CALC., MG/L)	257.59			403.12			354.17		
TDS (SUM-SIO2, MG/L)	368.40			518.00			478.55		
SP.COND. (UMHOS/CM@25C)	450.00L			490.00L			630.00L		
	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	218.00	3.573	.778	226.00	3.704	.784	244.70	4.011	.633
CO3--	0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000
CL-	6.00	.169	.037	6.00	.169	.036	10.60	.299	.047
SO4--	40.00	.833	.181	33.00	.687	.145	95.10	1.980	.313
F-	.30	.016	.003	.40	.021	.004	.42	.022	.003
NO3-	0.00	0.000	0.000	8.90	.144	.030	1.24	.020	.003
PO4---							.03	.001	.000
TOTAL ANIONS	264.30	4.591		274.30	4.725		352.09	6.333	
NA+	20.00	.870	.155	161.00	7.004	.600	29.40	1.279	.193
K+	5.10	.130	.023	5.70	.146	.012	6.26	.160	.024
CA++	58.00	2.894	.515	56.00	2.794	.239	70.10	3.498	.527
MG++	21.00	1.727	.307	21.00	1.727	.148	20.70	1.703	.256
TOTAL CATIONS	104.10	5.622		243.70	11.671		126.46	6.640	
SIO2 (MG/L)									
TOTAL EPM		10.213			16.396			12.972	
ANIONS / CATIONS		.817			.405			.954	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)		1.1400			.0600				
MN (MG/L)		0.0000			0.0000				
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG		1.675			1.618			2.054	
NA / K		6.671			44.052			7.990	
CA+MG / NA+K		4.620			.632			3.614	
HCO3+CO3 / CL+SO4		3.566			.526			1.760	
SO4 / CL		4.922			4.059			6.621	

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

	LG14 PAGUATE WELL #1	LG15 CASA BLANCA PHS CLINIC	LG16 PAGAJE SUPPLY YARD
SAMPLE POINT	LG106 - ACL-N	LG107 - ACL-N	LG108 - ACL-N
LOCATION DATA			
SAMPLE NUMBER, AGENCY			
COLLECTION DATE, TIME	06/19/78 1200	06/16/66 1200	08/11/59 1200
WATER LEVEL			
TEMPERATURE (C)			27.00
PH (F=FIELD, L=LAB)	7.94L		7.70L
TDS (SUM OF GROSS, MG/L)	425.21		1949.40
TDS (BY EVAP., MG/L)	340.00		3414.00
TDS (BY CALC., MG/L)	310.13		1769.48
TDS (SUM-SIO2, MG/L)	425.21		1948.40
SP.COND. (UMHOS/C@25C)	540.00L	1700.00L	

	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	226.40	3.711	.642				352.00	5.769	.179
CO3--	10.00	.333	.059				4.00	.133	.004
CL-	8.60	.243	.042				241.00	7.927	.246
SO4--	70.80	1.474	.255				886.00	18.322	.569
F-	.34	.018	.003				1.40	.074	.002
NO3-	.19	.003	.001						
PO4---									
TOTAL ANIONS	316.33	5.782					1518.40	32.225	
NA+	25.30	1.101	.190						
K+	4.68	.120	.021						
CA++	59.10	2.949	.509				200.00	9.380	.345
MG++	19.80	1.629	.281				230.00	18.920	.655
TOTAL CATIONS	108.88	5.798					430.00	29.900	
SIO2 (MG/L)									
TOTAL EPM		11.580						61.125	
ANIONS / CATIONS		.997						1.115	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)	<	.2000							
MN (MG/L)	<	.0500			0.0000				
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG		1.911						.527	
NA / K		9.197							
CA+MG / NA+K		3.752						.225	
HCO3+CO3 / CL+SO4		2.356						2.511	
SO4 / CL		6.076							

070080

SUMMARY OF WATER CHEMISTRY ANALYSIS REPORT DATE 05/05/81

SAMPLE POINT	LG17 CASA BLANCA END OF LINE ON W	LG18 PARAJE CONCHO WELL	LG19 MESITA 100 YDS E OF WINDMILL
LOCATION DATA			
SAMPLE NUMBER, AGENCY	LG109 - ACL-N	LG110 - ACL-N	LG111 - ACL-N
COLLECTION DATE, TIME	12/28/61 1200	06/17/63 1200	07/12/56 1200
WATER LEVEL			
TEMPERATURE (C)			28.00
PH (F=FIELD, L=LAB)	8.30L	8.20L	7.80L
TDS (SUM OF GROSS, MG/L)	1243.80	2027.02	727.40
TDS (BY EVAP., MG/L)	1240.00	1905.00	760.00
TDS (BY CALC., MG/L)	1124.35	1827.77	666.24
TDS (SUM-SIO2, MG/L)	1243.80	2027.02	727.40
SP.COND. (UMHOS/CM@25C)	1660.00L	2500.00L	

	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	235.00	3.852	.221	392.00	6.425	.228	140.00	2.295	.219
CO3--	0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000
CL-	37.00	1.044	.060	67.00	1.890	.067	55.00	1.552	.148
SO4--	598.00	12.450	.713	945.00	19.675	.697	311.00	6.475	.617
F-	1.60	.084	.005	4.40	.232	.008	.90	.047	.005
NO3-	1.80	.029	.002	.62	.010	.000	7.50	.121	.012
PO4---									
TOTAL ANIONS	873.40	17.459		1409.02	28.231		514.40	10.490	
NA+	233.00	10.136	.544	454.00	19.749	.680	115.00	5.003	.484
K+	2.40	.061	.003	18.00	.460	.016			
CA++	82.00	4.092	.219	98.00	4.890	.168	84.00	4.192	.405
MG++	53.00	4.360	.234	48.00	3.948	.136	14.00	1.152	.111
TOTAL CATIONS	370.40	18.648		618.00	29.048		213.00	10.346	
SIO2 (MG/L)									
TOTAL EPM		36.107			57.279			20.835	
ANIONS / CATIONS		.936			.972			1.014	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)	.5600			1.3400					
MN (MG/L)	0.0000			0.0000			0.0000		
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG		.939			1.239			3.640	
NA / K		165.159			42.904				
CA+MG / NA+K		.829			.437				
HCO3+CO3 / CL+SO4		.285			.298			.286	
SO4 / CL		11.928			10.410			4.173	

SUMMARY OF WATER CHEMISTRY ANALYSIS REPORT DATE 05/05/81

	LG20 MESITA NEW WELL			LG21 MESITA MITO WELL HOUSE			LG22 FLW LAGUNA EAST END OF LINE		
SAMPLE POINT LOCATION DATA									
SAMPLE NUMBER, AGENCY	LG112 - ACL-N			LG114 - ACL-N			LG115 - ACL-N		
COLLECTION DATE, TIME	05/03/63 1200			08/01/66 1200			12/29/61 1200		
WATER LEVEL									
TEMPERATURE (C)									
PH (F=FIELD, L=LAB)	8.90L			7.80L			8.40L		
TDS (SUM OF GROSS, MG/L)	1363.70			2623.30			1245.30		
TDS (BY EVAP., MG/L)	1375.00						1230.00		
TDS (BY CALC., MG/L)	1270.69			2449.67			1141.61		
TDS (SUM-SIO2, MG/L)	1363.70			2623.00			1245.30		
SP.COND. (UMHOS/CM@25C)	1870.00L			3800.00L			1645.00L		
	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	183.00	2.999	.148	341.00	5.589	.143	204.00	3.344	.189
CO3--	40.00	1.333	.066	0.00	0.000	0.000	9.00	.300	.017
CL-	106.00	2.990	.148	600.00	16.926	.432	44.00	1.241	.070
SO4--	596.00	12.409	.613	800.00	16.656	.425	610.00	12.700	.718
F-	2.00	.105	.005				1.50	.084	.005
NO3-	25.00	.403	.020				1.60	.026	.001
PO4---									
TOTAL ANIONS	952.00	20.240		1741.00	39.171		870.20	17.695	
NA+	306.00	13.311	.684	800.00	34.800	.884	242.00	10.527	.560
K+	4.70	.120	.006				5.10	.130	.007
CA++	70.00	3.493	.179	68.00	3.393	.086	74.00	3.693	.196
MG++	31.00	2.550	.131	14.00	1.152	.029	54.00	4.442	.236
TOTAL CATIONS	411.70	19.474		882.00	39.345		375.10	18.792	
SIO2 (MG/L)									
TOTAL EPM		39.714			78.516			36.487	
ANIONS / CATIONS		1.039			.996			.942	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)		.1600			4.0000			.0600	
MN (MG/L)		.2000			.4000			0.0000	
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG		1.370			2.946			.831	
NA / K		110.760						80.724	
CA+MG / NA+K		.450						.767	
HCO3+CO3 / CL+SO4		.281			.166			.261	
SO4 / CL		4.159			.984			10.232	

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

SAMPLE POINT		LG23 OLD LAGUNA SPRNG NR HLTH CT	LG24 NEW LAGUNA PHS CLINIC	LG24 NEW LAGUNA PHS CLINIC
LOCATION DATA				
SAMPLE NUMBER, AGENCY		LG116 - ACL-N	LG117 - ACL-N	LG118 - ACL-N
COLLECTION DATE, TIME		07/11/63 1200	04/14/66 1200	08/27/77 1200
WATER LEVEL				
TEMPERATURE (C)				
PH (F=FIELD, L=LAB)		8.00L	8.40L	7.70L
TDS (SUM OF GROSS, MG/L)		1867.80	1269.80	393.79
TDS (BY EVAP., MG/L)		1945.00	1259.00	902.00
TDS (BY CALC., MG/L)		1784.44	1120.87	393.79
TDS (SUM-SIO2, MG/L)		1867.80	1269.80	393.79
SP.CND. (UMHOS/CM@25C)		2200.00L	1640.00L	

		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		164.00	2.688	.097	293.00	4.802	.262			
CO3--		0.00	0.000	0.000	16.00	.533	.029			
CL-		108.00	3.047	.110	74.00	2.088	.114	48.00	1.354	.157
SO4--		1044.00	21.736	.784	518.00	10.785	.589	344.00	7.162	.833
F-		1.30	.068	.002	1.30	.068	.004	1.45	.076	.009
NO3-		11.00	.177	.006	1.80	.029	.002	.34	.005	.001
PO4---										
TOTAL ANIONS		1328.30	27.717		904.10	18.305		393.79	8.598	
NA+		168.00	7.308	.261	186.00	8.091	.431			
K+		5.50	.141	.005	9.70	.248	.013			
CA++		294.00	14.671	.523	110.00	5.489	.293			
MG++		72.00	5.923	.211	60.00	4.936	.263			
TOTAL CATIONS		539.50	28.042		365.70	18.764				
SIO2	(MG/L)									
TOTAL EPM			55.759			37.069			8.598	
ANIONS / CATIONS			.988			.976				
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)								.0025	
CR	(MG/L)									
CN	(MG/L)								.0120	
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)								.0025	
AG	(MG/L)									
CU	(MG/L)								.0470	
FE	(MG/L)		0.0000			.0100			.0950	
MN	(MG/L)		0.0000			0.0000		<	.0020	
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)									
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG			2.477			1.112				
NA / K			51.964			32.621				
CA+MG / NA+K			2.765			1.250				
HCO3+CO3 / CL+SO4			.108			.414				
SO4 / CL			7.134			5.166			5.299	

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

		LG25 NEW LAGUNA #1 WELL 98FT			LG26 ENCINAL VILLAGE					
SAMPLE POINT										
LOCATION DATA		LG119 - ACL-N			LG120 - ACL-N					
SAMPLE NUMBER, AGENCY										
COLLECTION DATE, TIME		01/18/73 1200			07/19/56 1200					
WATER LEVEL										
TEMPERATURE (C)					28.00					
PH (F=FIELD, L=LAB)		8.00L			8.10L					
TDS (SUM OF GROSS, MG/L)		1284.47			1139.30					
TDS (BY EVAP., MG/L)		1181.00			1064.00					
TDS (BY CALC., MG/L)		1120.39			990.88					
TDS (SUM-SIO2, MG/L)		1284.47			1139.30					
SP.COND. (UMHOS/CM@25C)		1450.00L								
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		322.80	5.291	.291	292.00	4.786	.300			
CO3--		18.60	.620	.034	28.00	.933	.058			
CL-		61.40	1.732	.095	27.00	.762	.048			
SO4--		500.50	10.420	.572	453.00	9.431	.591			
F-		1.81	.095	.005	.90	.047	.003			
NO3-		3.10	.050	.003	.40	.006	.000			
PO4---		.03	.001	.000						
TOTAL ANIONS		908.24	18.209		801.30	15.966				
NA+		243.20	10.579	.559	283.00	12.311	.799			
K+		3.13	.080	.004						
CA++		75.20	3.752	.198	44.00	2.196	.142			
MG++		54.70	4.500	.238	11.00	.905	.059			
TOTAL CATIONS		376.23	18.911		338.00	15.411				
SIO2	(MG/L)									
TOTAL EPM			37.121			31.377				
ANIONS / CATIONS			.963			1.036				
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)		.0300			0.0000				
MN	(MG/L)									
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)		0.1100							
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG			.834			2.426				
NA / K			132.184							
CA+MG / NA+K			.774							
HCO3+CO3 / CL+SO4			.486			.561				
SO4 / CL			6.016			10.383				

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/31

SAMPLE POINT		LG27 ENCINAL CANYON SPRING	LG27 ENCINAL CANYON SPRING	LG28 ENCINAL COMM CYST NR SPRING
LOCATION DATA		LG121 - ACL-N	LG122 - ACL-N	LG123 - ACL-N
SAMPLE NUMBER, AGENCY				
COLLECTION DATE, TIME		01/27/67 1200	01/18/73 1200	06/19/78 1200
WATER LEVEL				
TEMPERATURE (C)		8.00L	8.00L	8.10L
PH (F=FIELD, L=LAB)		150.78	143.64	129.31
TDS (SUM OF GROSS, MG/L)		165.00	158.00	143.00
TDS (BY EVAP., MG/L)		96.39	94.33	90.73
TDS (BY CALC., MG/L)		150.78	143.64	129.31
TDS (SUM-SIO2, MG/L)		195.00L	190.00L	187.00L
SP.COND. (UMHOS/CM@25C)				
		MG/L EPM ION. RAT.	MG/L EPM ION. RAT.	MG/L EPM ION. RAT.
HCO3-		107.00 1.754 .915	97.00 1.590 .889	75.90 1.244 .756
CO3--		0.00 0.000 0.000		.80 .027 .016
CL-		4.50 .127 .066	3.50 .099 .055	3.80 .107 .065
SO4--		1.00 .021 .011	2.90 .060 .034	12.00 .250 .152
F-		.25 .013 .007	.33 .017 .010	.24 .013 .008
NO3-		.13 .002 .001	1.24 .020 .011	.26 .004 .003
PO4---			.05 .002 .001	
TOTAL ANIONS		112.88 1.917	105.02 1.798	93.00 1.645
NA+		10.00 .435 .217	11.50 .500 .265	9.20 .400 .218
K+		3.10 .079 .040	3.52 .090 .048	3.51 .090 .049
CA++		17.00 .848 .423	20.00 .998 .530	18.40 .918 .500
MG++		7.80 .642 .320	3.60 .296 .157	5.20 .428 .233
TOTAL CATIONS		37.90 2.004	38.62 1.994	36.31 1.836
SIO2	(MG/L)			
TOTAL EPM		3.921	3.672	3.480
ANIONS / CATIONS		.956	.949	.896
AS	(MG/L)			< .0050
BA	(MG/L)			< .1000
CD	(MG/L)			< .0010
CR	(MG/L)			< .0050
CN	(MG/L)			
PB	(MG/L)			< .0050
HG	(MG/L)			< .0050
SE	(MG/L)			< .0050
AG	(MG/L)			< .0010
CU	(MG/L)			
FE	(MG/L)	.1200		< .2500
MN	(MG/L)	0.0000		< .0500
PHENOLS	(MG/L)			
ZN	(MG/L)			
AL	(MG/L)			
B	(MG/L)			
CO	(MG/L)			
MO	(MG/L)			
NI	(MG/L)			
V	(MG/L)			
GROSS ALPHA	(PCI/L)			
URANIUM	(UG/L)			
RA-226	(PCI/L)			
RA-228	(PCI/L)			
RA-226 + -228	(PCI/L)			
PB-210	(PCI/L)			
TH-230	(PCI/L)			
TH-232	(PCI/L)			
CA / MG		.322	3.370	2.146
NA / K		5.489	5.558	4.459
CA+MG / NA+K		2.897	2.192	2.747
HCO3+CO3 / CL+SO4		11.868	9.992	8.559
SO4 / CL		.164	.612	2.331

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

SAMPLE POINT		LG29 ENCINAL COMM SYST NR WINDMLL			LG30 ENCINAL COMM SYST 1.25MI S			LG31 WELL		
LOCATION DATA								09.04.16.324		
SAMPLE NUMBER, AGENCY		LG124 - ACL-N			LG125 - ACL-N			LG001 - GS-		
COLLECTION DATE, TIME		12/28/61 1200			12/28/61 1200			05/11/59 1200		
WATER LEVEL								320.00		
TEMPERATURE (C)								321.00		
PH (F=FIELD, L=LAB)		8.30L			8.30L			320.00		
TDS (SUM OF GROSS, MG/L)		1166.80			1181.30			3870.00L		
TDS (BY EVAP., MG/L)		1125.00			1140.00					
TDS (BY CALC., MG/L)		1001.09			1014.07					
TDS (SUM-SIO2, MG/L)		1166.80			1141.30					
SP.COND. (UMHOS/CM@25C)		1580.00L			1580.00L					
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		326.00	5.343	.347	329.00	5.392	.345			
CO3--		0.00	0.000	0.000	0.00	0.000	0.000			
CL-		22.00	.621	.040	23.00	.649	.042	320.00	9.027	1.000
SO4--		449.00	9.348	.607	456.00	9.494	.608			
F-		1.10	.058	.004	1.10	.058	.004			
NO3-		1.40	.023	.001	1.90	.031	.002			
PO4---										
TOTAL ANIONS		799.50	15.392		811.00	15.624		320.00	9.027	
NA+		328.00	14.268	.864	334.00	14.529	.876			
K+		4.30	.110	.007	4.30	.110	.007			
CA++		23.00	1.148	.070	21.00	1.048	.063			
MG++		12.00	.987	.060	11.00	.905	.055			
TOTAL CATIONS		367.30	16.513		370.30	16.592				
SIO2	(MG/L)									
TOTAL EPM			31.905			32.215			9.027	
ANIONS / CATIONS			.932			.942				
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)		.2400			.6800				
MN	(MG/L)		0.0000			0.0000				
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)									
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG			1.163			1.158				
NA / K			129.767			132.141				
CA+MG / NA+K			.148			.133				
HCO3+CO3 / CL+SO4			.536			.532				
SO4 / CL			15.063			14.632				

0700086

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS REPORT DATE 05/05/81

SAMPLE POINT	LG32 WELL	LG33 MESITA DAY SCHOOL KITCHEN	LG34 MESITA PUMP HSE RITO VILLAGE
LOCATION DATA	09.04.18.300	09.04.18.313	09.04.19.211
SAMPLE NUMBER, AGENCY	LG002 - GS	LG003 - ACL-N	LG014 - ACL-N
COLLECTION DATE, TIME	01/16/59 1200	08/23/62 1200	11/22/61 1200
WATER LEVEL			
TEMPERATURE (C)		8.10L	8.40L
PH (F=FIELD, L=LAB)		1615.70	1391.70
TDS (SUM OF GROSS, MG/L)	78.00	1450.00	1190.00
TDS (BY EVAP., MG/L)		1339.69	1162.97
TDS (BY CALC., MG/L)	78.00	1615.70	1391.70
TDS (SUM-SIO2, MG/L)	79.00	2110.00L	1850.00L
SP.COND. (UMHOS/CM@25C)	2630.00L		

	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-				543.00	8.900	.426	450.00	7.376	.397
CO3--				0.00	0.000	0.000	38.00	1.267	.068
CL-	78.00	2.200	1.000	46.00	1.298	.062	32.00	.903	.049
SO4--				500.00	10.577	.506	430.00	8.953	.482
F-				2.60	.137	.007	1.10	.058	.003
NO3-				0.00	0.000	0.000	0.00	0.000	0.000
PO4---									
TOTAL ANIONS	78.00	2.200		1099.60	20.911		951.10	19.555	
NA+				490.00	21.315	.937	419.00	18.227	.944
K+				3.90	.100	.004	4.70	.120	.006
CA++				15.00	.749	.033	13.00	.649	.034
MG++				7.20	.592	.026	3.90	.321	.017
TOTAL CATIONS				516.10	22.755		440.60	19.316	
SIO2 (MG/L)									
TOTAL EPM		2.200			43.666			37.871	
ANIONS / CATIONS					.919			.961	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)					.6000			.8800	
MN (MG/L)					.0500			0.0000	
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG					1.264			2.022	
NA / K					213.742			151.661	
CA+MG / NA+K					.063			.053	
HCO3+CO3 / CL+SO4					.750			.877	
SO4 / CL					9.150			9.917	

070087

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

SAMPLE POINT		LG35 SPRING								
LOCATION DATA		C9.05.04.133								
SAMPLE NUMBER, AGENCY		LG005 - GS-								
COLLECTION DATE, TIME		03/25/65 1200								
WATER LEVEL										
TEMPERATURE (C)										
PH (F=FIELD, L=LAB)		7.60F								
TDS (SUM OF GROSS, MG/L)		1675.10								
TDS (BY EVAP., MG/L)										
TDS (BY CALC., MG/L)		1568.36								
TDS (SUM-SIO2, MG/L)		1648.10								
SP.COND. (UMHOS/CM@25C)		2280.00L								
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		210.00	3.442	.123						
CO3--		0.00	0.000	0.000						
CL-		112.00	3.160	.113						
SO4--		1020.00	21.236	.761						
F-		1.10	.058	.002						
NO3-										
PO4---										
TOTAL ANIONS		1343.10	27.896							
NA+										
K+										
CA++		229.00	11.427	.646						
MG++		76.00	6.252	.354						
TOTAL CATIONS		305.00	17.679							
SIO2	(MG/L)		27.00							
TOTAL EPM			45.575							
ANIONS / CATIONS			1.578							
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)		.0070							
MN	(MG/L)									
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)									
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG			1.828							
NA / K										
CA+MG / NA+K										
HCO3+CO3 / CL+SO4			.141							
SO4 / CL			6.721							

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

		LG36 WELL 09.05.12.442A LG006 - GS- 05/13/63 1200			LG36 WELL 09.05.12.442A LG007 - GS- 05/15/63 1200			LG36 WELL 09.05.12.442A LG009 - GS- 09/19/63 2200		
SAMPLE POINT LOCATION DATA SAMPLE NUMBER, AGENCY COLLECTION DATE, TIME WATER LEVEL										
TEMPERATURE (C)										
PH (F=FIELD, L=LAB)		7.50F			7.70F			7.30F		
TDS (SUM OF GROSS, MG/L)		3330.00			3382.00			18359.00		
TDS (BY EVAP., MG/L)								17698.21		
TDS (BY CALC., MG/L)		3121.60			3174.61			18345.00		
TDS (SUM-SIO2, MG/L)		3330.00			3382.00			23200.00CL		
SP.COND. (UMHOS/CM@25C)		5450.00L			5580.00L					
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		410.00	6.720	.095	408.00	6.687	.093	1300.00	21.307	.075
CO3--		0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000
CL-		420.00	11.848	.168	414.00	11.679	.163	5300.00	163.618	.574
SO4--		2500.00	52.050	.737	2560.00	53.299	.744	4900.00	99.935	.351
F-								3.00	.158	.001
NO3-										
PO4---										
TOTAL ANIONS		3330.00	70.618		3382.00	71.665		11903.00	285.019	
NA+								5600.00	243.600	.827
K+								32.00	.818	.003
CA++								510.00	25.449	.086
MG++								300.00	24.679	.084
TOTAL CATIONS								6442.00	294.545	
SIO2	(MG/L)								14.00	
TOTAL EPM ANIONS / CATIONS			70.618			71.665			579.564 .968	
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)									
MN	(MG/L)									
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)								2.6000	
B	(MG/L)									
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG									1.031	
NA / K									297.712	
CA+MG / NA+K									.205	
HCO3+CO3 / CL+SO4			.105			.103			.091	
SO4 / CL			4.393			4.564			.611	

070089

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

SAMPLE POINT	LG36 WELL	LG36 WELL	LG36 WELL
LOCATION DATA	09.05.12.442A	09.05.12.442A	09.05.12.442A
SAMPLE NUMBER, AGENCY	LG009 - GS-	LG010 - GS-	LG011 - GS-
COLLECTION DATE, TIME	09/20/63 1425	09/21/63 1615	09/23/63 1507
WATER LEVEL			
TEMPERATURE (C)	26.00	18.00	21.00
PH (F=FIELD, L=LAB)	7.00F	7.10F	6.70F
TDS (SUM OF GROSS, MG/L)	12200.00	12200.00	2410.00
TDS (BY EVAP., MG/L)			1596.72
TDS (BY CALC., MG/L)	11437.55	11335.89	2410.00
TDS (SUM-SIO2, MG/L)	12200.00	12200.00	22700.00L
SP.COND. (UMHOS/CM@25C)	23300.00L	23300.00L	

	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	1500.00	24.585	.084	1700.00	27.863	.096	1600.00	26.224	1.000
CO3--	0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000
CL-	5900.00	166.439	.572	5800.00	163.618	.565			
SO4--	4400.00	99.936	.343	4700.00	97.954	.339			
F-									
NO3-									
PO4---									
TOTAL ANIONS	12200.00	290.960		12200.00	289.335		1600.00	26.224	
NA+							450.00	22.455	.431
K+							360.00	29.614	.569
CA++									
MG++									
TOTAL CATIONS							810.00	52.069	
SIO2 (MG/L)									
TOTAL EPM		290.960			289.335			78.293	
ANIONS / CATIONS								.504	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)									
MN (MG/L)									
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG								.759	
NA / K									
CA+MG / NA+K									
HCO3+CO3 / CL+SO4		.092			.107				
SO4 / CL		.600			.598				

070090

SUMMARY OF WATER CHEMISTRY ANALYSIS REPORT DATE 05/05/81

SAMPLE POINT	LG36 WELL	LG36 WELL	LG36 WELL
LOCATION DATA	09.05.12.442A	09.05.12.442A	09.05.12.442A
SAMPLE NUMBER, AGENCY	LG012 - GS-	LG014 - GS-	LG015 - GS-
COLLECTION DATE, TIME	10/01/63 1200	10/07/63 1100	10/25/63 1615
WATER LEVEL			
TEMPERATURE (C)	19.00	34.00	
PH (F=FIELD, L=LAB)	6.70F	6.90F	
TDS (SUM OF GROSS, MG/L)	7910.00	19151.60	930.00
TDS (BY EVAP., MG/L)		18500.00 @ 180 C	
TDS (BY CALC., MG/L)	6939.15	18460.31	930.00
TDS (SUM-SIO2, MG/L)	7910.00	19136.60	930.00
SP.COND. (UMHOS/CM@25C)	23200.00L	25200.00L	

	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	1910.00	31.305	.156	1350.00	22.290	.073			
CO3--	0.00	0.000	0.000	0.00	0.000	0.000			
CL-	6000.00	169.260	.844	6900.00	194.649	.635			
SO4--				4300.00	89.526	.292			
F-				1.60	.084	.000			
NO3-									
PO4---									
TOTAL ANIONS	7910.00	200.565		12561.60	306.550				
NA+				5600.00	243.610	.797			
K+				55.00	1.406	.005			
CA++				460.00	22.954	.075	470.00	23.453	.383
MG++				460.00	37.840	.124	460.00	37.840	.617
TOTAL CATIONS				6575.00	305.800		930.00	61.293	
SIO2 (MG/L)					15.00				
TOTAL EPM		200.565			612.350			61.293	
ANIONS / CATIONS					1.002			0.000	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)					.0910				
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)					.0810				
FE (MG/L)					3.4000			2.6000	
MN (MG/L)					.0100				
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)					4.8000				
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG					.607			.620	
NA / K					173.214				
CA+MG / NA+K					.248				
HCO3+CO3 / CL+SO4					.078				
SO4 / CL					.460				

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

SAMPLE POINT		LG36 WELL	LG36 WELL	LG36 WELL
LOCATION DATA		09.05.12.442A	09.05.12.442A	09.05.12.442A
SAMPLE NUMBER, AGENCY		LG016 - GS-	LG017 - GS-	LG018 - GS-
COLLECTION DATE, TIME		10/26/63 1400	10/26/63 1500	11/10/64 1000
WATER LEVEL				
TEMPERATURE (C)		29.50	28.50	31.50
PH (F=FIELD, L=LAB)		7.30F	6.40F	6.70F
TDS (SUM OF GROSS, MG/L)		19380.80	11200.00	14596.97
TDS (BY EVAP., MG/L)		19100.00 @ 180 C		
TDS (BY CALC., MG/L)		18703.84	11200.00	13696.23
TDS (SUM-SIO2, MG/L)		19365.80	11200.00	14541.97
SP.COND. (UNHOS/CM@25C)		25900.00L	25400.00L	19000.00L
		MG/L EPM ION. FAT.	MG/L EPM ION. FAT.	MG/L EPM ION. FAT.
HCO3-		1320.00 21.635 .070		1770.00 29.013 .130
CO3--		0.00 0.000 0.000		0.00 0.000 0.000
CL-		7100.00 200.291 .647	7000.00 197.470 .693	3700.00 104.377 .469
SO4--		4200.00 87.444 .283	4200.00 87.444 .307	4300.00 89.526 .401
F-		1.80 .095 .000		2.90 .153 .001
NO3-				.07 .001 .000
PO4---				
TOTAL ANIONS		12621.80 309.465	11200.00 284.914	9772.97 223.067
NA+		6000.00 261.000 .838		4100.00 178.350 .800
K+		54.00 1.381 .004		59.00 1.509 .007
CA++		240.00 11.976 .038		320.00 15.968 .072
MG++		450.00 37.017 .119		330.00 27.146 .122
TOTAL CATIONS		6744.00 311.374		4809.00 222.972
SIO2	(MG/L)	15.00		14.00
TOTAL EPM		620.838	284.914	446.040
ANIONS / CATIONS		.994		1.000
AS	(MG/L)	0.0000		
BA	(MG/L)			
CD	(MG/L)			
CR	(MG/L)			
CN	(MG/L)			
PB	(MG/L)			
HG	(MG/L)			
SE	(MG/L)	.0410		
AG	(MG/L)			
CU	(MG/L)			
FE	(MG/L)	.0200		
MN	(MG/L)			
PHENOLS	(MG/L)			
ZN	(MG/L)			
AL	(MG/L)	.2200		
B	(MG/L)			3.5000
CO	(MG/L)			
MO	(MG/L)			
NI	(MG/L)			
V	(MG/L)			
GROSS ALPHA	(PCI/L)			
URANIUM	(MG/L)			
RA-226	(PCI/L)			
RA-228	(PCI/L)			
RA-226 + -228	(PCI/L)			
PB-210	(PCI/L)			
TH-230	(PCI/L)			
TH-232	(PCI/L)			
CA / MG		.324		.598
NA / K		180.024		119.220
CA+MG / NA+K		.187		.241
HCO3+CO3 / CL+SO4		.075		.152
SO4 / CL		.437	.443	.559

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/91

		LG36 WELL			LG37 WELL					
SAMPLE POINT										
LOCATION DATA		09.05.12.442A			09.05.12.442B					
SAMPLE NUMBER, AGENCY		LG019 - GS-			LG020 - GS-					
COLLECTION DATE, TIME		11/10/64 1001			06/12/75 0850					
WATER LEVEL										
TEMPERATURE (C)					26.00					
PH (F=FIELD, L=LAB)		6.80F								
TDS (SUM OF GROSS, MG/L)		6117.61			4931.00					
TDS (BY EVAP., MG/L)										
TDS (BY CALC., MG/L)		5233.17			4931.00					
TDS (SUM-SIO2, MG/L)		6103.61			4931.00					
SP.COND. (UMHOS/CM@25C)		18100.00L			13000.00L					
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		1740.00	28.519	.214						
CO3--		0.00	0.000	0.000						
CL-		3700.00	104.377	.784	2000.00	56.420	1.000			
SO4--										
F-		3.50	.184	.001						
NO3-		.11	.002	.000						
PO4---										
TOTAL ANIONS		5443.61	133.082		2000.00	56.420				
NA+					2900.00	126.150	.994			
K+					31.00	.793	.006			
CA++		320.00	15.968	.363						
MG++		340.00	27.968	.637						
TOTAL CATIONS		660.00	43.936		2931.00	126.943				
SIO2	(MG/L)		14.00							
TOTAL EPM			177.018			183.363				
ANIONS / CATIONS			3.029			.444				
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)									
MN	(MG/L)									
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)		4.6000			3.4000				
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG			.571							
NA / K						153.146				
CA+MG / NA+K										
HCO3+CO3 / CL+SO4										
SO4 / CL										

0700093

SUMMARY OF WATER CHEMISTRY ANALYSIS REPORT DATE 05/05/81

SAMPLE POINT	LG38 MESITA MUNICIPAL WELL	LG38 MESITA MUNICIPAL WELL	LG38 MESITA MUNICIPAL WELL
LOCATION DATA	09.05.13.233	09.05.13.233	09.05.13.233
SAMPLE NUMBER, AGENCY	LG021 - GS-	LG022 - GS-	LG023 - AGL-S
COLLECTION DATE, TIME	05/02/63 1200	03/19/65 1200	01/18/73 1200
WATER LEVEL			
TEMPERATURE (C)			8.00L
PH (F=FIELD, L=LAB)	7.50F	7.80F	
TDS (SUM OF GROSS, MG/L)	1062.50	1009.50	1089.96
TDS (BY EVAP., MG/L)		1210.00 @ 180 C	
TDS (BY CALC., MG/L)	925.26	897.67	889.16
TDS (SUM-SIO2, MG/L)	1042.50	984.50	1089.96
SP.COND. (UMHOS/CM@25C)	1850.00L	1660.00L	1440.00L

	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	270.00	4.425	.230	220.00	3.606	.207	198.30	3.250	.211
CO3--	0.00	0.000	0.000	0.00	0.000	0.000			
CL-	110.00	3.103	.161	86.00	2.426	.139	79.10	2.231	.145
SO4--	550.00	11.451	.596	540.00	11.243	.646	455.30	9.479	.616
F-	1.90	.100	.005	1.20	.063	.004	1.45	.076	.005
NO3-	8.60	.139	.007	4.30	.069	.004	21.70	.350	.023
PO4---									
TOTAL ANIONS	940.50	19.218		851.50	17.407		755.85	15.387	
NA+							221.60	9.640	.618
K+							12.51	.320	.020
CA++	74.00	3.693	.616	95.00	4.741	.603	72.10	3.598	.227
MG++	28.00	2.303	.384	38.00	3.126	.397	27.90	2.295	.145
TOTAL CATIONS	102.00	5.996		133.00	7.866		334.11	15.852	
SIO2 (MG/L)		20.00			25.00				
TOTAL EPM		25.214			25.274			31.240	
ANIONS / CATIONS		3.205			2.213			.971	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)		.0900			.1500			.0300	
MN (MG/L)									
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG		1.603			1.517			1.569	
NA / K								30.135	
CA+MG / NA+K								.592	
HCO3+CO3 / CL+SO4		.304			.264			.279	
SO4 / CL		3.690			4.674			4.249	

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

SAMPLE POINT		LG39 WELL			LG40 WELL			LG41 WELL		
LOCATION DATA		09.05.14.200			09.05.19.234			09.05.19.412		
SAMPLE NUMBER, AGENCY		LG024 - GS-			LG025 - GS-			LG026 - GS-		
COLLECTION DATE, TIME		04/02/63 1200			08/23/66 1200			08/23/66 200		
WATER LEVEL										
TEMPERATURE (C)										
PH (F=FIELD, L=LAB)					8.10F			8.10F		
TDS (SUM OF GROSS, MG/L)		760.00			319.00			246.20		
TDS (BY EVAP., MG/L)										
TDS (BY CALC., MG/L)		760.00			186.84			139.46		
TDS (SUM-SIO2, MG/L)		760.00			309.00			236.30		
SP.COND. (UMHOS/CM@25C)		2340.00L			511.00L			372.00L		
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-					260.00	4.261	.795	210.00	3.442	.856
CO3--					0.00	0.000	0.000	0.00	0.000	0.000
CL-		290.00	8.181	.455	11.00	.310	.058	4.30	.121	.030
SO4--		470.00	9.785	.545	38.00	.791	.148	22.00	.458	.114
F-										
NO3-										
PO4---										
TOTAL ANIONS		760.00	17.966		309.00	5.363		236.30	4.021	
NA+										
K+										
CA++										
MG++										
TOTAL CATIONS										
SIO2	(MG/L)					10.00			9.90	
TOTAL EPM			17.966			5.363			4.021	
ANIONS / CATIONS										
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)									
MN	(MG/L)									
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)									
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG										
NA / K										
CA+MG / NA+K										
HCO3+CO3 / CL+SO4						3.869			5.941	
SO4 / CL			1.196			2.550			3.776	

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

		LG42 WELL			LG43 WELL			LG44 WELL		
SAMPLE POINT										
LOCATION DATA		09.06.02.1234			09.06.04.433			09.06.05.2221		
SAMPLE NUMBER, AGENCY		LG027 - GS-			LG028 - GS-			LG023 - GS-		
COLLECTION DATE, TIME		01/27/77 0840			06/12/75 1020			01/25/77 0815		
WATER LEVEL										
TEMPERATURE (C)					15.00					
PH (F=FIELD, L=LAB)		7.60F						7.80F		
TDS (SUM OF GROSS, MG/L)		2271.50			956.80			1981.80		
TDS (BY EVAP., MG/L)										
TDS (BY CALC., MG/L)		2059.03			356.80			1766.28		
TDS (SUM-SIO2, MG/L)		2246.50			956.80			1949.80		
SP.COND. (UMHOS/CM@25C)		2900.00L			4200.00L			2460.00L		
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		418.00	6.851	.206				424.00	6.949	.246
CO3--		0.00	0.000	0.000				0.00	0.000	0.000
CL-		220.00	6.206	.186	80.00	2.257	1.000	170.00	4.796	.170
SO4--		970.00	20.195	.606				790.00	16.448	.582
F-		1.10	.058	.002				1.50	.079	.003
NO3-										
PO4---										
TOTAL ANIONS		1609.10	33.311		80.00	2.257		1385.50	28.272	
NA+		410.00	17.835	.558	870.00	37.845	.995	406.00	17.400	.625
K+		6.40	.164	.005	6.80	.174	.005	8.30	.212	.008
CA++		130.00	6.487	.203				81.00	4.042	.145
MG++		91.00	7.486	.234				75.00	6.170	.222
TOTAL CATIONS		637.40	31.971		876.80	38.019		564.30	27.824	
SIO2	(MG/L)		25.00						32.06	
TOTAL EPM			65.282			40.276			56.095	
ANIONS / CATIONS			1.042			.059			1.016	
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)		.0100						.0100	
MN	(MG/L)									
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)		.4700			.8400			.4700	
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)	<	.0100					<	.1000	
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG			.867						.655	
NA / K			109.984			217.655			81.986	
CA+MG / NA+K			.776						.580	
HCO3+CO3 / CL+SO4			.259						.327	
SO4 / CL			3.254						3.430	

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

SAMPLE POINT		LG45 WELL			LG46 WELL			LG47 ENGINAL WINDMILL		
LOCATION DATA		09.06.10.122			09.06.31.130			10.06.03.132		
SAMPLE NUMBER, AGENCY		LG030 - GS-			LG031 - GS-			LG032 - ACL-N		
COLLECTION DATE, TIME		02/27/53 1200			05/13/57 1200			08/27/62 1200		
WATER LEVEL										
TEMPERATURE (C)					14.50					
PH (F=FIELD, L=LAB)					7.40F			8.10L		
TDS (SUM OF GROSS, MG/L)		297.80			1892.30			962.50		
TDS (BY EVAP., MG/L)								947.00		
TDS (BY CALC., MG/L)		201.22			1749.98			862.87		
TDS (SUM-SIO2, MG/L)		280.80			1871.30			902.50		
SP.COND. (UMHOS/CM@25C)		347.00L			2530.00L			1275.00L		
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		190.00	3.114	.854	280.00	4.589	.147	196.00	3.212	.232
CO3--		0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000
CL-		4.00	.113	.031	60.00	1.693	.054	51.00	1.439	.104
SO4--		19.00	.396	.108	1200.00	24.984	.798	440.00	9.161	.662
F-		.40	.021	.006	.60	.032	.001	.60	.032	.002
NO3-		.20	.003	.001	1.70	.027	.001	0.00	0.000	0.000
PO4---										
TOTAL ANIONS		213.60	3.647		1542.30	31.325		647.60	13.844	
NA+								124.00	5.394	.372
K+								1.90	.049	.003
CA++		60.00	2.994	.835	240.00	11.976	.621	99.00	4.940	.341
MG++		7.20	.592	.165	89.00	7.321	.379	50.00	4.113	.284
TOTAL CATIONS		67.20	3.586		329.00	19.297		274.90	14.496	
SIO2	(MG/L)		17.00			21.00				
TOTAL EPM			7.233			50.622			28.339	
ANIONS / CATIONS			1.017			1.623			.955	
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)								.0200	
MN	(MG/L)								0.0000	
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)									
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG			5.055			1.636			1.201	
NA / K									111.526	
CA+MG / NA+K									1.663	
HCO3+CO3 / CL+SO4			6.125			.172			.303	
SO4 / CL			3.506			14.761			6.367	

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

	LG48 WELL	LG49 WELL	LG50 SPRING
SAMPLE POINT			
LOCATION DATA	10.06.03.334	10.06.04.222	10.06.21.400
SAMPLE NUMBER, AGENCY	LG033 - GS-	LG034 - GS-	LG035 - GS-
COLLECTION DATE, TIME	01/20/51 1200	03/25/65 1200	05/12/57 1200
WATER LEVEL			
TEMPERATURE (C)			11.00
PH (F=FIELD, L=LAB)		8.10F	7.90F
TDS (SUM OF GROSS, MG/L)	1347.50	916.65	199.75
TDS (BY EVAP., MG/L)	1190.00	1080.00 @ 180 C	168.00 @ 180 C
TDS (BY CALC., MG/L)	1192.98	713.33	140.79
TDS (SUM-SIO2, MG/L)	1297.50	904.65	148.75
SP.COND. (UMHOS/CM@25C)	1650.00L	1620.00L	204.00L

	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	304.00	4.983	.264	400.00	6.556	.394	116.00	1.901	.904
CO3--	0.00	0.000	0.000	0.00	0.000	0.000	0.30	0.005	0.002
CL-	80.00	2.257	.120	23.00	.649	.039	5.00	.141	.067
SO4--	558.00	11.618	.615	450.00	9.369	.563	1.90	.040	.019
F-	.50	.026	.001	1.10	.058	.003	.40	.021	.010
NO3-				.05	.001	.000	.05	.001	.000
PO4---									
TOTAL ANIONS	942.50	18.983		874.15	16.633		123.35	2.104	
NA+	156.00	6.786	.359						
K+									
CA++	132.00	6.587	.349	22.00	1.098	.611	19.00	.948	.643
MG++	67.00	5.511	.292	8.50	.699	.389	6.40	.526	.357
TOTAL CATIONS	355.00	18.884		30.50	1.797		25.40	1.475	
SIO2 (MG/L)		50.00			12.00			51.00	
TOTAL EPM		37.767			19.430			3.578	
ANIONS / CATIONS		1.000			9.256			1.427	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)					.2700				
MN (MG/L)									
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG		1.195			1.570			1.801	
NA / K									
CA+MG / NA+K									
HCO3+CO3 / CL+SO4		.359			.654			10.527	
SO4 / CL		5.148			14.440			.280	

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS REPORT DATE 05/05/81

		LG51 WELL			LG52 WELL			LG53 WELL		
SAMPLE POINT										
LOCATION DATA		10.06.28.000			10.06.29.220			10.06.31.443		
SAMPLE NUMBER, AGENCY		LG036 - GS-			LG037 - GS-			LG038 - GS-		
COLLECTION DATE, TIME		11/20/52 1200			05/21/59 1200			05/25/60 1200		
WATER LEVEL										
TEMPERATURE (C)								20.00		
PH (F=FIELD, L=LAB)								7.70F		
TDS (SUM OF GROSS, MG/L)		614.00			40.00			1034.77		
TDS (BY EVAP., MG/L)										
TDS (BY CALC., MG/L)		339.52			40.00			851.78		
TDS (SUM-SIO2, MG/L)		614.00			40.00			998.77		
SP.COND. (UMHOS/CM@25C)		3540.00L			2820.00L			1510.00L		
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		540.00	8.851	.802				360.00	5.900	.353
CO3--		20.00	.667	.060				0.00	0.000	0.000
CL-		54.00	1.523	.138	40.00	1.128	1.000	70.00	1.975	.118
SO4--								420.00	8.744	.524
F-								1.30	.068	.004
NO3-								.47	.009	.000
PO4---										
TOTAL ANIONS		614.00	11.041		40.00	1.128		851.77	16.696	
NA+										
K+										
CA++								100.00	4.990	.563
MG++								47.00	3.866	.437
TOTAL CATIONS								147.00	8.856	
SIO2	(MG/L)								36.00	
TOTAL EPM			11.041			1.128			25.552	
ANIONS / CATIONS									1.885	
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)									
MN	(MG/L)								.2600	
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)									
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG									1.291	
NA / K										
CA+MG / NA+K										
HCO3+CO3 / CL+SO4									.550	
SO4 / CL									4.428	

070099

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

SAMPLE POINT	LG54 WELL	LG55 WELL	LG56 PARAJE WELL
LOCATION DATA	10.06.31.443A	10.06.33.100	10.06.33.122
SAMPLE NUMBER, AGENCY	LG039 - GS-	LG040 - GS-	LG041 - ACL-N
COLLECTION DATE, TIME	03/18/65 1200	10/20/52 1200	11/15/56 1200
WATER LEVEL			
TEMPERATURE (C)			32.00
PH (F=FIELD, L=LAB)	8.00F		7.45L
TDS (SUM OF GROSS, MG/L)	1047.77	1982.72	2105.04
TDS (BY EVAP., MG/L)	1080.00 @ 180 C		2018.00
TDS (BY CALC., MG/L)	859.70	1669.23	1955.75
TDS (SUM-SIO2, MG/L)	1019.77	1869.72	2106.04
SP.COND. (UMHOS/CM@25C)	1530.00L	2910.00L	

	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	370.00	6.064	.356	420.00	6.884	.209	276.00	4.524	.154
CO3--	0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000
CL-	68.00	1.918	.113	37.00	1.044	.032	41.60	1.157	.039
SO4--	430.00	8.953	.526	1200.00	24.984	.757	1133.00	23.589	.803
F-	1.30	.068	.004	1.40	.074	.002	2.00	.105	.004
NO3-	.47	.008	.000	.32	.005	.000	.04	.001	.000
PO4---									
TOTAL ANIONS	869.77	17.011		1658.72	32.990		1452.04	29.375	
NA+							523.00	22.751	.754
K+									
CA++	97.00	4.840	.526	130.00	6.487	.493	104.00	5.190	.172
MG++	53.00	4.360	.474	81.00	6.663	.507	27.00	2.221	.074
TOTAL CATIONS	150.00	9.200		211.00	13.150		654.00	30.161	
SIO2 (MG/L)		28.00			13.00				
TOTAL EPM		26.211			46.140			59.536	
ANIONS / CATIONS		1.849			2.509			.974	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)		.0400							
MN (MG/L)									
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG		1.110			.974			2.337	
NA / K									
CA+MG / NA+K									
HCO3+CO3 / CL+SO4		.558			.264			.183	
SO4 / CL		4.667			23.936			20.795	

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS REPORT DATE 05/05/81

SAMPLE POINT	LG57 WELL	LG57 WELL	LG58 PARAJE (CASA BLANCA) WELL
LOCATION DATA	10.06.33.142	10.06.33.142	10.06.33.443
SAMPLE NUMBER, AGENCY	LG042 - GS-	LG043 - GS-	LG044 - ACL-N
COLLECTION DATE, TIME	02/20/51 1200	02/22/51 1200	07/12/56 1200
WATER LEVEL			
TEMPERATURE (C)			24.00
PH (F=FIELD, L=LAB)			7.60L
TDS (SUM OF GROSS, MG/L)	2068.10	1200.00	805.25
TDS (BY EVAP., MG/L)			852.00
TDS (BY CALC., MG/L)	1905.44	1200.00	744.09
TDS (SUM-SIJ2, MG/L)	2053.10	1200.00	805.25
SP.COND. (UMHOS/CM@25C)	3410.00L		

	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-	320.00	5.245	.139				140.00	2.295	.197
CO3--	0.00	0.000	0.000				0.00	0.000	0.000
CL-	260.00	7.335	.194				38.00	1.072	.092
SO4--	1200.00	24.984	.662	1200.00	24.984	1.000	395.00	8.224	.707
F-	2.50	.132	.003				.70	.037	.003
NO3-	3.60	.058	.002				.55	.009	.001
PO4---									
TOTAL ANIONS	1786.10	37.753		1200.00	24.984		574.25	11.636	
NA+							51.00	2.219	.191
K+									
CA++	180.00	8.982	.557				167.00	8.333	.717
MG++	87.00	7.157	.443				13.00	1.069	.092
TOTAL CATIONS	267.00	16.139					231.00	11.621	
SIO2 (MG/L)		15.00							
TOTAL EPM		53.892			24.984			23.257	
ANIONS / CATIONS		2.339						1.001	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)									
MN (MG/L)								0.0000	
PHENOLS (MG/L)									
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG		1.255						7.793	
NA / K									
CA+MG / NA+K									
HCO3+CO3 / CL+SO4		.162						.247	
SO4 / CL		3.406						7.672	

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

		LG59 WELL	LG59 WELL	LG60 WELL
SAMPLE POINT				
LOCATION DATA		10.06.35.140	10.06.35.140	10.06.35.300
SAMPLE NUMBER, AGENCY		LG045 - GS-	LG046 - GS-	LG047 - GS-
COLLECTION DATE, TIME		02/12/60 1200	02/12/60 2030	03/08/60 1500
WATER LEVEL				
TEMPERATURE (C)			15.00	16.00
PH (F=FIELD, L=LAB)			8.10F	7.80F
TDS (SUM OF GROSS, MG/L)		558.00	961.33	1022.10
TDS (BY EVAP., MG/L)				
TDS (BY CALC., MG/L)		558.00	829.17	979.78
TDS (SUM-SIO2, MG/L)		554.00	932.33	939.10
SP.COND. (UMHOS/CM@25C)			1460.00L	1570.00L
		MG/L EPM ION. RAT.	MG/L EPM ION. RAT.	MG/L EPM ION. RAT.
HCO3-			260.00 4.261 .262	280.00 4.589 .261
CO3--			0.00 0.000 0.000	0.00 0.000 0.000
CL-		38.00 1.072 .090	38.00 1.072 .066	43.00 1.213 .069
SO4--		520.00 10.826 .910	520.00 10.826 .666	560.00 11.659 .664
F-			1.90 .100 .006	2.10 .111 .006
NO3-			.43 .007 .000	
PO4---				
TOTAL ANIONS		558.00 11.898	820.33 16.267	885.10 17.572
NA+				
K+				
CA++			62.00 3.094 .429	73.60 3.643 .525
MG++			50.00 4.113 .571	40.00 3.290 .475
TOTAL CATIONS			112.00 7.207	113.00 6.933
SIO2	(MG/L)		29.00	24.00
TOTAL EPM		11.898	23.474	24.505
ANIONS / CATIONS			2.257	2.535
AS	(MG/L)			
BA	(MG/L)			
CD	(MG/L)			
CR	(MG/L)			
CN	(MG/L)			
PB	(MG/L)			
HG	(MG/L)			
SE	(MG/L)			
AG	(MG/L)			
CU	(MG/L)			
FE	(MG/L)		0.0000	.0200
MN	(MG/L)			
PHENOLS	(MG/L)			
ZN	(MG/L)			
AL	(MG/L)			
B	(MG/L)			
CO	(MG/L)			
MO	(MG/L)			
NI	(MG/L)			
V	(MG/L)			
GROSS ALPHA	(PCI/L)			
URANIUM	(MG/L)			
RA-226	(PCI/L)			
RA-228	(PCI/L)			
RA-226 + -228	(PCI/L)			
PB-210	(PCI/L)			
TH-230	(PCI/L)			
TH-232	(PCI/L)			
CA / MG			.752	1.107
NA / K				
CA+MG / NA+K			.358	.357
HCO3+CO3 / CL+SO4			10.099	9.812
SO4 / CL		10.099		

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

		LG61 WELL			LG62 WELL			LG63 WELL		
SAMPLE POINT										
LOCATION DATA		10.06.35.322			10.06.35.324			10.06.35.342A		
SAMPLE NUMBER, AGENCY		LG048 - GS-			LG049 - GS-			LG050 - GS-		
COLLECTION DATE, TIME		02/12/80 1200			09/09/80 1200			03/08/80 1200		
WATER LEVEL										
TEMPERATURE (C)		16.00						15.00		
PH (F=FIELD, L=LAB)		8.10F			7.60F			7.80F		
TDS (SUM OF GROSS, MG/L)		1011.33			1073.01			1255.46		
TDS (BY EVAP., MG/L)										
TDS (BY CALC., MG/L)		879.17			930.69			1114.14		
TDS (SUM-SIO2, MG/L)		982.33			1046.01			1232.46		
SP.COND. (UMHOS/CM@25C)		1460.00L			1650.00L			1570.00L		
		MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-		260.00	4.261	.262	280.00	4.589	.253	280.00	4.589	.261
CO3--		0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000
CL-		38.00	1.072	.066	42.00	1.185	.065	43.00	1.213	.069
SO4--		520.00	10.826	.666	590.00	12.284	.677	560.00	11.659	.663
F-		1.90	.100	.006	1.60	.084	.005	2.10	.111	.006
NO3-		.43	.007	.000	.41	.007	.000	.36	.006	.000
PO4---										
TOTAL ANIONS		920.33	16.267		914.01	18.149		885.46	17.578	
NA+		50.00	2.175	.232				230.00	10.005	.579
K+										
CA++		62.00	3.094	.330	85.00	4.242	.523	73.00	3.643	.211
MG++		50.00	4.113	.438	47.00	3.866	.477	44.00	3.619	.210
TOTAL CATIONS		162.00	9.382		132.00	8.108		347.00	17.267	
SIO2	(MG/L)		29.00			27.00			24.00	
TOTAL EPM			25.649			26.256			34.845	
ANIONS / CATIONS			1.734			2.238			1.018	
AS	(MG/L)									
BA	(MG/L)									
CD	(MG/L)									
CR	(MG/L)									
CN	(MG/L)									
PB	(MG/L)									
HG	(MG/L)									
SE	(MG/L)									
AG	(MG/L)									
CU	(MG/L)									
FE	(MG/L)		.4200			.0400			8.1000	
MN	(MG/L)									
PHENOLS	(MG/L)									
ZN	(MG/L)									
AL	(MG/L)									
B	(MG/L)									
CO	(MG/L)									
MO	(MG/L)									
NI	(MG/L)									
V	(MG/L)									
GROSS ALPHA	(PCI/L)									
URANIUM	(MG/L)									
RA-226	(PCI/L)									
RA-228	(PCI/L)									
RA-226 + -228	(PCI/L)									
PB-210	(PCI/L)									
TH-230	(PCI/L)									
TH-232	(PCI/L)									
CA / MG			.752			1.097			1.006	
NA / K										
CA+MG / NA+K			.358			.341			.357	
HCO3+CO3 / CL+SO4			10.099			10.368			9.612	
SO4 / CL										

ANACONDA COPPER COMPANY, JACKPILE-PAGUATE (NM) MINE - WATER QUALITY DATA

SUMMARY OF WATER CHEMISTRY ANALYSIS — REPORT DATE 05/05/81

	LG64 WELL			LG65 MESITA NEW WELL-BIA TEST			LG66 TEST WELL 2MI N OF ENCINAL		
SAMPLE POINT					LG113 - ACL-N			LG126 - ACL-N	
LOCATION DATA	10.06.35.3428								
SAMPLE NUMBER, AGENCY	LG051 - GS-								
COLLECTION DATE, TIME	08/08/60 1500				03/11/65 1200			04/23/64 1200	
WATER LEVEL									
TEMPERATURE (C)	16.00								
PH (F=FIELD, L=LAB)					7.80L			8.00L	
TDS (SUM OF GROSS, MG/L)					1123.20			792.60	
TDS (BY EVAP., MG/L)					1085.00			853.00	
TDS (BY CALC., MG/L)					1023.57			674.67	
TDS (SUM-SIO2, MG/L)					1123.20			792.60	
SP.COND. (UMHOS/CM@25C)	1700.00L				1570.00L			1120.00L	
	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.	MG/L	EPM	ION. RAT.
HCO3-				196.00	3.212	.203	232.00	3.802	.363
CO3--				0.00	0.000	0.000	0.00	0.000	0.000
CL-				77.00	2.172	.137	18.00	.508	.048
SO4--				472.00	9.827	.622	294.00	6.121	.584
F-				1.50	.079	.005	.90	.047	.005
NO3-				32.00	.516	.033	0.00	0.000	0.000
PO4---									
TOTAL ANIONS				778.50	15.807		544.30	10.479	
NA+				240.00	10.440	.633	114.00	4.959	.371
K+				4.70	.120	.007	4.70	.120	.009
CA++				71.00	3.543	.215	72.00	3.593	.269
MG++				29.00	2.386	.145	57.00	4.689	.351
TOTAL CATIONS				344.70	16.489		247.70	13.361	
SIO2 (MG/L)									
TOTAL EPM ANIONS / CATIONS					32.295 / .959			23.840 / .784	
AS (MG/L)									
BA (MG/L)									
CD (MG/L)									
CR (MG/L)									
CN (MG/L)									
PB (MG/L)									
HG (MG/L)									
SE (MG/L)									
AG (MG/L)									
CU (MG/L)									
FE (MG/L)									
MN (MG/L)					.0600			.0600	
PHENOLS (MG/L)					0.0000			0.0000	
ZN (MG/L)									
AL (MG/L)									
B (MG/L)									
CO (MG/L)									
MO (MG/L)									
NI (MG/L)									
V (MG/L)									
GROSS ALPHA (PCI/L)									
URANIUM (MG/L)									
RA-226 (PCI/L)									
RA-228 (PCI/L)									
RA-226 + -228 (PCI/L)									
PB-210 (PCI/L)									
TH-230 (PCI/L)									
TH-232 (PCI/L)									
CA / MG					1.485			.766	
NA / K					86.870			41.263	
CA+MG / NA+K					.561			1.631	
HCO3+CO3 / CL+SO4					.268			.574	
SO4 / CL					4.524			12.055	

Plates Not Scanned
Original document located
in Gray Cabinet (glass-front)
Bottom Shelf in the
Storage Building

APPENDIX B

PLATE B. OFFSITE GROUND-WATER SAMPLE LOCATIONS SOUTH AND WEST OF JACKPILE-PAGUATE MINE

PROJECT 1240-81	REVISIONS
DATE July 17, 1981	

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07000106

PLATE I. EXPLANATION OF GEOLOGIC SYMBOLS FOR PLATES II, IV, AND V.

Pleistocene or Recent	Qc - Colluvial Deposits
	Qe - Eolian and Alluvial Deposits
Pliocene or Pleistocene	QTb - Basalt undifferentiated
Upper Cretaceous	Kpu - Upper part of Point Lookout Sandstone sandstone
	Kmsa - Satan Tongue of Mancos Shale shale and sandstone
	Kph - Hosta Tongue of Point Lookout Sandstone sandstone interbedded with shale
	Kcg - Gibson Coal Member of Crevasse Canyon Formation sandstone, shale and coal
	Kcd - Dalton Sandstone Member of Crevasse Canyon Formation sandstone with siltstone
	Kmm - Mulatto Tongue of Mancos Shale shale and sandstone
	Kcdi - Dilco Coal Member of Crevasse Canyon Formation interbedded sandstone, siltstone and shale
	Km - Mancos Shale shale interbedded with sandstone
	Kms - Three Sisters Sandstone of Mancos Shale, undifferentiated sandstone, siltstone and shale
Lower Cretaceous	Kd - Dakota Sandstone sandstone interbedded with shale
Upper Jurassic	Jmj - Jackpile sandstone of Morrison Formation sandstone and mudstone
	Jmb - Brushy Basin Member of Morrison Formation mudstone, sandstone and limestone
	Jmw - Westwater Canyon Member of Morrison Formation sandstone
	Jmr - Recapture Member of Morrison Formation mudstone, siltstone and sandstone

07000107

PLATE I.

PROJECT 1240-81	REVISIONS
DATE July 17, 1981	

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PLATE II. LOCATION OF ELECTRICAL CONDUCTIVITY MEASUREMENTS AND STANDING WATER BODIES

PROJECT 1240-81	REVISIONS
DATE July 17, 1981	

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CONSULTING HYDROLOGISTS-GEOLOGISTS
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07000108

ıber,86.0, is the average of all flow measurements
)18, 1980. Lower left column is time of day. Lower
cified time for period July 15–18, 1980.

PLATE III. STREAMFLOW HYDROGRAPHS AND SUMMARY OF STREAMFLOW SURVEY JULY 15–18, 1980

PROJECT 1240-81	REVISIONS
DATE July 17, 1981	

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PLATE IV. CHEMICAL QUALITY OF SURFACE WATER

PROJECT 1240-81	REVISIONS
DATE July 17, 1981	

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PLATE V. CHEMICAL QUALITY OF GROUND WATER

PROJECT 1240-81	REVISIONS
DATE July 17, 1981	

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QUALITY ASSURANCE SAMPLING PLAN

FOR

JACKPILE-PAGUATE URANIUM MINE
SR 279 LAGUNA PUEBLO
PAGUATE, CIBOLA COUNTY, NEW MEXICO

Prepared for

U.S. Environmental Protection Agency Region 6
Linda Carter, Project Officer
1445 Ross Avenue
Dallas, Texas 75202

Contract No. EP-W-06-042
Technical Direction Document No. TO-0019-10-02-02
WESTON Work Order No. 20406.012.019.0514.01
NRC No. N/A
CERCLIS No. NMN000607033
FPN No. N/A
EPA SAM: Brenda Nixon Cook
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February 2010

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SIGNATURE PAGE

2/25/2010

Brenda Nixon Cook
U.S. Environmental Protection Agency Region 6
Site Assessment Manager

Date

5/2010

Jeff Criner
Weston Solutions, Inc.
START-3 Assessment/Inspection Manager

Date

May 2010

Cecilia Shappee, P.E.
Weston Solutions, Inc.
START-3 Quality Assurance Officer

Date

May 2010

Michelle Brown
Weston Solutions, Inc.
START-3 Project Team Leader

Date

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TABLE OF CONTENTS

Section **Page**

1. INTRODUCTION 1-1
1.1 PROJECT OBJECTIVES 1-1
1.2 PROJECT TEAM 1-2
1.3 QASP FORMAT 1-2

2. SITE BACKGROUND 2-1
2.1 SITE LOCATION AND DESCRIPTION 2-1
2.2 SITE HISTORY 2-1

3. SAMPLING APPROACH AND PROCEDURES 3-1
3.1 OVERVIEW OF MONITORING/SAMPLING ACTIVITIES 3-1
3.1.1 Data Quality Objectives 3-1
3.1.2 Health and Safety Plan Implementation 3-2
3.1.3 Community Relations 3-2
3.2 SAMPLING/MONITORING APPROACH 3-2
3.2.1 Waste Sampling 3-3
3.2.2 Surface Water Pathway Sampling 3-3
3.2.3 Investigation-Derived Wastes 3-4
3.2.4 Sampling and Sample Handling Procedures 3-4
3.2.5 Quality Assurance/Quality Control Samples 3-4
3.3 SAMPLE MANAGEMENT 3-5
3.4 DECONTAMINATION 3-6
3.5 SAMPLE PRESERVATION, CONTAINERS, AND HOLD TIMES 3-6

4. ANALYTICAL METHODS 4-1
4.1 RADIOLOGICAL ANALYSIS 4-1
4.2 CHEMICAL ANALYSIS 4-1

5. DATA VALIDATION 5-1

6. QUALITY ASSURANCE 6-1
6.1 SAMPLE CUSTODY PROCEDURES 6-1
6.2 PROJECT DOCUMENTATION 6-2
6.2.1 Field Documentation 6-3
6.2.2 Report Preparation 6-4

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LIST OF APPENDICES

Appendix A EPA Contract Laboratory Program Guidance for Field Samplers

Appendix B Site-specific Data Quality Objectives

Appendix C WESTON Standard Operating Procedures

Appendix D Laboratory Analyte List and Reporting Limits

Appendix E START-3 TDD No. TO-0019-10-02-02

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LIST OF FIGURES

Title

Figure 1-1 Site Location Map

Figure 2-1 Site Area Map

Figure 3-1 Proposed Sample Location Map

LIST OF TABLES

Title

Table 4-1 Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times Jackpile-Paguate Uranium Mine Paguate, Cibola County, New Mexico 4-2

Table 4-2 Field and Laboratory QA/QC and Analysis Summary..... 4-3

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1. INTRODUCTION

Weston Solutions, Inc. (WESTON®), the EPA Region 6 Superfund Technical Assessment and Response Team (START-3) Contractor, has been tasked by the U.S. Environmental Protection Agency (EPA) Region 6 Prevention and Response Branch (PRB) under Contract No. EP-W-06-042 and Technical Direction Document (TDD) No. TO-0019-10-02-02 (Appendix E) to perform Site Investigation (SI) activities at the Jackpile-Paguate Uranium Mine site located on SR 279 Laguna Pueblo in Paguate, Cibola County, New Mexico. A Site Location Map is provided as Figure 1-1. The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database number assigned to the Jackpile-Paguate Uranium Mine Site is NMN000607033. START-3 has prepared this Quality Assurance Sampling Plan (QASP) to describe the technical scope of work (SOW) to be completed as part of the SI.

1.1 PROJECT OBJECTIVES

START-3 is providing technical assistance to EPA Region 6 for the performance of a SI at the Jackpile-Paguate Uranium Mine site. The objective of the SI is to identify potential threats that hazardous substances attributable to the site may pose to human health and the environment. START-3 will assess the existence and migration of hazardous substances and identify the receptors, or targets, potentially exposed to the hazardous substances.

The objective of the SI will be achieved by evaluating data obtained during the investigation from off-site surface water and/or sediment samples; waste samples from pits, dumps, and stockpiles located on the site; and background samples. The site-specific Contaminants of Concern (COCs) include isotopic uranium, total metals, mercury, and cyanide. The site-specific screening levels will be identified as three times the maximum background sample concentrations.

The information collected by START-3 during the SI will be used to evaluate the site using the Hazard Ranking System (HRS) and to assist in determining whether the site is a potential candidate for inclusion on the National Priorities List (NPL). The intent of the SI is to provide

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documentation necessary to either rank the site on the NPL or assign a "No Further Remedial Action Planned" (NFRAP) status.

1.2 PROJECT TEAM

The Project Team will consist of START-3 personnel including Michelle Brown as the Project Team Leader (PTL); a Field Safety Officer (FSO); a Data Manager; and additional START-3 Field Team Members to assist with sampling activities. The PTL, in collaboration with Brenda Nixon Cook, the EPA Site Assessment Manager (SAM), will determine the number and location of samples to be collected. The PTL will oversee collection of the samples as necessary, record the activities at each sample location in the field logbook, and verify sample documentation. Sample documentation and preparation is also the responsibility of START-3. The PTL will be responsible for documenting the work performed and will serve as START-3 liaison to EPA Region 6.

1.3 QASP FORMAT

This QASP has been organized in a format that is intended to facilitate and effectively meet the objective of the removal assessment. The QASP is organized as follows:

- Section 1 – Introduction
- Section 2 – Site Background
- Section 3 – Sampling Approach and Procedures
- Section 4 – Analytical Methods
- Section 5 – Data Validation
- Section 6 – Quality Assurance

Tables are included at the end of each representative section. All figures are provided as separate Portable Document Format (PDF) files. Appendices are attached with the following information:

Appendix A Contract Laboratory Program Guidance for Field Samplers
Appendix B Site-Specific Data Quality Objectives
Appendix C WESTON Standard Operating Procedures
Appendix D Laboratory Analyte List and Reporting Limits
Appendix E START-3 TDD No. TO-0019-10-02-02

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2. SITE BACKGROUND

Information regarding the site location, description, and site history are included in the following subsections.

2.1 SITE LOCATION AND DESCRIPTION

The Jackpile-Paguate Uranium Mine site consists of approximately 7,868 acres of uranium mine leases within the Laguna Indian Reservation, Paguate, Cibola County, New Mexico. The site is located 40 miles west of Albuquerque, New Mexico and contains 2,656 acres of disturbed land which consists of three open pits and nine underground mines. The geographical center of the site is Latitude 35° 8' 16.74" North and Longitude 107° 20' 51.84" West. A Site Area Map derived from the ESRI geographical information system (GIS) Microsoft Virtual Earth Roads, 2009 is included as Figure 2-1.

The town of Paguate is located adjacent and west of the site with a population of approximately 474 according to the 2000 census. The remaining surrounding area is mainly undeveloped, with the perennial rivers Rio Moquino and Rio Paguate bisecting the site. The Rio Paguate continues south of the former uranium mine continuing through the Paguate Reservoir and then becoming the Rio San Jose.

2.2 SITE HISTORY

The mine was operated by Anaconda Minerals Company, a division of the Atlantic Richfield Company, from 1953 through 31 March 1982. The mine was closed because of depressed uranium mining conditions.

Open pit mining was conducted with large front-end loaders and haul trucks. The overburden, consisting of topsoil, alluvium, shale, and sandstone, was blasted or ripped, removed from the open pits and placed in waste dumps. Underground mining was conducted by driving adits, or declines, to the ore zone. The ore was removed by modified room and pillar methods. Mine water was collected in sumps and pumped to ponds in the open pits. Waste rock was placed in

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waste dumps. The ore was segregated and shipped by rail to Anaconda's Mill, 40 miles west of the mine.

During the 29 years of mining, approximately 400 million tons of earth was moved within the mine area, and about 25 million tons of ore were removed.

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3. SAMPLING APPROACH AND PROCEDURES

The specific field investigation activities that will be conducted during site sampling are presented in the following subsections. Samples collected as part of this SI will be obtained in accordance with EPA *Contract Laboratory Program Guidance for Field Samplers, EPA540-R-00-003, OSWER 9240.0-35* (Appendix A).

3.1 OVERVIEW OF MONITORING/SAMPLING ACTIVITIES

This SI is being performed to evaluate the hazardous substances present in the potential source area and surface water exposure pathway at or near the Jackpile-Paguate Uranium Mine site. The primary chemicals of concern at the site are uranium and heavy metals. Subcontracted laboratories will be utilized for analysis of isotopic uranium, total metals, mercury, and cyanide.

The EPA SAM and START-3 will collect up to 6 waste source samples (including one duplicate) from the various waste areas located in pits, dumps, and stockpiles on-site. START-3 will also collect up to 39 water and/or sediment samples from the surface water pathways that include the Rio Moquino, Rio Paguate, Paguate Reservoir, and the Rio San Jose (including six background and Quality Assurance/Quality Control [QA/QC]). If necessary, sampling of investigation-derived waste (IDW) will be performed to properly dispose of IDW. START-3 will use EPA Scribe Environmental Sampling Data Management System (SCRIBE) software to manage sample data.

3.1.1 Data Quality Objectives

The objectives of the sampling activities described in this QASP are to characterize known or suspected hazardous waste source areas on-site and to determine if there has been a release of site-related hazardous substances and contaminants into the surface water pathway. To accomplish this, the following data quality objectives (DQOs) have been established and are included in Appendix B:

- Characterization of source and areas of observed contamination.
- Determine if there is a release of site-related contamination in the surface water pathway.

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The DQOs were developed using the seven-step process set out in the *EPA Guidance for Quality Assurance Project Plans: EPA QA/G-5*.

3.1.2 Health and Safety Plan Implementation

The START-3 field activities will be conducted in accordance with the site-specific health and safety plan (HASP). The FSO will be responsible for implementation of the HASP during all field investigation activities. In accordance with the WESTON general health and safety operating procedures, the field team will also drive the route to the hospital specified in the HASP prior to initiating sampling activities. Radiation monitoring will be conducted at all sample locations prior to and during sample collection using a MicroR meter with a pancake G-M detector.

3.1.3 Community Relations

Community relations may require additional EPA involvement due to the general nature of the site. Community relations issues will be directed to the EPA SAM. If the EPA SAM is not present, the START-3 PTL, under the guidance of the START-3 Assessment/Inspection Manager, will manage community relations in the field as directed by the SAM. If a community relations plan and implementation program becomes necessary, START-3 will establish each if requested by the EPA SAM. START-3 will work as directed by the EPA SAM to obtain access to all designated sampling locations.

3.2 SAMPLING/MONITORING APPROACH

All samples will be collected in general accordance with the WESTON Standard Operating Procedures (SOPs) 1002-01 for Surface Water Sample Collection and 1002-04 for Sediment Sampling (Appendix C). Source samples will be collected using 1001-01, 1001-04 and 1001-10 (Surface Soil Sampling, Stockpile Sampling and Composite Sampling). The specific sampling procedures are described below.

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3.2.1 Waste Sampling

Approximately six source waste samples (including one duplicate) will be collected on-site. The exact number of samples and locations of the samples will be decided by the EPA SAM and START-3 PTL. The waste samples will be submitted to ALS Laboratory Group in Fort Collins, Colorado, for the following analyses:

- Isotopic Uranium (including isotopes 234, 235, and 238) by ASTM 3972-90M alpha spectrometry.
- Total metals including mercury by SW846 Methods 6010B and 7470/7471, respectively.
- Total cyanide by SW846 Method 9014.

Laboratory-specific analyte lists and reporting limits are included in Appendix D. Deviations from the sample locations will be due to new observations made prior to sampling, information obtained in the field that warrants an altered sampling point, difficulty in sample collection, or limited access. The EPA SAM will be notified, and concurrence will be obtained should significant deviations from the planned sampling points be proposed. Details regarding deviations of the QASP will be documented in the site logbook.

3.2.2 Surface Water Pathway Sampling

START-3 will collect up to 39 surface water and/or sediment sample locations (including six background and five QA/QC samples) as part of the SI to document a release to the surface water pathway from the site. Combined surface water and sediment samples will be collected along the surface water pathway to the Paguate Reservoir. Downstream of the Paguate Reservoir, only sediment samples will be collected. The proposed surface water and/or sediment sample locations are presented in Figure 3-1.

Surface water and/or sediment samples will be submitted to ALS Laboratory Group in Fort Collins, Colorado, for the following analyses:

- Isotopic Uranium (including isotopes 234, 235, and 238) by ASTM 3972-90M alpha spectrometry.
- Total metals including mercury by SW846 Methods 6010B and 7470/7471, respectively.
- Cyanide by SW846 Method 9014.

The laboratory-specific analyte list and reporting limits are included in Appendix D.

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3.2.3 Investigation-Derived Wastes

Attempts will be made to eliminate or minimize generation of IDW during this investigation. All non-dedicated equipment will be decontaminated according to WESTON SOP 1201.01. Non-dedicated equipment will be rinsed with soap and water and attempts will be made to dispose of decontamination fluids on-site. The analytical data from collected samples will be reviewed after completion of the field activities, and disposal options will be evaluated accordingly. It is anticipated that minimal amounts of IDW will be generated during this activity.

3.2.4 Sampling and Sample Handling Procedures

Samples will be collected using equipment and procedures appropriate to the matrix, parameters, and sampling objectives. The volume of the sample collected must be sufficient to perform the laboratory analysis requested. Samples must be stored in the proper types of containers and preserved in a manner appropriate to the analysis to be performed. A sample collection and analyses summary table is presented in Section 4.

All clean, decontaminated sampling equipment and sample containers will be maintained in a clean, segregated area. All samples will be collected with clean decontaminated equipment following WESTON SOP 1201.01. All samples collected for laboratory analysis will be placed directly into pre-cleaned, unused glass or plastic containers. Sampling personnel will change gloves between each sample collection/handling. All samples will be assembled and catalogued prior to shipping to the designated laboratory (following WESTON SOP 1101.1 and 1102.01).

3.2.5 Quality Assurance/Quality Control Samples

START-3 will collect field duplicate and MS/MSD samples of soil, sediment, and surface water and prepare equipment rinsate blank samples as needed during the removal assessment sampling activities. QA/QC samples will be collected according to the following dictates:

- Blind field duplicate samples will be collected during sampling activities at locations selected by the START-3 PTL. The data obtained from these samples will be used to assist in the quality assurance of the sampling procedures and laboratory analytical data by allowing an evaluation of reproducibility of results. Efforts will be made to collect duplicate samples in locations where there is visual evidence of contamination or where

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contamination is suspected. Blind field duplicate samples will be collected at the rate of one duplicate for every 10 samples collected.

- Equipment rinsate blanks will be prepared by pouring laboratory-grade deionized water over nondisposable sampling equipment after it has been decontaminated and collecting the rinse water in sample containers for analyses. These samples will be prepared to demonstrate that the equipment decontamination procedures for the sampling equipment were performed effectively. No equipment rinsate blanks will be collected as part of this sampling activity as dedicated sampling equipment will be used as part of the sampling activity.
- Temperature blanks will be prepared in the field and will consist of one 40-milliliter glass sample container with Teflon-lined septum cap. The temperature blank will be packaged along with the field samples in the shipping cooler and will represent the temperature of the incoming cooler upon receipt at the laboratory. Use of these samples within a shipping container enables the laboratory to assess the temperature of the shipment without disturbing any of the field samples.
- MS/MSD samples will be collected during sampling activities at locations selected by the START-3 PTL. The data obtained from these samples will be used to assist in the quality assurance of the sampling procedures and laboratory analytical data by allowing an evaluation of reproducibility of results. Efforts will be made to collect MS/MSD samples in locations where there is no visual evidence of contamination or where contamination is not suspected. MS/MSD samples will be collected at the rate of one MS/MSD sample per matrix for every 20 samples collected.

3.3 SAMPLE MANAGEMENT

Specific nomenclature that will be used by START-3 will provide a consistent means of facilitating the sampling and overall data management for the project (WESTON SOP 0110.01). The START-3 Assessment/Inspection Manager must approve any deviations from the sample nomenclature proposed below.

As stated in WESTON SOP 0110.01, sample nomenclature will follow a general format regardless of the type or location of the sample collected. The general nomenclature consists of the following components:

- Geographic location (e.g., location within a school or park).
- Collection type (composite, grab, etc.).
- QA/QC type (normal, duplicate, etc.).
- Sequence - An additional parameter used to further differentiate samples.

Sample data management will be completed utilizing SCRIBE including Chain-of-Custody (COC) and sample documentation needs.

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3.4 DECONTAMINATION

The nondisposable sampling equipment (hand trowels, stainless steel bowls, etc.) used during the sample collection process will be thoroughly decontaminated before initial use, between use, and at the end of the field investigation. Equipment decontamination will be completed in the following steps:

- Water spray or brush, if needed, to remove soil/sediment from the equipment.
- Nonphosphate detergent and potable water wash to clean the equipment.
- Final potable water rinse.
- Air-dried equipment.

Personnel decontamination procedures are described in the site-specific HASP. All decontamination activities will be conducted at a temporary decontamination pad that will be constructed in an area to be determined by the PTL prior to the beginning of field activities.

Excess soil and fluids generated as a result of equipment decontamination will be placed in a drum and staged in an area to be determined by the PTL. The drum will be labelled on the side with the name of the site, the contents, sampling location, and date.

3.5 SAMPLE PRESERVATION, CONTAINERS, AND HOLD TIMES

Once collected, samples will be stored in coolers on-site until shipped for laboratory analysis. Samples designated for alpha spectrometry analysis do not require maintenance of a specific temperature range and do not have a holding time limit. Chain-of-custody forms will be completed for each sample shipment and sent with the samples to the designated laboratory by overnight carrier.

START-3 will receive analytical results based on discussions with the EPA SAM. This turnaround time (TAT) is initiated when the samples are received by the laboratory and continues until the analytical results are made available to START-3 either verbally or by providing facsimile or email copies of the results for review. Samples that have been analyzed will be disposed by the designated laboratory in accordance with the laboratory SOPs.

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4. ANALYTICAL METHODS

START-3 will collect samples for both radiological and chemical analysis. Tables 4-1 and 4-2 summarize the samples that will be collected, including the volumes, container types, and associated analytical methods.

4.1 RADIOLOGICAL ANALYSIS

Samples collected by START-3 during the removal assessment will be analyzed by ALS Laboratory Group in Fort Collins, Colorado. Surface water, sediment, and source waste samples will be submitted for analysis of isotopic uranium by ASTM 3972-90M alpha spectrometry with a focus on uranium 234, 235, and 238.

4.2 CHEMICAL ANALYSIS

The source soil, surface water and sediment samples will be submitted to ALS Laboratory Group in Fort Collins, Colorado for the following inorganic analyses with a turn-around-time of 3 to 5 business days for analytical results.

- Total Metals by SW-846 Method 6010B
- Mercury by SW-846 Method 7470/7471
- Total Cyanide by SW-846 Method 9014

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Table 4-1
Requirements for Containers, Preservation Techniques,
Sample Volumes, and Holding Times
Jackpile-Paguate Uranium Mine
Paguate, Cibola County, New Mexico

Name	Analytical Methods	Container	Preservation	Minimum Sample Volume or Weight	Maximum Holding Time
TAL Metals and Mercury	SW846 6010B and SW846 7470/7471	Polyethylene (water), Glass (solid)	HNO_3 to pH<2 (water), 4°C	500 mL, 8oz	28 days for mercury 180 days all other metals
Total Cyanide	SW846 9014	Polyethylene (water), Glass (solid)	NaOH to pH >12 (water), 4°C	250 mL, 4 oz	14 days
Uranium (isotopic)	Alpha Spec ASTM 3972-90M	Polyethylene (water), Glass (solid)	HNO_3 to pH< 2 (water), NA (soil)	1 liter, 8 oz	6 months

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Table 4-2
Field and Laboratory QA/QC and Analysis Summary
Jackpile-Paguate Uranium Mine
Paguate, Cibola County, New Mexico

Sample Type	Sample Collection Method	No. of Samples	Rationale	EPA Analytical Method
Waste Source Soils	SOP 1001.1, 1001.4 and 1001.10	5	Extent of contamination	SW846 6010B SW846 7470/7471 SW846 9014 ASTM 3972-90M
Duplicate Soil (10%)	SOP 1001.1, 1001.4 and 1001.10	1	QA/QC	SW846 6010B SW846 7470/7471 SW846 9014 ASTM 3972-90M
Surface Water (water)	SOP 1002.1	9	Extent of contamination	SW846 6010B SW846 7470/7471 SW846 9014 ASTM 3972-90M
Surface Water (water)	SOP 1002.1	4	Background	SW846 6010B SW846 7470/7471 SW846 9014 ASTM 3972-90M
Surface Water (sediment)	SOP 1002.4	15	Extent of contamination	SW846 6010B SW846 7470/7471 SW846 9014 ASTM 3972-90M
Surface Water (sediment)	SOP 1002.4	6	Background	SW846 6010B SW846 7470/7471 SW846 9014 ASTM 3972-90M
Duplicate Surface Water (10%)	SOP 1002.1	2	QA/QC	SW846 6010B SW846 7470/7471 SW846 9014 ASTM 3972-90M
Duplicate Sediment (10%)	SOP 1002.4	3	QA/QC	SW846 6010B SW846 7470/7471 SW846 9014 ASTM 3972-90M
Rinsate Blanks[1]	N/A	5	QA/QC	SW846 6010B SW846 7470/7471 SW846 9014 ASTM 3972-90M
Temperature Blanks[2]	N/A	5	QA/QC	Vial temperature measured upon arrival at laboratory

Note:
[1]Rinsate blanks: samples will be collected at the rate of 1 per day per nondisposable sampling equipment.
[2]Temperature blanks: samples will be collected at a rate of 1 per cooler.

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5. DATA VALIDATION

START-3 will validate the radioanalytical data by having each data set reviewed by a professional health physicist. A summary of the data validation and findings will be presented in Summary Reports as part of the final report. START-3 will evaluate the following to verify that the radioanalytical data are within acceptable QA/QC tolerances:

- The completeness of the Laboratory Reports, verifying that all required components of the report are present and that the samples indicated on the accompanying chain-of-custody are addressed in the report.
- The results of laboratory blank analyses.
- The results of laboratory control sample (LCS) analyses.
- Compound identification and quantification accuracy relative to expected isotopic ratios for uranium and its decay products.
- Laboratory precision, through review of the results for blind field duplicates.

The inorganic analytical data generated by the designated laboratory will be validated using EPA-approved data validation procedures in accordance with the EPA CLP National Functional Guidelines for Inorganic Data Review (October 2004). A summary of the data validation findings will be presented in Data Validation Summary Reports as part of the final report. The following will be evaluated to verify that the analytical data is within acceptable QA/QC tolerances:

- The completeness of the Laboratory Reports, verifying that all required components of the report are present and that the samples indicated on the accompanying chain-of-custody are addressed in the report.
- The calibration and tuning records for the laboratory instruments used for the sample analyses.
- The results of internal standards analyses.
- The results of laboratory blank analyses.
- The results of laboratory control sample (LCS) analyses.
- The results of MS/MSD analyses.
- Compound identification and quantification accuracy.
- Laboratory precision, by reviewing the results for blind field duplicates.

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Variances from the QA/QC objectives will be addressed as part of the Data Validation Summary Reports.

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6. QUALITY ASSURANCE

Quality Assurance (QA) will be conducted in accordance with the WESTON Corporate Quality Management Manual, dated March 2004; the WESTON START-3 Quality Management Plan and Programmatic Quality Assurance Project Plan, dated July 2009; and EPA Guidance for Performing Site Inspections under CERCLA. Following receipt of the TDD from EPA, a Quality Control (QC) officer will be assigned and will monitor work conducted throughout the entire project including reviewing interim report deliverables and field audits. The START-3 PTL will be responsible for QA/QC of the field investigation activities. The designated laboratory utilized during the investigation will be responsible for QA/QC related to the analytical work. START-3 will also collect samples to verify that laboratory QA/QC is consistent with the required standards and to validate the laboratory data received.

6.1 SAMPLE CUSTODY PROCEDURES

Because of the evidentiary nature of sample collection, the possession of samples must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. After sample collection and identification, samples will be maintained under the chain-of-custody procedures. If the sample collected is to be split (laboratory QC), the sample will be allocated into similar sample containers. Sample labels completed with the same information as that on the original sample container will be attached to each of the split samples. All personnel required to package and ship coolers containing potentially hazardous material will be trained accordingly.

Chain-of-custody forms will be prepared by START-3 utilizing SCRIBE software. The chain-of-custody procedures are documented and will be made available to all personnel involved with the sampling. A typical chain-of-custody record will be completed each time a sample or group of samples is prepared for shipment to the laboratory. The record will repeat the information on each sample label and will serve as documentation of handling during shipment. A copy of this record will remain with the shipped samples at all times, and another copy will be retained by the member of the sampling team who originally relinquished the samples. At the completion of the

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project, the data manager will export the SCRIBE chain-of-custody documentation to the Analytic Service Tracking System (ANSETS) database.

Samples relinquished to the participating laboratories will be subject to the following procedures for transfer of custody and shipment:

- The COC record will accompany samples. When transferring possession of samples, the individuals relinquishing and receiving the samples will sign, date, and note the time of the sample transfer on the record. This custody record documents transfer of sample custody from the sampler to another person or to the laboratory.
- Samples will be properly packed for shipment and dispatched to the appropriate laboratory for analysis with separate, signed custody records enclosed in each sample box or cooler. Sample shipping containers will be custody-sealed for shipment to the laboratory. The preferred procedure includes use of a custody seal wrapped across filament tape that is wrapped around the package at least twice. The custody seal will then be folded over and stuck to the seal to ensure that the only access to the package is by cutting the filament tape or breaking the seal to unwrap the tape.
- If sent by common carrier, a bill of lading or airbill will be used. Bill of lading and airbill receipts will be retained in the project file as part of the permanent documentation of sample shipping and transfer.

WESTON SOPs 1101.01 and 1102.01, provided in Appendix C, describe these procedures in more detail.

6.2 PROJECT DOCUMENTATION

All documents will be completed legibly and in ink and by entry into field logbooks and SCRIBE. Response Manager will be used after direction of the EPA SAM.

SCRIBE Enterprise is designed to give users the ability to synchronize the SCRIBE field data to the Regional Response Center - Environmental Data Management System (RRC-EDMS) Web Hub. This allows analytical data managers and data validators access to data to perform reviews from anywhere with an Internet connection. SCRIBE Enterprise is designed to take the analytical data management functionality of the EPA SCRIBE software and make it available for multiple users to access on one site. SCRIBE Enterprise also supports EPA standards such as ANSETS and Staged Electronic Data Deliverable (SEDD), and will allow users to connect to the

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database using the SCRIBE desktop interface, thus providing normal SCRIBE desktop-like functionality for multiple users.

6.2.1 Field Documentation

The following field documentation will be maintained as described below.

Field Logbook

The field logbook is a descriptive notebook detailing site activities and observations so that an accurate, factual account of field procedures may be reconstructed. All entries will be signed by the individuals making them. Entries should include, at a minimum, the following:

- Site name and project number.
- Names of personnel on-site.
- Dates and times of all entries.
- Description of all site activities, including site entry and exit times.
- Noteworthy events and discussions.
- Weather conditions.
- Site observations.
- Identification and description of samples and locations.
- Subcontractor information and names of on-site personnel.
- Dates and times of sample collections and chain-of-custody information.
- Records of photographs.
- Site sketches.
- Calibration results.

Sample Labels

Sample labels will be securely affixed to the sample container. The labels will clearly identify the particular sample and include the following information:

- Site name and project number.
- Date and time the sample was collected.
- Sample preservation method.
- Analysis requested.
- Sampling location.

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Chain-of-Custody Record

A chain-of-custody will be maintained from the time of sample collection until final deposition. Every transfer of custody will be noted and signed for, and a copy of the record will be kept by each individual who has signed it.

Custody Seal

Custody seals demonstrate that a sample container has not been tampered with or opened. The individual who has custody of the samples will sign and date the seal and affix it to the container in such a manner that it cannot be opened without breaking the seal.

Photographic Documentation

START-3 will take photographs to document site conditions and activities as site work progresses. Initial conditions should be well documented by photographing features that define the site-related contamination or special working conditions. Representative photographs should be taken of each type of site activity. The photographs should show typical operations and operating conditions as well as special situations and conditions that may arise during site activities. Site final conditions should also be documented as a record of how the site appeared at completion of the work.

All photographs should be taken with either a film camera or digital camera capable of recording the date on the image. Each photograph will be recorded in the logbook with the location of the photographer, direction the photograph was taken, the subject of the photograph, and its significance (i.e., why the picture was taken).

6.2.2 Report Preparation

At the completion of the project, START-3 will review and validate all laboratory data and prepare a draft report of field activities and analytical results for EPA SAM review. Draft deliverable documents will be uploaded to the EPA TeamLink website for EPA SAM review and comment.

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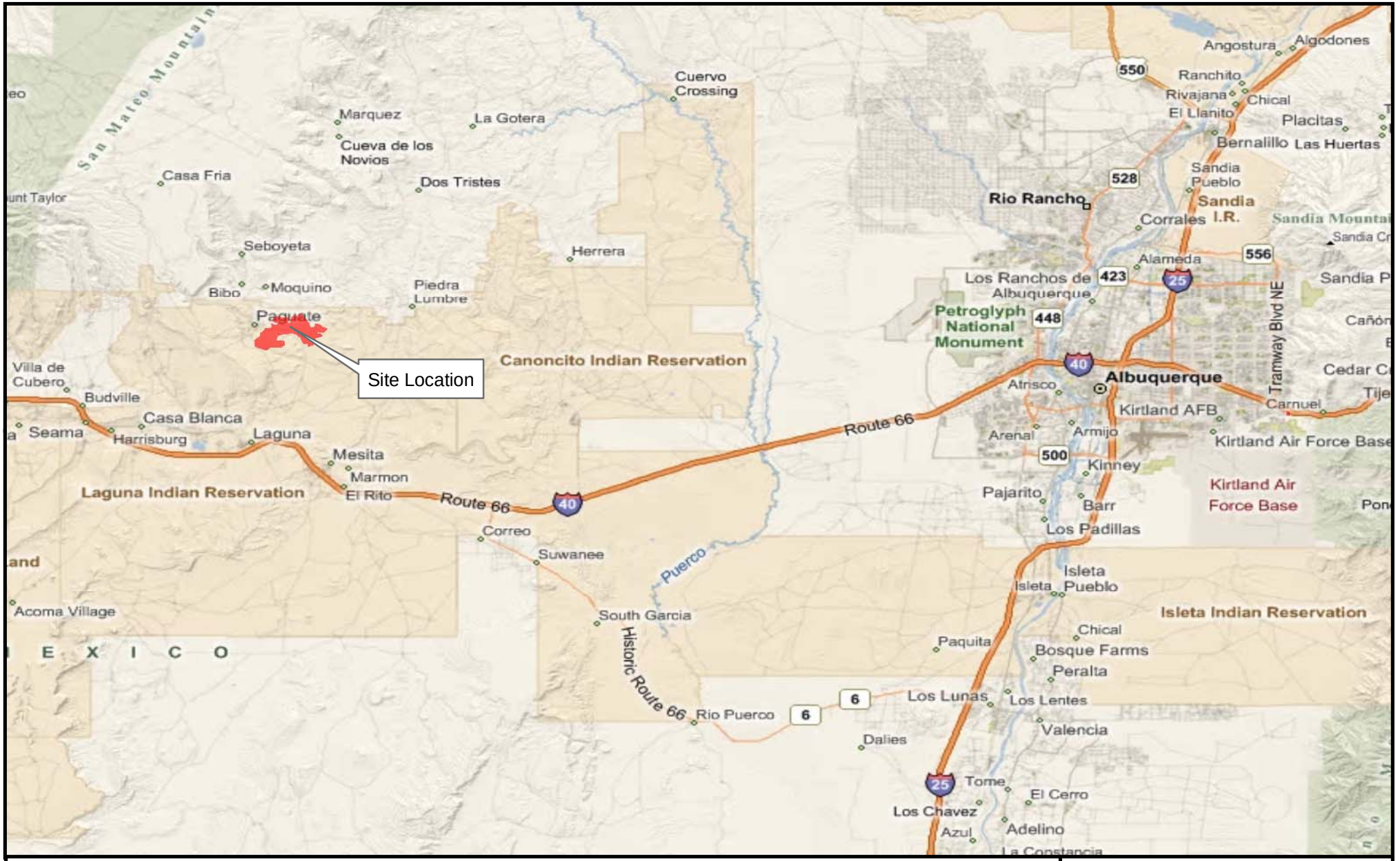

LEGEND

Approximate Site Area

Source: Microsoft Virtual Earth Roads, 2009
CERCLIS: NMN000607033
SSID: A6T3
TDD: TO-0019-10-02-02

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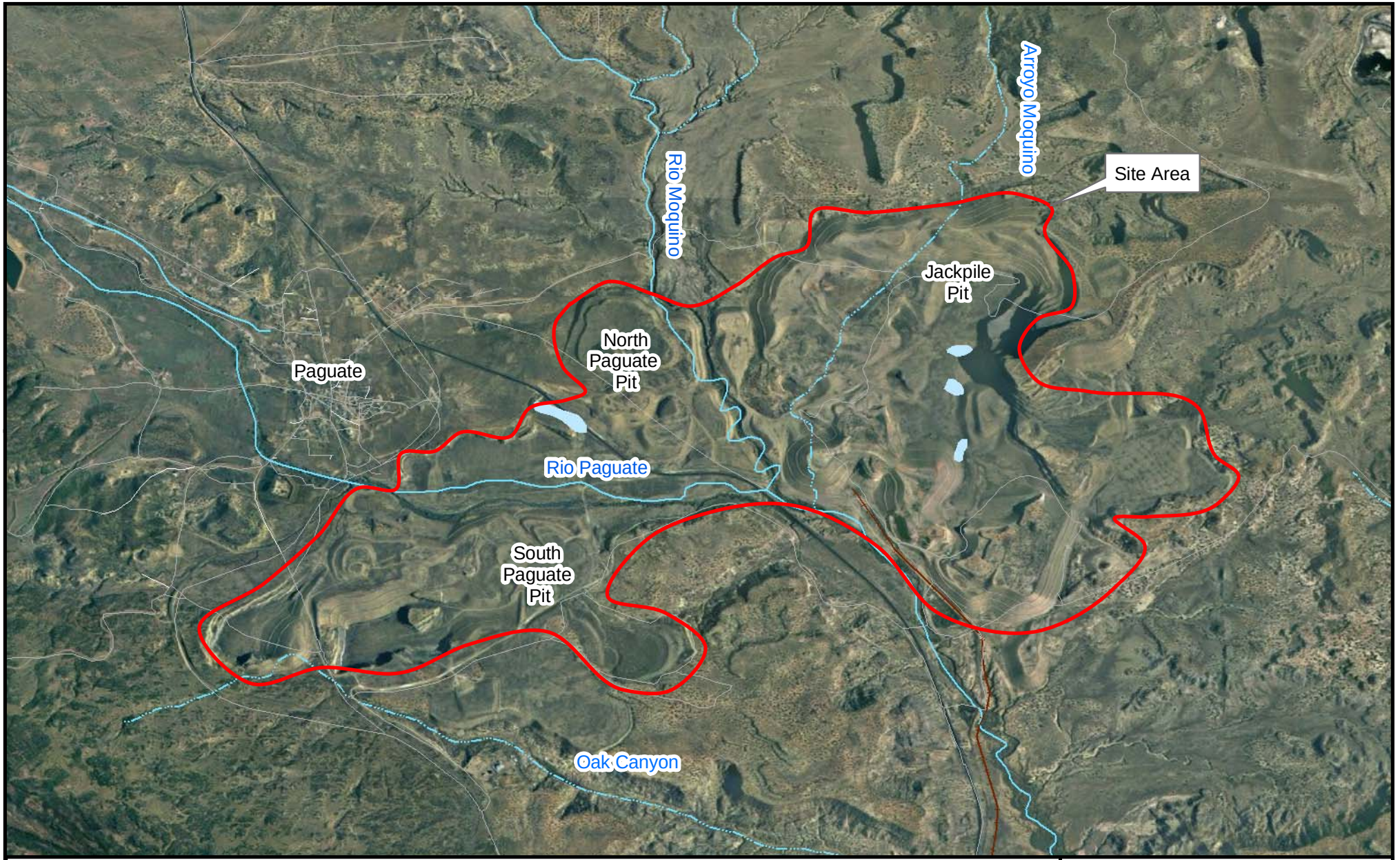
USEPA REGION 6
START - 3

FIGURE 1-1
SITE LOCATION MAP
JACKPILE-PAGUATE URANIUM MINE
SR 279 Laguna Pueblo
Paguate, Cibola County, New Mexico

0800025

DATE	PROJECT NO	SCALE
FEB 2010	20406.012.019.0514.01	AS SHOWN



LEGEND

Approximate Site Area

0 0.5 1
Miles

New Mexico

N

Source: Microsoft Virtual Earth Roads, 2009
CERCLIS: NMN000607033
SSID: A6T3
TDD: TO-0019-10-02-02

0800026

0800026

USEPA REGION 6
START - 3

FIGURE 2-1
SITE AREA MAP
JACKPILE-PAGUATE URANIUM MINE
SR 279 Laguna Pueblo
Paguate, Cibola County, New Mexico

0800026

DATE	PROJECT NO	SCALE
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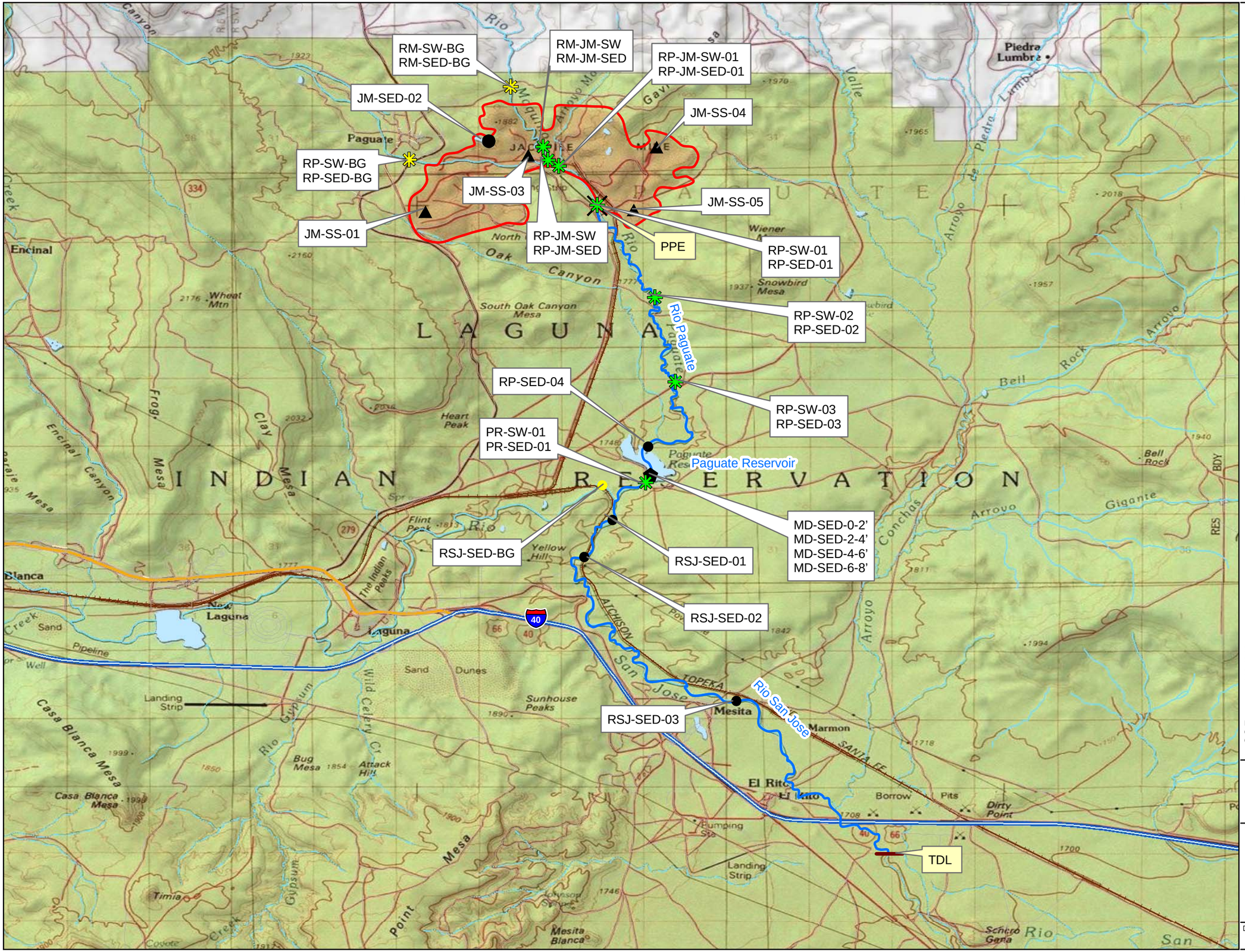

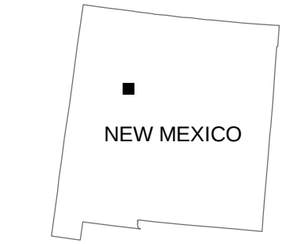

LEGEND

- Approximate Site Area
- Probable Point of Entry (PPE)
- Target Distance Limit (TDL)
- Surface Water (SW) Pathway
- SW and Sediment Sample Location
- Sediment Boring Location
- SW and Sediment Background Sample Location
- Sediment Sample Location
- Sediment Background Sample Location
- Waste Source Soil Sample Location
- RP — Sample Name

N

0 1.5 3

SCALE IN MILES

Source: NGS USA Topographic Maps
CERCLIS: NMN000607033
SSID: A6T3
TDD: TO-0019-10-02-02

DISCLAIMER: THIS FIGURE IS PREPARED FOR REFERENCE PURPOSES ONLY AND SHOULD NOT BE USED, AND IS NOT INTENDED FOR, SURVEY OR ENGINEERING PURPOSES.

USEPA REGION 6
START-3

FIGURE 3-1
PROPOSED SAMPLE LOCATION MAP
JACKPILE-PAGUATE URANIUM MINE
SR 279 Laguna Pueblo
Paguate, Cibola County, New Mexico

0800027

DATE	PROJECT NO	SCALE
FEB 2010	20406.012.019.0514.01	AS SHOWN

File: \\fsdtx03\IT\GIS_Projects\brownm\Jackpile\QASP\Figure 3-1, 24-February-2010, brownm

APPENDIX A

EPA CONTRACT LABORATORY PROGRAM GUIDANCE FOR FIELD SAMPLERS

APPENDIX A

EPA CONTRACT LABORATORY PROGRAM GUIDANCE FOR FIELD SAMPLERS

OSWER 9240.0-44
EPA 540-R-07-06

FINAL July 2007

Office of Superfund Remediation and Technology Innovation

Contract Laboratory Program Guidance for Field Samplers

Disclaimer: The final version of the document replaces any prior versions of the document in their entirety.

Foreword

The intent of the Contract Laboratory Program (CLP) Guidance for Field Samplers is to replace the CLP Samplers Guide. This guidance document is designed to provide users with general information regarding environmental sample collection for the United States Environmental Protection Agency's (USEPA) Contract Laboratory Program (CLP). This document provides minimum CLP requirements, an explanation of the general sampling process sequence of events, and any related information. The appendices contain useful reference information and checklists to aid in planning and documenting sampling activities.

CLP users also are encouraged to review the Introduction to the Contract Laboratory Program document that contains a general overview of the CLP, how it works, and how to access the program. The CLP requires samplers to use the functionality provided by the Field Operations Records Management System (FORMS) II Lite™ software, which is the preferred means of creating CLP sample documentation. For guidance in using the software to record and submit sampling data, users should reference the FORMS II Lite User's Guide.

Both the Introduction to the Contract Laboratory Program and the Contract Laboratory Program Guidance for Field Samplers can be downloaded from the CLP Web site at the following address:

http://www.epa.gov/superfund/programs/clp/guidance.htm

The FORMS II Lite User's Guide can be downloaded from the CLP Web site at the following address:

http://dyncsdao1.fedcsc.com/itg/forms2lite/doc.html

For more information regarding the CLP or this guide, please contact Elizabeth Holman via email at Holman.Elizabeth@epa.gov or via telephone at (703) 603-8761.

Key Information

Text in blue and underlined indicates an external link to information outside of this document.

The images below are located throughout the document to draw attention to important information and each are labeled accordingly:

Important

Note

Table of Contents

1.0 INTRODUCTION 1

1.1 About this Guide 1
1.2 Overview of the CLP 1
1.2.1 Key Players Within the CLP 1
1.3 Overview of the Sampling Process 3
1.3.1 Procedures Must be Consistent 3
1.3.2 Analytical Data Must be Accurate and Defensible 3
1.3.3 Sampling Procedures and Guidelines Must Meet Minimum Requirements 4
1.4 Overview of Sampling Documentation Requirements 4
1.4.1 CLP Documentation Requirements 4

2.0 PRE-FIELD ACTIVITIES 7

2.1 Prepare for a Sampling Event 7
2.2 Communicate During a Sampling Event 8
2.3 Review Project Plans Containing Regional Requirements 8
2.4 Plan to Meet Documentation Requirements 9
2.4.1 Request Scheduling of Analysis, SMO-assigned Case Numbers, CLP Sample Numbers, and Laboratory Contact Information 9
2.4.2 Prepare Sample Cooler Return Documentation 10
2.5 Obtain Municipal Permits, Licenses, and Clearances 11
2.5.1 Request Access to County, State, Tribal, Military, and/or Federal Property 11
2.5.2 Contact Private Property Owners 11
2.5.3 Contact Utility Companies 11
2.6 Identify and Obtain Sampling Materials 12
2.6.1 Procure Appropriate Equipment and Supplies 12
2.6.2 Procure Sample Containers 12
2.6.3 Procure Shipping Supplies 13
2.7 Comply with Transportation and Shipping Requirements 13
2.8 Provide Shipment Notification 14
2.9 Perform Readiness Review/Dry Run 14

3.0 IN-FIELD ACTIVITIES 15

3.1 Collect Samples 15
3.1.1 Determine Types of Samples to be Collected 15
3.1.2 Meet Volume, Preservation, and Holding Time Requirements 17
3.2 Complete Documentation 22
3.2.1 Identify a Sample with a CLP Sample Number and SMO-assigned Case Number 22
3.2.2 Complete TR/COC Records 22
3.2.3 Complete and Attach Custody Seals 28
3.2.4 Complete and Attach Sample Labels 28
3.2.5 Complete and Attach Sample Tags 29
3.3 Provide Sample Receipt 30
3.4 Pack and Ship Samples 31
3.4.1 Sample Containers 31
3.4.2 Inventory of Samples and Documentation 31
3.4.3 Shipping Regulations 31
3.4.4 Sample Packaging for Shipment 31
3.4.5 Shipment Notification 34

Appendix A: Functions within a Sampling Project 1

Appendix B: CLP Sample Collection Guidelines for VOAs in Soil by SW-846 Method 5035A 1

Appendix C: General CLP Sample Collection Guidelines VOAs in Water 1

Appendix D: Sampling Techniques and Considerations 1

Table of Contents (Cont.)

Appendix E: Sampling Checklists 1
Appendix E-1: Personnel Preparation Checklist 1
Appendix E-2: General Sample Collection Checklist 2
Appendix E-3: Completing Field Logbook Checklist 3
Appendix E-4: Completing Handwritten Sample Labels Checklist 4
Appendix E-5: Completing Handwritten Sample Tags & Custody Seals Checklists 5
Appendix E-6: Packing Sample Container Checklist 6
Appendix E-7: Packing Shipping Container Checklist 7
Appendix E-8: Shipping & Reporting CLP Samples Checklist 8

Appendix F: Glossary 1

List of Figures

Figure 3-1. Packaged Sample with Identification and Chain-of-Custody Documentation (Excluding TR/COC Record) 22
Figure 3-2. Organic Traffic Report & Chain of Custody Record (Laboratory Copy) 24
Figure 3-3. Inorganic Traffic Report & Chain of Custody Record (Laboratory Copy) 25
Figure 3-4. Organic Traffic Report & Chain of Custody Record (Region Copy) 26
Figure 3-5. Inorganic Traffic Report & Chain of Custody Record (Region Copy) 27
Figure 3-6. Custody Seal 28
Figure 3-7. Completed Sample Tag 30
Figure 3-8. Sample Receipt Created Using the FORMS II Lite Software 30
Figure 3-9. Sample Cooler with Attached TR/COC Record and Cooler Return Documentation 33
Figure 3-10. Sample Weight Log 33
Figure 3-11. Shipping Cooler with Custody Seals 34

List of Tables

Table 1-1. Participants in the CLP Sampling Process 2
Table 2-1. CLP Sample Number Letter Codes 10
Table 2-2. Container Type Specifications 13
Table 3-1. QC Sample Types and CLP Submission Requirements 16
Table 3-2. Sample Collection Requirements for CLP SOW SOM01 (VOAs) 19
Table 3-3. Sample Collection Requirements for CLP SOW SOM01 (SVOAs, Pesticides and Aroclors) 20
Table 3-4. Sample Collection Requirements for CLP SOW ILM05 21
Table 3-5. Completing and Attaching a Custody Seal 28
Table 3-6. Completing and Attaching a Handwritten Sample Tag 29
Table 3-7. Packing Samples for Shipment 32
Table D-1. Mixing a Sample and Filling Sample Containers D-2

ASB	Analytical Services Branch
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CLP PO	CLP Project Officer
CRQL	Contract Required Quantitation Limit
CVAA	Cold Vapor Atomic Absorption
DOT	Department of Transportation
DQO	Data Quality Objective
dbf	Database File
ET	Eastern Time
FORMS II Lite™	Field Operations Records Management System II Lite
FSP	Field Sampling Plan
HCN	Hydrocyanic acid
IATA	International Air Transport Association
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry
MS	Matrix Spike
MSD	Matrix Spike Duplicate
$NAHSO_4$	Sodium Bisulfate
NPL	National Priorities List
OSC	On-scene/on-site Coordinator
OSHA	Occupational Safety and Health Administration
OSRTI	Office of Superfund Remediation and Technology Innovation
OSWER	Office of Solid Waste and Emergency Response
PCBs	Polychlorinated Biphenyls
PE	Performance Evaluation
PM	Program Manager
ppb	Parts-Per-Billion
ppt	Parts-Per-Trillion
PRP	Potentially Responsible Party
PT	Proficiency Testing
PTFE	Polytetrafluoroethylene
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QASPER	Quality Assurance Sampling Plan for Environmental Response
QATS	Quality Assurance Technical Support
QC	Quality Control
RAS	Routine Analytical Services
RPM	Remedial Project Manager
RSCC	Regional Sample Control Center Coordinator
RSM	Regional Site Manager
SAM	Site Assessment Manager
SAP	Sampling Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SDG	Sample Delivery Group
SMC	System Monitoring Compound
SMO	Sample Management Office
SOP	Standard Operating Procedure
SOW	Statement of Work
SVOA	Semivolatile Organic Analyte
TR/COC	Traffic Report/Chain of Custody
txt	Text File
UN	United Nations
USEPA	United States Environmental Protection Agency
VOA	Volatile Organic Analyte
XML	eXtensible Markup Language

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1.0 INTRODUCTION

1.1 About this Guide

This document describes the important organizational roles and responsibilities for those who plan and conduct environmental sample collection projects for analysis through the Superfund's Contract Laboratory Program (CLP). This chapter introduces the structure and purpose of this document. Chapter 2, *Pre-field Activities*, addresses pre-field planning activities that the sampling team could complete prior to the actual sampling event. Chapter 3, *In-field Activities*, addresses those activities that need to be completed during the sampling event.

Appendix A describes the functions within a sampling project which are taken from the Quality Assurance Project Plan requirements. Appendix B and Appendix C contain the sample collection guidelines for Volatile Organic Analytes (VOAs) in soil and in water. Appendix D recommends sampling techniques. Appendix E contains checklists to help the sampler ensure that all necessary steps are completed.

A project and site-specific Quality Assurance Project Plan (QAPP) providing Regional guidance will override guidance given within this document.

1.2 Overview of the CLP

The CLP is a national program of commercial laboratories under contract to support the USEPA's nationwide effort to clean up designated hazardous waste sites by supporting its Superfund program. The Superfund program was originally established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and presently exists under the Superfund Amendments and Reauthorization Act (SARA) of 1986.

The CLP uses state-of-the-art technology to provide users with analytical services. The program provides data of known and documented quality to support USEPA enforcement activities or other user needs. To achieve this goal, the CLP has established strict Quality Control (QC) procedures and detailed documentation requirements. Current CLP users include the USEPA Regions, States and Tribal governments, and other Federal agencies. CLP users also are encouraged to review the *Introduction to the Contract Laboratory Program* document that contains a general overview of the CLP, how it works, and how to access the program.

1.2.1 Key Players Within the CLP

In coordinating Superfund sampling efforts, the Analytical Services Branch (ASB) is supported by the Sample Management Office (SMO) contractor, the Regional CLP Project Officers (CLP POs), the Regional Sample Control Center Coordinators (RSCCs), and the Regional Site Managers (RSMs), including Site Assessment Managers (SAMs), On-scene/On-site Coordinators (OSCs), and Remedial Project Managers (RPMs). Samplers may work directly with the RSCC and/or RSM (or equivalent), and/or an OSC from the Field Support Section during a sampling event. See Table 1-1 for a brief description of the functions performed by key participants (functions may vary by Region).

Table 1-1. Participants in the CLP Sampling Process

Participants	Responsibilities
Analytical Services Branch	USEPA ASB directs the CLP from within the Office of Superfund Remediation and Technology Innovation (OSRTI) in the Office of Solid Waste and Emergency Response (OSWER). ASB responsibilities include: • Development of the Statements of Work (SOWs) that define required analytical methods (including QC, detection/quantitation limits, and holding times) for the analytical services procured under the CLP; • Development and implementation of policies and budgets for Superfund analytical operations; • Development of information management policies and products for analytical data; • Management of SMO and Quality Assurance Technical Support (QATS) contracts; • National administration, evaluation, and management of the CLP; and • Direction of CLP Quality Assurance (QA) activities in coordination with overall OSWER QA activities. To obtain the most current ASB contact list, refer to the following Web site: http://www.epa.gov/superfund/programs/clp/contacts.htm#ASB
CLP Sample Management Office	The contractor-operated SMO provides necessary management, operations, and administrative support to the CLP. SMO receives Regional analytical requests, coordinates and schedules sample analyses, and tracks sample shipments. SMO also receives and checks data for completeness and compliance, processes laboratory invoices, and maintains a repository of sampling records and program data.
CLP Contract Laboratories	The contractor-operated laboratories within CLP provide necessary analytical services for the isolation, detection, and quantitation of the CLP's target compounds and analytes.
Regional CLP Project Officer	The CLP PO monitors the technical performance of the contract laboratories in each Region. The CLP PO works closely with ASB Program Managers (PMs) to identify and resolve laboratory technical issues, and leads laboratory on-site evaluations. To obtain the most current CLP PO contact list, refer to the following Web site: http://www.epa.gov/superfund/programs/clp/polist.htm
Regional Sample Control Center Coordinator	In most Regions, the RSCC coordinates sampling efforts and serves as the central point-of-contact for sampling questions and problems. The RSCC works with SMO to schedule sample shipments to laboratories. In addition, the RSCC's activities may include: informing SMO of sample shipment, cancellations, special instructions, and sampling issues. To obtain the most current RSCC contact list, refer to the following Web site: http://www.epa.gov/superfund/programs/clp/rsccclist.htm
Regional Site Manager	The RSM Coordinates the development of acceptance or performance criteria and oversees project-specific contractors, state officials, or private parties conducting site sampling efforts. The RSM could be the SAM, the OSC, or the Remedial Project Manager (RPM).
Field Support Section	The Field Support Section consists of personnel such as the OSC, SAM, and RPM. In most Regions, the Field Support Section develops Standard Operating Procedures (SOPs) for field sampling and related procedures, and assists sampling teams in following those SOPs. The sampling team determines what type(s) of CLP services will be required for a particular sampling event. The Field Support Section reviews Sampling Analysis Plans (SAPs) prepared by sampling teams and oversees sampling teams in the field. The Field Support Section may also prepare their own SAPs, perform sampling activities in the field, and analyze and report the results of their sampling events to the RSM.

1.3 Overview of the Sampling Process

At–a-Glance:
Overview of the Sampling Process

- ✓ Procedures must be consistent.
- ✓ Analytical data must be accurate and defensible.
- ✓ Procedures must meet minimum requirements.

Once USEPA has determined that physical, chemical, and/or biological testing of a site is necessary, samples of material from the site area must be collected. The type of material that must be collected and the analytical method to be used depends upon the physical location of the site, detection level(s), site history (previous sampling), and known or unknown conditions and contaminants. The sampling process includes carefully planned and consistently applied procedures that produce accurate and legally defensible data. The sampling team should consider the procedures and plans presented in this guide as minimum sampling process guidelines to maintain sample integrity and identity. Samples should be collected according to the approved project and site-specific QAPP and SAP. This document does not define specific sampling procedures because specific sampling protocols depend on individual site conditions, Regional requirements, and acceptance and performance criteria. Since Regions may have their own specific requirements for individual sampling programs, they are responsible for generating Region-specific sampling SOPs.

1.3.1 Procedures Must be Consistent

The purpose of sampling is to collect representative portions from a suspected contaminated site. Sample collection is critical to determining the presence, type, concentration, and extent of environmental contamination by hazardous substances, thus it is a crucial part of every sampling and environmental testing effort. Sampling procedures must be consistently written and followed to mitigate risk of error and the expense of re-sampling.

Failure to follow proper sampling and shipping procedures could result in samples that are contaminated, broken, mislabeled, lost during shipping, or unusable because of a missed holding time. If procedures are inconsistently or improperly followed, any resultant analytical data may be inaccurate and may not be defensible in a court of law.

If re-sampling is needed due to improper sampling, the sampling team may incur the cost.

1.3.2 Analytical Data Must be Accurate and Defensible

The data gathered during sampling activities helps to accurately characterize contaminated waste sites so that the impact on human health and the environment can be properly evaluated. Acquiring accurate and defensible data that will be accepted in a court of law is the CLP's primary objective; therefore, the sampler must collect samples according to strict sampling procedures, plans, and guidelines. USEPA and many other Federal agencies use data resulting from analytical testing of soil/sediment/aqueous samples to:

- Determine if a site is contaminated with organic and/or inorganic compounds;
- Identify pollution sources and Potentially Responsible Parties (PRPs);
- Validate remedial design methodologies;
- Assess response and remedial priorities;
- Assess risk to human health and the environment;
- Determine appropriate cleanup actions; and
- Determine cleanup achievements.

1.3.3 Sampling Procedures and Guidelines Must Meet Minimum Requirements

It is imperative that samplers be aware of the minimum CLP and Regional requirements that directly impact and define how a sampling event will take place. It is important to note that the procedures and guidelines set forth in this document are considered minimum CLP requirements. Samplers should reference the following sections within this document that specifically address important requirements that must be met for a successful sampling event:

- Section 1.4.1 CLP Documentation Requirements;
- Section 2.4.1 Request Scheduling of Analysis, SMO-assigned Case Numbers, CLP Sample Numbers, and Laboratory Contact Information;
- Section 2.7 Comply with Transportation and Shipping Requirements;
- Section 2.8 Provide Shipment Notification;
- Section 3.1 Collect Samples; and
- Section 3.2 Complete Documentation.

1.4 Overview of Sampling Documentation Requirements

The sampler must properly document samples collected for analysis in order to uniquely identify each sample and ensure adequate chain-of-custody procedures. When collecting samples, the sampler should always keep in mind that any samples collected may be used in future litigation. This is especially important when samples are from privately owned property. If sampling on privately owned property, samplers should also provide the property owner with a receipt for samples collected and removed from that owner's property. Samplers may also be required by a Region to use a sample label, sample tag, or field operations records documenting information such as daily activities, equipment and materials used, personnel involved, site security, etc. These types of documentation help ensure proper sample identification and provide additional chain-of-custody records.

The documentation required by a Region for a sampling event is outlined in project plans such as the QAPP, SAP, and Field Sampling Plan (FSP).

At–a-Glance:
Overview of the Sampling Document Requirements

- ✓ Must use FORMS II Lite to create sample documentation. Analytical data must be accurate and defensible.
- ✓ CLP documentation requirements:
  - CLP Sample Number
  - SMO-assigned Case Number
  - Traffic Report/Chain of Custody (TR/COC) Record
  - Sample Labels
  - Sample Tags
  - Custody Seals
  - Field Operation Records

Under no circumstances should the site name appear on any documentation that is sent to the laboratory (for the CLP).

1.4.1 CLP Documentation Requirements

Samplers must:

1) Record the CLP Sample Number on each sample bottle;
2) Complete the Traffic Report/Chain of Custody (TR/COC) Record using the FORMS II Lite software, making sure to indicate on the TR/COC Record if the samples require the use of a Modified Analysis;
3) Complete and attach sample labels;
4) Complete and attach sample tags to meet Regional requirements;
5) Complete and attach custody seals to meet Regional requirements; and
6) Complete field operations records, as necessary.

Please contact your RSCC (see Table 1-1) for information regarding CLP Sample Numbers, SMO-assigned Case Numbers, TR/COC Records, and chain-of-custody seals for sampling events.

For information regarding using FORMS II Lite to create and complete a TR/COC Record, refer to the following Web site:

http://www.epa.gov/superfund/programs/clp/f2lite.htm

1.4.1.1 CLP Sample Number

A CLP Sample Number is unique per sampling location and is used to identify and track samples throughout the sampling and analytical processes and is recorded on many types of sampling documentation (e.g., TR/COC Records, sample labels, and sample tags). CLP Sample Numbers are provided to samplers by their RSCC or SMO.

Samplers must contact their RSCC (or their designee) to obtain CLP Sample Numbers for their sampling event. Samplers must correctly assign the CLP Sample Numbers to the appropriate sample bottle or container. Please refer to Section 3.2.1 for more detailed information regarding the use of CLP Sample Numbers.

If the sampler has any questions regarding the assignment of CLP Sample Numbers, they should contact their RSCC.

1.4.1.2 SMO-assigned Case Number

SMO-assigned Case Numbers are used to track groups of samples throughout the sampling and analytical processes and are recorded on many types of sampling documentation (e.g., TR/COC Records, sample labels, and sample tags). Samplers must correctly assign the SMO-assigned Case Number to the appropriate sample bottle or container. To obtain a SMO-assigned Case Number, samplers must contact their RSCC (or their designee).

1.4.1.3 Laboratory Assignment

Samplers are responsible for shipping samples to the appropriate SMO-assigned laboratory for analysis. Samplers must contact their RSCC (or their designee) to obtain their laboratory assignment or they may be provided by SMO.

1.4.1.4 TR/COC Record

The TR/COC Record is used as physical evidence of sample custody and functions as a permanent record of each sample collected.

Per CLP documentation requirements, each cooler must contain a TR/COC Record that lists all the samples contained therein.

In an effort to automate sample documentation in the field, ASB has developed a stand-alone, Windows-based software application that samplers can use to automatically create and generate sample documentation. The FORMS II Lite software allows users to enter information prior to and during sampling events. It allows users to multi-task and electronically create, edit, and print documentation associated with sampling activities. Users can customize data entry screens throughout the entire documentation process. Users can also customize the format and content of sample labels based on specific requirements.

The program simplifies and accelerates the tedious manual sample documentation process by reducing the generation of handwritten documents by almost 70%. The FORMS II Lite software enables samplers to:

- Increment CLP Sample Numbers or manually assign their own unique, project-specific non-CLP Sample Numbers;
- Input the SMO-assigned Case Number into the appropriate field;
- Create sample labels, sample tags, TR/COC Records, Sample Weight forms, and receipts for samples taken from a site;
- Track samples from the field to the laboratory;

- Electronically capture sample information into databases; and
- Export electronic data as a database File (.dbf), Text (.txt), or eXtensible Markup Language (.xml) file.

USEPA requires samplers to use the FORMS II Lite software for all CLP sampling efforts. For assistance with obtaining or using the FORMS II Lite software, please contact the FORMS II Lite Help Desk at 703-818-4200 from 9:00 AM - 5:00 PM Eastern Time (ET). For additional information regarding FORMS II Lite use and training, please refer to the following Web site:

http://www.epa.gov/superfund/programs/clp/f2lite.htm

1.4.1.5 Chain-of-Custody Seals

A chain-of-custody seal is any adhesive label or tape that can be used to seal a sample bottle, container, plastic bag, or shipping cooler such that if it is opened or tampered with, the seal will be broken. Custody seals must be placed on each sample bottle, container, or bag (as appropriate) and each shipping cooler or container. The custody seal is an excellent means of maintaining a record of chain-of-custody, as well as guarding against possible sample contamination or tampering during shipping.

1.4.1.6 Sample Labels

A sample label is a sticker attached to a sample bottle or container that contains a sample. Sample labels are affixed to each sample container as samples are collected in the field or affixed prior to going in the field. A sample label must contain, at a minimum, a CLP Sample Number so that they can be associated with, and listed on, the associated TR/COC Record. The sample label may also include the required analysis/fraction and preservative used (to eliminate confusion at the laboratory). Samplers should refer to their project plans for Region-specific sample label requirements.

1.4.1.7 Sample Tags

A sample tag identifies a sample bottle or container that contains a sample. The tag also provides specific analytical direction and proof that a sample existed. To support the use of sample data in potential enforcement actions, samples with other than in situ measurements (e.g., pH, temperature, conductivity) can be identified with a sample tag. A CLP Sample Number and SMO-assigned Case Number must be recorded on a sample tag to indicate that the sample container comprises the whole sample in the case where there is just one container of sample, or part of the indicated sample in the case of multiple containers of sample. Samplers should refer to their project plans for Region-specific sample tag requirements.

1.4.1.8 Field Operation Records

Samplers should maintain complete, accurate, and legible field operations records as they perform a sampling activity. The following records are included: Field Logbooks; Corrective Action Reports; Sampling Trip Reports; supplemental standardized forms; logs; and records such as maps or photographs that document each step of the work performed in the field. Samplers should refer to their project plans for Region-specific field operations record requirements. These records are very important tools because they are considered part of the official project file when legal issues arise.

1.4.1.9 Weight Logs

A sample weight log identifies the tared, sample and final weights per bottle for VOA samples. In order to support Method 5035 for VOAs, samplers should enter tared and final weights per bottle in the CLP Sample Weight Log.

2.0 PRE-FIELD ACTIVITIES

At-a-Glance:
Pre-field Activities

- ✓ Prepare for and communicate during a sampling event.
- ✓ Review project plans containing Regional requirements.
- ✓ Plan to meet documentation requirements.
- ✓ Obtain any necessary permits, licenses, and clearances.
- ✓ Identify and obtain sampling materials.
- ✓ Comply with transportation and shipping requirements.
- ✓ Provide shipment notification.
- ✓ Perform Readiness Review/Run-through.

This chapter provides instructions for completing the suggested pre-field activities that samplers could complete prior to performing sampling activities. These important pre-field activities will save time and help the sampler to better prepare for the sampling event. Samplers should be aware of issues routinely arise during the sampling process so that samplers can avoid making the same mistakes or having the same problems that could adversely affect their sampling event. Samplers are also expected to review all pertinent project plans and meet both CLP and Regional requirements that directly impact the structure and purpose of a sampling event.

The project plans provide information such as the types and numbers of samples to be collected, the analytical methods to be used based on the desired level of quantitation, and the necessary equipment and supplies. The plans also describe the sampling method which may require different specific sample volumes/masses, containers, preservation, shipping, and handling to maintain the integrity of the samples without degradation or contamination.

In addition to reviewing project plans, samplers should determine if the sampling site is privately or publicly owned and obtain the necessary permission to access the sampling site. If the site is privately owned, samplers should make sure to have receipts for available samples to provide to the owner for all samples collected and removed from their property. Samplers must also prepare to identify and obtain sampling materials, prepare to meet documentation requirements by obtaining and learning to use the required software, comply with transportation and shipping requirements, and perform a readiness review/dry run of the sampling process.

2.1 Prepare for a Sampling Event

Samplers must prepare to meet CLP and Regional requirements for a sampling event, appropriately use the CLP Sample Number and SMO-assigned Case Number, complete the TR/COC Record using the FORMS II Lite software, and complete and attach the custody seal(s). It is very important that the sampler include the correct CLP Sample Number on each sample. It is also imperative that the TR/COC Record be accurately completed and submitted with the sample(s). Finally, the sampler must accurately and legibly complete and attach a custody seal to each sample container, or plastic sample bag (as appropriate), and each shipping cooler or container.

However, meeting the sampling requirements requires more than just the proper application of a CLP Sample Number on each sample, completion of the TR/COC Record, and use of a custody seal. The actual collection of samples, packaging, and shipping of those samples are equally important to a successful sampling event.

For example, if a sampler collects an insufficient volume of a sample, the laboratory may not be able to perform the requested analysis. Insufficient sample volumes may also result in a laboratory being unable to perform laboratory quality control, such as Matrix Spike (MS), Matrix Spike Duplicate (MSD), and Duplicate sample analysis. Additionally, if the laboratory receives a sample that is either unpreserved or the sample pH is outside of the required range, the sample cannot be properly analyzed.

Unfortunately, improper shipping and labeling processes and procedures often result in:

- Samples being shipped to the wrong laboratory;
- Broken or empty samples being received at the laboratory; and
- Custody seals or sealant tape that is missing or broken on sample bottles, containers, plastic bags, or shipping coolers shipped to the laboratories.

The importance of completing the paperwork associated with a sampling event cannot be overemphasized. Samplers must make a conscientious effort to accurately complete the TR/COC Record since this is the main document used to derive vital information about a particular sample. The person completing a TR/COC Record

must be careful to avoid errors such as the appropriate sample(s) not being listed, or the wrong samples being listed. In an effort to eliminate such errors and the confusion that can be associated with handwritten TR/COC Records, samplers must use the FORMS II Lite software to complete the TR/COC Record and other associated sampling documentation.

It is extremely important that QC samples, including field sample duplicates, field samples for Matrix Spike and Matrix Spike Duplicate analyses, and Proficiency Testing (PT) samples, also known as Performance Evaluation (PE) samples, be designated and labeled per Regional guidance by samplers in the field. Mislabeling of QC samples can result in improper and/or inaccurate analysis of a sample at the laboratory.

2.2 Communicate During a Sampling Event

Communication is a key element in planning, administrating, and conducting a sampling event. It is extremely important that all parties involved in a sampling event be in contact throughout the sampling process. The procedures and recommendations outlined in this guide are based on more than 20 years of experience. It has been demonstrated that approximately 50% of all sampling efforts have been negatively affected by incorrect sampling procedures and poor communication among participants.

The key elements of communication for a sampling event include the relationship between the RSCC, SMO, the samplers in the field, and the laboratories who will be accepting the samples. For instance, the samplers must contact the RSCC to start the process for setting up a sampling event. The RSCC will in turn contact SMO who will schedule the sampling event, establish laboratory availability, and arrange for the laboratory to accept projected samples. SMO will then communicate the laboratory assignment to the Region and possibly the sampler.

The sampler should contact the RSCC (per Regional guidelines) and allow enough time for the RSCC to contact SMO at least a week prior to the sampling event.

SMO provides SMO-assigned Case and CLP Sample Numbers in time for the sampling event. SMO also schedules a laboratory and makes sure the laboratory will not have any capacity problems. Communication is also important because if there is a change in the sampling event due to a cancellation or an increase or decrease in the number of samples that will be sent to the laboratory, the sampler can contact the RSCC who can work with SMO to remedy potential capacity, availability, or overbooking problems.

2.3 Review Project Plans Containing Regional Requirements

In addition to meeting CLP requirements, the sample collection process must fulfill numerous Regional requirements. These requirements are determined by a variety of factors that affect how samples should be collected for an individual sampling event. These factors include:

- The type of samples being collected (organic/inorganic, water, soil/sediment, etc.);
- The method by which the samples will be analyzed;
- The acceptance or performance criteria (i.e., Data Quality Objectives [DQOs]); and
- The type of data needed.

The QAPP for each sampling project is written to meet requirements outlined in the documents *EPA Requirements for Quality Assurance Project Plans* (QA/R-5), *EPA Guidance on Quality Assurance Project Plans* (G-5), and Regional QAPP preparation documents. The QAPP is prepared in advance of field activities and is used by samplers to develop any subsequent plans such as the Sampling SAP or the FSP. Samplers should review the QAPP and any subsequent project plans for information outlining the basic components of a sampling activity. QAPP and project plans should be finalized and approved by appropriate Regional QA personnel, the OSC, SAM, or the RPM before providing them to the sampling team. This should be done prior to the start of field activities. Appendix A explains the functions within a sampling project (as these functions relate to a sampling event) and the elements of that function as described in a typical QAPP. Copies of all project plans and relevant SOPs should be maintained in the field for the duration of the sampling project.

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2.4 Plan to Meet Documentation Requirements

At-a-Glance:
Plan to meet documentation requirements.

- ✓ Request SMO-assigned Case and CLP Sample Numbers.
- ✓ Prepare sample cooler return documentation.
- ✓ Prepare to use the FORMS II Lite software.

Sampling events require a variety of accurate and complete documentation. Samplers should review their project plans to determine the types of documentation that must be completed for a sampling project and to ensure that the appropriate documentation will be on-hand in the field. The CLP documentation requirements include the CLP Sample Number, the SMO-assigned Case Number, the TR/COC Record, sample labels, sample tags, custody seals, and field operations records (as necessary). Samplers need to request SMO-assigned Case and CLP Sample Numbers for each sampling event prior to starting field activities. Samplers also need to make sure that the correct TR/COC Records (Organic TR/COC Record for organic analysis or Inorganic TR/COC Record for inorganic analysis) are being used within the FORMS II Lite software. Finally, samplers should be prepared to complete the appropriate shipping cooler return documentation.

Since samplers are required to use the FORMS II Lite software to prepare and submit sampling project documentation and maintain sample chain-of-custody, software users must be familiar with all emergency back up procedures that should be followed in the event of a system failure. Samplers must have access to FORMS II Lite-generated TR/COC Records at sampling events. If problems are experienced while using the FORMS II Lite software, please contact the FORMS II Lite Help Desk at 703-818-4200 from 9:00 AM - 5:00 PM ET.

In the event of a system crash, samplers must have backup hardcopies of FORMS II Lite TR/COC Records. For information regarding emergency backup procedures, please refer to the following Web site:

http://www.epa.gov/superfund/programs/clp/trcoc.htm

2.4.1 Request Scheduling of Analysis, SMO-assigned Case Numbers, CLP Sample Numbers, and Laboratory Contact Information

SMO-assigned Case Numbers are assigned based on a request for CLP Routine Analytical Services (RAS), which is processed though the RSCC (or his/her designee). The sampler must request the RSCC to schedule CLP RAS analysis. The CLP does have the capacity to schedule sampling on an emergency basis, however the sampler must contact the RSCC (or his/her designee) to obtain details regarding how to handle such a situation. When scheduling a sampling event that will last for more than one week, it is recommended that the sampler contact the RSCC (or his/her designee) on a weekly basis to provide updates. This contact between the sampler, the RSCC (or his/her designee), and SMO is very important because it will ensure better availability of laboratory capacity.

In addition to SMO-assigned Case and CLP Sample Numbers, samplers should make sure to have accurate laboratory contact information, such as:

- Laboratory name;
- Laboratory address;
- Contact name; and
- Laboratory phone number.

This information is used for both TR/COC Records and chain-of-custody documentation and shipping paperwork such as address labels and airbills.

The SMO-assigned Case Number is used to track groups of samples throughout the sampling and analytical processes. Samplers must correctly indicate the assigned Case Number on the appropriate sample bottle or container.

The RSCC (or his/her designee) provides the CLP Case Numbers and Sample Numbers for each sampling event to samplers. Once the CLP Sample Numbers have been provided to the sampler, the sampler can use FORMS II Lite to print them onto sample labels.

The following characters are not to be used in generating CLP Sample Numbers and should never appear on any paperwork submitted to the laboratory: I, O, U, and V.

A CLP *Sample Number* is defined **as** a number that is unique per sampling location and identifies each CLP sample (see Section 1.4.1.1). Since samples must be identified per analytical program (either organic or inorganic), there are two types of TR/COC Records and two letter codes to denote organic vs. inorganic analysis.

A CLP *sample* is defined as one discrete portion of material to be analyzed that is contained at one concentration level, from one station location for each individual or set of analytical fractions -- provided the fractions are all requested for the same CLP analytical service (i.e., organic or inorganic), and identified by a unique Sample Number.

When samples are collected from several station locations to form a composite sample, the composite sample should be assigned either a number from one of the station locations used during collection, or a unique number that represents the composite sample for tracking purposes. The numbering scheme used internally at a sampling event for identifying composite samples should also be documented appropriately (e.g., in the field logs).

Organic CLP Sample Numbers begin with the Regional letter code, followed by four letters and/or numbers. Inorganic CLP Sample Numbers begin with "M", followed by the Regional letter code and then four letters and/or numbers. See Table 2-1 for Region and letter codes for each sample type (i.e., organic or inorganic).

Table 2-1. CLP Sample Number Letter Codes

Region	Letter Code	
	Organic	Inorganic
1	A	MA
2	B	MB
3	C	MC
4	D	MD
5	E	ME
6	F	MF
7	G	MG
8	H	MH
9	Y	MY
10	J	MJ

According to CLP guidelines, each individual inorganic water sample may be analyzed for total metals or dissolved metals, but not both. Therefore, water samples collected for total metal and dissolved metal analyses from the same sampling location must be assigned separate (unique) CLP Sample Numbers. A sampler can use the same CLP Sample Number for an inorganic soil or water sample collected for total metals, mercury and cyanide analyses.

Organic soil and water samples may be collected for analysis under the SOM01 SOW to detect:

- Aroclors;
- Semivolatile Organic Analytes (SVOAs);
- Pesticides;
- Volatile Organic Analytes (VOAs); and/or
- Trace Volatile Analytes

Inorganic soil and water samples may be collected for analysis for cyanide, and for metals using Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) and Cold Vapor Atomic Absorption (CVAA), under the ILM05.X SOW.

Inorganic water only samples may be collected for analysis for cyanide, and for metals using Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) and CVAA, under the ILM05 SOW.

2.4.2 Prepare Sample Cooler Return Documentation

CLP laboratories must routinely return sample shipping coolers to the appropriate sampling office within 14 calendar days following receipt of shipment from the sampler. For sample coolers to be returned, the

sampler must complete the appropriate cooler documentation and work with Regions and government agencies to provide a cost-effective mechanism for laboratories to return the empty coolers to the appropriate sampling office. The sampling cooler return documentation can be prepared in advance and provided to samplers before field activities begin. **The sampler (not the CLP laboratory) is responsible for paying for return of the cooler and should also include shipping airbills bearing the sampler's account number, as well as a return address to allow for cooler return.**

To maintain consistency among cooler transportation programs, samplers should:

- Minimize the use of multiple transportation carriers to avoid confusion;
- Use multiple-copy labels so the laboratory and the sampling team can each retain a copy for their records;
- Prepare labels in advance so that the laboratory can simply affix a completed shipping label on the cooler;
- Include third-party billing information (i.e., their shipping account number) on labels so the laboratory will not be billed by the transportation carrier;
- Confirm that the laboratory knows which transportation carrier to use; and
- Include the SMO-assigned Case Number on return information.

2.5 Obtain Municipal Permits, Licenses, and Clearances

Before starting a sampling event, samplers must make sure to obtain the proper municipal permits, accesses to the property, and any government clearances, if required. The sampler must also contact any appropriate utility companies to ascertain where any underground pipes, cables, etc., may be located.

At-a-Glance:
Obtain permits, licenses, and clearances.

- ✓ Request access to County, State, Tribal, military, and/or Federal property.
- ✓ Contact private property owner(s).
- ✓ Contact utility companies.

2.5.1 Request Access to County, State, Tribal, Military, and/or Federal Property

Proper access to perform sampling activities is important not only for legal reasons, but also to eliminate delays in work and possible refusal to allow sampling to take place. It is crucial that the appropriate permits, licenses, and clearances be secured to obtain access for sampling activities that will be performed on County, State, Tribal, military, and/or Federal property. The sampler must contact the appropriate government offices or personnel well in advance to determine what kinds of approval are required. Pre-approval may be required for specific types of sample collection such as drilling or excavation. For example, drilling on a military base requires pre-approval. Base security may require clearances for all members of the sampling team, including subcontractors. This process may take two or more days.

If arrangements are not made in advance, the team may not be allowed to enter the site until their clearances are processed and the team has been approved to drill. As a result, the sampling schedule is delayed, costing extra time and money.

2.5.2 Contact Private Property Owners

The sampler must obtain written permission from the private property owner(s) before sampling on their property, even if verbal permission has been granted. It is recommended that samplers obtain verbal permission prior to their arrival at the sampling location, but written permission can be obtained on the day of sampling. If a property owner refuses to grant access to their property, it may be necessary for sampling participants to contact the appropriate authorities for assistance.

2.5.3 Contact Utility Companies

The sampler should contact local utility companies (e.g., power, phone, gas, cable, sanitation, etc.) at least one week prior to the sampling event to have underground cables, lines, and pipes flagged and marked. This is required by law. A national one-call directory can be found at:

http://www.digsafely.com/contacts.htm.

This will eliminate potential safety hazards and service disruption. For example, soil sampling in a residential area may require digging below the soil's surface. It is very important to know where utility lines and pipes are located so that samplers do not hit live electrical wires or rupture gas lines. Samplers should follow Regional or other appropriate program procedures for the procurement of such services. The utility service(s) disruption dates should be confirmed at least two days prior to sampling activities.

Pre-payment of survey fees to local utility companies may be required.

2.6 Identify and Obtain Sampling Materials

Samplers must make sure to be prepared for a sampling project with the appropriate sampling materials (equipment, supplies, sample containers, packing materials, and shipping materials). The equipment and supplies must be properly cleaned, calibrated, and tested as necessary to meet the needs of the sampling project.

At-a-Glance:
Identify and obtain sampling materials.

- ✓ Procure appropriate equipment and supplies.
- ✓ Procure sample containers.
- ✓ Procure shipping supplies.

2.6.1 Procure Appropriate Equipment and Supplies

Each sampling event requires the procurement of equipment and materials to collect, document, identify, pack, and ship samples. The proper field sampling equipment is vital to a successful sample collection. Regional or other samplers should obtain, and arrange in advance, all of the equipment and supplies required for each sampling event. Samplers should review the project plans to verify that the proper equipment is being used for sample collection.

At a minimum, the following materials are generally required during a sampling event:

- Sample storage containers;
- Packing material;
- Sample containers;
- Shipping containers;
- Access to the FORMS II Lite software for creating sample labels, stickers, tags, and TR/COC Records;
- Custody seals; and
- Sampling equipment such as bowls, augers, pumps, etc.

Sampling events may also require specific items such as:

- Cooler temperature blanks;
- Trip blanks for VOA analysis;
- Preservation supplies (e.g., ice or acid); and
- Specially prepared sample vials (e.g., for SW-846 Method 5035A).

2.6.2 Procure Sample Containers

The analytical protocol(s) to be used for sample analysis often requires the use of a particular type of sample container. The type of container also may depend on the sample matrix and analysis. It is recommended that samplers use borosilicate glass containers, which are inert to most materials, when sampling for pesticides and/or other organics. Conventional polyethylene is recommended when sampling for metals because of the lower cost and absorption rate of metal ions.

Using the wrong container may result in breakage, gathering of an insufficient volume needed to perform sample analysis, or the container material may interfere with the analysis. Therefore, samplers should identify and use the correct sample containers for each sampling event.

Containers procured for a sampling event are usually pre-cleaned and shipped ready-for-use from the manufacturer to the sampling site. Regardless of the type of container used, samplers must ensure that the containers have been analyzed or certified clean to levels below concern for the project. These containers must meet the USEPA container type specifications listed in Table 2-2.

Table 2-2. Container Type Specifications

Reference Number	Container Type	Specifications	
		Closure	Septum
1	40 mL amber glass vial, 24 mm neck finish.	Polypropylene or phenolic, open-top screw-cap, 15 cm opening, 24-400 size.	24 mm disc of 0.005 in. Polytetrafluoroethylene (PTFE) bonded to 0.120 in. silicone for total a thickness of 0.125 in.
2	1 L high density polyethylene, cylinder-round bottle, 28 mm neck finish.	Polyethylene cap, ribbed, 28-410 size; F217 polyethylene liner.	N/A
3	8 oz short, wide mouth, straight-sided, glass jar, 70 mm neck finish.	Polypropylene or phenolic cap, 70-400 size; 0.015 in. PTFE liner.	N/A
4	4 oz (120 mL) tall, wide mouth, straight-sided, glass jar, 48 mm neck finish.	Polypropylene or phenolic cap, 48-400 size; 0.015 in. PTFE liner.	N/A
5	1 L amber round glass bottle, 33 mm pour-out neck finish.	Polypropylene or phenolic cap, 33-430 size; 0.015 in. PTFE liner.	N/A
6	500 mL high density polyethylene, cylinder-round bottle, 28 mm neck finish.	Polypropylene cap, ribbed, 28-410 size; F217 polyethylene liner.	N/A
7	Coring tool used as a transport device (e.g., 5 g Sampler).	Has built-in closing mechanism.	N/A
8	250 mL high density polyethylene, cylinder-round bottle, 28 mm neck finish.		N/A

The information contained in this table is also cross-referenced in the sample collection parameters discussed in Chapter 3. The container Reference Numbers are used in Tables 3-2 and 3-3 under the Containers column. For example, samples collected for low-level soil VOA analysis using SW-846 Method 5035A may require the sampler to use pre-prepared, tared closed-system purge-and-trap vials with a preservative (refer to Appendix B).

Have extra containers readily available for each sampling event in case of breakage, loss, or contamination.

2.6.3 Procure Shipping Supplies

Samples should be correctly packaged into the appropriate shipping containers to reduce the risk of breakage or leakage, and the shipping containers should be appropriately prepared for shipment. Before heading into the field, samplers should refer to the appropriate project plans to determine the types of samples that will be taken during the sampling project so that samplers will have the proper packaging materials at the site for all pertinent samples container types and sample matrices. Samplers should also make sure to obtain the appropriate shipping paperwork (e.g., shipping forms required by the delivery service).

2.7 Comply with Transportation and Shipping Requirements

Samplers are expected to review the applicable project plans to be aware of all State, Federal, Department of Transportation (DOT), and International Air Transport Association (IATA) regulations governing environmental and hazardous sample packaging. The person who ships the samples is responsible for being in compliance with applicable packaging, labeling, and shipping requirements.

Samplers should request and receive sample permits for outside the continental United States, prior to shipping.

Additional information can be obtained on Hazardous Materials Safety Program regulations from the DOT's Research and Special Programs Administration. Federal transportation regulations can be found in 49-CFR Parts 100-185, are available on the Internet at:

http://www.myregs.com/dotrspa/

2.8 Provide Shipment Notification

Some Regions may require that samplers notify their RSCC (or his/her designee) when samples are shipped. Some Regions allow samplers to contact SMO directly to provide shipment notification. It is recommended that samplers contact the RSCC of sample origin to verify if such notification is necessary. If samplers are shipping samples after 5:00 PM ET, samplers must notify the RSCC (or designee) or SMO by 8:00 AM ET on the following business day.

For Saturday delivery at the laboratory, samplers MUST contact the RSCC (or designee) or SMO so that SMO will receive the delivery information by 3:00 PM ET on the Friday prior to delivery.

2.9 Perform Readiness Review/Dry Run

A readiness review/dry run is a test run of the proposed sampling event. This is a recommended practice since it gives samplers a chance to check all plans, documentation software (i.e., FORMS II Lite), and equipment lists for accuracy and completeness prior to sampling activities. It also provides an opportunity to consult with sampling team members to make sure all the elements are in place and everyone understands their tasking before actually going out to the field. Sampling project managers should provide the test or dry run dates and schedules to samplers so that samplers can prepare accordingly.

3.0 IN-FIELD ACTIVITIES

This chapter addresses the in-field activities a sampler will focus on during a sampling event such as: determining the type of samples to be collected; collecting the samples; meeting volume, preservation, and holding time requirements; completing documentation; and packing and shipping samples.

When performing a sampling event, the sampler is expected to follow prescribed sampling techniques. The sampler should also be aware of any special sampling considerations, contamination issues, and sample compositing and mixing methods that could affect their sampling efforts. Please refer to Appendix D for more detailed information.

At-a-Glance:
In-field Activities

- ✓ Collecting samples
- ✓ Completing documentation
- ✓ Sampling considerations
- ✓ Procuring shipping supplies

Appropriate Regional guidance and procedures should be consulted for detailed sample collection, preservation, handling and storing, equipment decontamination, and QA/QC procedures.

3.1 Collect Samples

CLP RAS are generally used to analyze samples from Superfund sites. The matrices can be water, soil, or sediment. In some instances, a mixed-matrix sample may be collected which contains either a supernate (for a sediment/soil sample) or a precipitate (for a water sample). In this event, samplers should consult their management plans and/or discuss the required procedures with the RSM or their designee.

A CLP sample consists of all sample aliquots (portions):

- for each individual or set of analytical fractions;
- from one station location;
- for one sample matrix;
- at one concentration level;
- for one laboratory; and
- for one analytical program;

provided that the fractions are all requested from the same CLP analytical service.

In general, it is recommended that two individual samples be collected by separating the aqueous layer from the solid/precipitate layer at the point of collection. They may be assigned two different sample IDs (e.g., Sample IDs ABC124 and ABC125 for Sample ID ABC123), along with a note in the field sample log or tracking system that the sample IDs are derived or related to the same sample ID, to ensure correct follow-up upon receipt of results from the laboratory. Alternatively, they may be assigned the same sample ID, along with a notation of each individual sub-sample or fraction (e.g., Sample IDs ABC123-1 and ABC123-2 or Sample ID ABC123 Fraction 1 and Sample ID ABC123 Fraction 2 for Sample ID ABC123).

3.1.1 Determine Types of Samples to be Collected

Samplers may be required to take several types of samples or sample aliquots during a sampling event. They should refer to their project plans to determine the types of samples or aliquots to be taken, the volumes needed of each sample or aliquot, and the preservation needed for each sample. For an explanation of the various sample types and the requirements for collecting and submitting each particular type, refer to Table 3-1.

Table 3-1. QC Sample Types and CLP Submission Requirements

Sample Type	Purpose	Collection[1]	CLP Sample Number
Field Duplicate	To check reproducibility of laboratory and field procedures. To indicate non-homogeneity.	Collect from areas that are known or suspected to be contaminated. Collect one sample per week or 10% (Regions may vary) of all field samples per matrix, whichever is greater.	Assign two separate (unique) CLP Sample Numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory.
Field Blanks	To check cross-contamination during sample collection, preservation, and shipment, as well as in the laboratory. Also to check sample containers and preservatives.	Collect for each group of samples of similar matrix per day of sampling. Organics - Use water (demonstrated to be free of the contaminants of concern). Inorganics - Use metal-free (deionized or distilled) water.	Assign separate CLP Sample Numbers to the field blanks.
Trip Blank (Volatile Organic Analysis Only)	To check contamination of VOA samples during handling, storage, and shipment from field to laboratory.	Prior to going into the field, prepare and seal one sample per shipment per matrix using water demonstrated to be free of the contaminants of concern (deionized water is appropriate). Place this sample in the cooler used to ship VOA samples.	Assign separate CLP Sample Numbers to the trip blanks.
Equipment Blank or Rinsate Blank	To check field decontamination procedures.	Collect when sampling equipment is decontaminated and reused in the field or when a sample collection vessel (bailer or beaker) will be used. Use blank water (water demonstrated to be organic-free, deionized or distilled for inorganics) to rinse water into the sample containers.	Assign separate CLP Sample Numbers to the equipment blanks.
Matrix Spike (MS) and Duplicate (MSD)[2] (Organic Analysis Only)	To check accuracy and precision of organic analyses in specific sample matrices.	Collect from areas that are known or suspected to be contaminated. For smaller sampling events (i.e., 20 samples or less), MS/MSD additional volume should be collected in the first round of sampling and included in the first shipment of samples to the laboratory. Collect double or triple volume[3] for aqueous samples and soil VOA samples designated for MS/MSD analyses. Additional sample volume is not required for soil samples requiring SVOA, Pesticide, and/or Aroclor analysis. See Appendix B for VOA collection volumes.	Assign the same CLP Sample Number to the field sample and the extra volume for MS/MSD. Identify the sample designated for MS/MSD on the TR/COC Record.
Matrix Spike (MS) and Duplicate (MSD) (Inorganic Analysis Only)	To check accuracy and precision of inorganic analyses in specific sample matrices.	Collect from areas that are known or suspected to be contaminated. For smaller sampling events (i.e., 20 samples or less), Matrix Spike and Duplicates should be collected in the first round of sampling and included in the first shipment of samples to the laboratory. Additional sample volume may be required for inorganic analysis.[4]	Assign the same CLP Sample Number to the field sample and extra volume (if collected). Identify the sample(s) designated for Matrix Spike and Duplicates on the TR/COC Record.
PE Samples	Specially-prepared QC samples used to evaluate a laboratory's analytical proficiency.	The PE samples contain analytes with concentrations unknown to the laboratory. Designated Regional or authorized personnel (depending on Regional policy) arrange for Case-specific CLP PE samples to be prepared and shipped by the QATS contractor. The PE samples can be shipped to the site, or shipped per Regional direction. QATS provides the appropriate preparation instructions and chain-of-custody materials.	Samplers have no direct interaction with the PE sampling process, but should be aware that such samples do exist within the CLP sampling process. Samplers must, however, order PE samples and ship them to the laboratory if required by the Region.

[1] Consult Regional or Project Manager Guidance for field QC sample frequencies; laboratory QC sample frequencies are generally fixed in the laboratory subcontracts or specified in analytical methods. Current frequency for MS/MSD (organic) and MS/duplicate (inorganic) for the CLP is one sample per twenty field sample of similar matrix.

[2] Samples sent under the Organic SOW (SOM01) do not require an MS or MSD for Trace VOA, VOA and BNA fractions, but the Region may opt to send them at their discretion.

[3] Example of double volume: An aqueous sample for SVOA analysis would require the field sampler to collect at least 2 L of field sample and at least 1 L each for the MS and MSD samples for a total volume of 4 L. If Pesticide or Aroclor MS/MSD analyses are required for the same sample, an additional 4 L must be collected. Double volume is the MINIMUM allowable volume for samples designated for MS/MSD analysis. Triple volume may be sent for MS/MSD samples to allow for sufficient volume for these analyses in the event sample volume is lost as a result of samples breaking, leaking, or laboratory accidents.

[4] Double volume may be sent for inorganic aqueous MS and MSD samples to allow for sufficient volume for these analyses in the event sample volume is lost as a result of samples breaking, leaking or laboratory accidents.

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3.1.1.1 Collect Field QC Samples

Samplers can collect field QC samples and laboratory QC samples to verify that sample quality is maintained during a sampling project.

Field QC samples are designed to assess variability of the media being sampled and to detect contamination and sampling error in the field. The types of field QC samples that are generally collected include field duplicates and field blanks (such as equipment, trip, or rinse blanks). Generally, field duplicate samples should remain "blind" to the laboratory (i.e., they should have separate CLP Sample Numbers).

3.1.1.2 Collect Laboratory QC Samples

A laboratory QC sample is an additional analysis of a field sample, as required by the laboratory's contract. There are three types of laboratory QC samples:

- MS [for organic and inorganic samples];
- MSD [for organic samples only]; and
- Duplicates [for inorganic samples only].

Samplers should obtain Regional guidance regarding the collection of MS and MSD samples (especially for organics analyses).

Samplers should select one sample per matrix per 20 samples as a "laboratory QC" sample. Designated organic laboratory QC samples should be noted on the Organic TR/COC Record. Designated inorganic laboratory QC samples should be noted on the Inorganic TR/COC Record. The laboratory QC sample must not be designated only in the "Field QC Qualifier" column on either the Organic or Inorganic TR/COC Records. Make sure that the laboratory QC sample is included in TR/COC Record samples to be used for the Laboratory QC field.

The sampler should select a field sample as the laboratory QC sample. If the sampler does not select a field sample as the laboratory QC sample, then it is possible that the laboratory could select the field blank (e.g., an equipment or rinsate blank) sample to meet contractual QC requirements. The use of field blanks for laboratory MS/MSD/Duplicate analysis reduces the usability of the data to assess data quality.

In the event of multiple sample shipments during a sampling event, it is recommended that the sampler submit laboratory QC samples in the first sample shipment.

3.1.2 Meet Volume, Preservation, and Holding Time Requirements

Samplers should refer to their project plans to obtain the specific sample volumes to be collected, the preservation needed for those samples, and the technical holding times under which they must submit samples to the scheduled CLP laboratory. Sample collection parameters (to include sample volumes, preservatives, and technical holding times) for organic collection and analysis are listed in Tables 3-2 and 3-3. Sample collection parameters for inorganic analysis and collection are listed in Table 3-4.

3.1.2.1 Collect Sample Volume

Collecting sufficient sample volume is critical. There must be sufficient physical sample volume for the analysis of all required parameters and completion of all QC determinations. The type of analytical procedure(s) to be performed will often dictate the sample volume to collect. For example, each water sample collected for VOA analysis by CLP SOW SOM01 or ILM05 requires a minimum of three vials, each filled completely to a 40 mL capacity. See Appendix C for information regarding the collection of VOAs in water. It is extremely important that samplers refer to their specific project plans to identify and collect the correct sample volume during each sampling event.

When sampling for VOAs in soils, samplers must use SW-846 Method 5035A guidelines included in Appendix B.

3.1.2.2 Preserve Samples

Degradation of some contaminants may occur naturally (e.g., VOAs). The sampler must chemically preserve some water samples for certain analytes before shipping them to the laboratory. The sampler should preserve and immediately cool all samples to 4°C (±2°C) upon collection and samples should remain cooled until the time of analysis (do not freeze water samples). Preservation techniques vary among Regions so the sampler should obtain Region-specific instructions and review the appropriate project plans and SOPs. See Appendix C for information regarding the collection of VOAs in water.

3.1.2.3 Ship within Holding Times

Samplers should ship samples to scheduled CLP laboratories as soon as possible after collection. Daily shipment of samples to CLP laboratories is preferred whenever possible. If samples cannot be shipped on a daily basis, they must be properly preserved and maintained to meet CLP-specified temperatures, holding times, and custody requirements.

The technical holding times are the maximum time allowed between a sample collection and the completion of the sample extraction and/or analysis. In contrast, contractual holding times are the maximum lengths of time that the CLP laboratory can hold the sample prior to extraction and/or analysis. These contractual holding times are described in the appropriate CLP SOW. Contractual holding times are shorter than the technical holding times to allow for sample packing and shipping.

If samplers are shipping samples after 5:00 PM ET, they must notify the RSCC (or designee) or SMO by 8:00 AM ET on the following business day. When making a Saturday delivery, samplers shall contact the RSCC (or designee) or SMO by 3:00 PM ET on the Friday prior to delivery.

Table 3-2. Sample Collection Requirements for CLP SOW SOM01 (VOAs)

Matrix	Container Type	Sample Type	Minimum Number of Containers Needed				Minimum Volume/ Mass	Important Notes	Preservative	Technical Holding Time
			with Water	Dry	% Moisture	TOTAL				
Water	See Table 2-2, Reference Number 1.	Samples Only	-	-	-	**3**	Fill to capacity	Containers/vials must be filled to capacity with no headspace or air bubbles. Refer to Appendix C for samples requiring QC analyses.	Preserve to a pH of 2 with HCl and cool to 4°C (±2°C) immediately after collection. DO NOT FREEZE water samples.	14 days
		Samples with SIM	-	-	-	**4**				
		Samples with MS/MSD	-	-	-	**6**				
		Samples with SIM and MS/MSD	-	-	-	**8**				
Soil/ Sediment	**OPTION 1** Closed-system Vials See Table 2-2, Reference Number 1.	Samples Only	-	3	1	**4**	5g	Place samples on side prior to being frozen. Refer to Appendix B for samples requiring QC analyses.	Frozen (-7°C to -15°C) or iced to 4° (±2°C).	14 days
		Samples with MS/MSD	-	9	1	**10**				48 hours
	OPTION 2 Closed-system containing Vials Water See Table 2-2, Reference Number 1.	Samples Only	2	1	1	**4**	5g	Containers/vials must be filled to capacity with no headspace or air bubbles. Place samples on side prior to being frozen. Refer to Appendix B for samples requiring QC analyses.	Frozen (-7°C to -15°C) or iced to 4° (±2°C). DO NOT FREEZE water samples.	14 days
		Samples with MS/MSD	6	1	5	**12**				48 hours
	OPTION 3 See Table 2-2, Reference Number 7.	Samples Only	-	3	1	**4**	5g	Refer to Appendix B for samples requiring QC analysis.	Frozen (-7°C to -15°C) or iced to 4°C (±2°C).	48 hours
		Samples with MS/MSD	-	9	1	**10**				48 hours

Notes

[1] Minimum volume/mass to be collected in order to ensure sample analysis can be performed.

[2] Check Regional guidance regarding use of acid as a preservative of samples that may contain carbonates, residual chlorine, and other oxidants.

[3] This technical holding time is calculated from the time of sample collection to sample extraction. Sample extracts are to be analyzed within 40 days of extraction. It is recommended that samplers ship samples to the laboratory on the same day that they are collected, or as soon as possible thereafter.

[4] Check Regional guidance regarding use of acid preservatives when testing for carbonates, residual chlorine, and other oxidants.

Table 3-3. Sample Collection Requirements for CLP SOW SOM01 (SVOAs, Pesticides and Aroclors)

Analysis	Matrix	Containers	Minimum Volume/ Mass	Important Notes	Preservative	Technical Holding Time
Semivolatile Analytes	Water	See Table 2-2, Reference Number 5.	2L	If amber containers are not available, the samples should be protected from light.	Cool all samples to 4°C (±2°C) immediately after collection. DO NOT FREEZE water samples.	7 days
	Soil/ Sediment	See Table 2-2, Reference Numbers 3 and 4.	Fill to capacity		Cool all samples to 4°C (±2°C) immediately after collection.	14 days
Pesticides/ Aroclors	Water	See Table 2-2, Reference Number 5.	2L	If amber containers are not available, the samples should be protected from light.	Cool all samples to 4°C (±2°C) immediately after collection. DO NOT FREEZE water samples.	7 days
	Soil/ Sediment	See Table 2-2, Reference Numbers 3 and 4.	Fill to capacity		Cool all samples to 4°C (±2°C) immediately after collection.	14 days

Notes

[1] Minimum volume/mass to be collected in order to ensure sample analysis can be performed.
[2] Check Regional guidance regarding use of acid as a preservative of samples that may contain carbonates, residual chlorine, and other oxidants.
[3] This technical holding time is calculated from the time of sample collection to sample extraction. Sample extracts are to be analyzed within 40 days of extraction. It is recommended that samplers ship samples to the laboratory on the same day that they are collected, or as soon as possible thereafter.
[4] Check Regional guidance regarding use of acid preservatives when testing for carbonates, residual chlorine, and other oxidants.

0800055

Table 3-4. Sample Collection Requirements for CLP SOW ILM05

Analysis	Matrix	Containers	Minimum Volume/ Mass[1]	Important Notes	Preservative	Technical Holding Time[4]
Metals/ICP-AES and/or Mercury by CVAA	Water	See Table 2-2, Reference Number 2.	1L	If collecting for both ICP-AES AND ICP-MS methods, a separate 1L volume of sample must be collected for each method per sample location.	Acidify to pH < 2 with HNO_3 and cool to 4°C (±2°C) immediately after collection.[2] DO NOT FREEZE water samples.	6 months for all metals except Mercury (28 days)
	Soil/ Sediment	See Table 2-2, Reference Number 3.	Fill to capacity		Cool to 4°C (±2°C) immediately after collection.	6 months
Cyanide/ Spectrophotometric Determination [3]	Water	See Table 2-2, Reference Number 2.	1L		To neutralize residual chlorine, immediately upon collection, add 0.6 g ascorbic acid for each liter of sample collected. Add NaOH until pH >12 and cool to 4°C (±2°C) immediately after collection.[5] DO NOT FREEZE water samples.	14 days
	Soil/ Sediment	See Table 2-2, Reference Number 3.	Fill to capacity		Cool to 4°C (±2°C) immediately after collection.	14 days

Notes

1 Minimum volume/mass to be collected in order to ensure sample analysis can be performed.

2 Check Regional guidance regarding use of acid as a preservative of samples that may contain carbonates, residual chlorine, and other oxidants.

3 Samplers must test for sulfide and oxidizing agents (e.g., chlorine) in aqueous samples in the field upon collection. Please refer to the SAP and Appendix C for guidance. Sulfides adversely affect the analytical procedure. The following can be done to test for and neutralize sulfides. Place a drop of the sample on lead acetate test paper to detect the presence of sulfides. If sulfides are present, treat 25 mL more of the sample than that required for the cyanide determination with powdered cadmium carbonate or lead carbonate. Yellow cadmium sulfide or black lead sulfide precipitates if the sample contains sulfide. Repeat this operation until a drop of the treated sample solution does not darken the lead acetate test paper. Filter the solution through a dry filter paper into a dry beaker, and from the filtrate measure the sample to be used for analysis. Avoid a large excess of cadmium carbonate and a long contact time in order to minimize a loss by complication or occlusion of cyanide on the precipitated material. Sulfide removal should be performed in the field, if practical, prior to pH adjustment with NaOH.

4 This technical holding time is calculated from the time of sample collection to sample extraction. Sample extracts are to be analyzed within 40 days of extraction. It is recommended that samplers ship samples to the laboratory on the same day that they are collected, or as soon as possible thereafter.

0800056

3.2 Complete Documentation

Samplers must complete all documentation, including the recording of the CLP Sample Number on the sample container or bottle, sample labels, and chain-of-custody seals (as appropriate), the completion of the TR/COC Record, and the completion of field operations records (as necessary).

Samplers should use the FORMS II Lite software to create and print sample labels and the TR/COC Record. Samplers can create and print out two copies of a sample label and attach one to the sample container or bottle, and place the other on the sample tag that may be attached to the sample container or bottle.

Samplers are expected to review their project plans to determine what documentation they are expected to include during a sampling event. It is highly recommended that samplers provide documentation, even if the Region does not require it.

Note: Under no circumstances should the site name appear on any documentation being sent to the laboratory.

An example of a packaged sample is shown in Figure 3-1. A description of each type of documentation and instructions for accurate completion are included in the following sections.

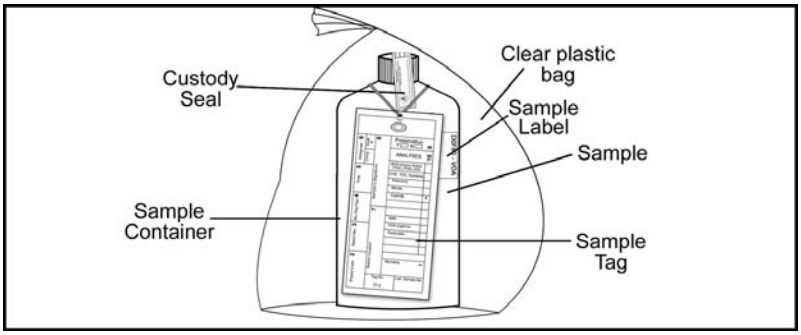

Figure 3-1. Packaged Sample with Identification and Chain-of-Custody Documentation (Excluding TR/COC Record)

3.2.1 Identify a Sample with a CLP Sample Number and SMO-assigned Case Number

The CLP Sample Number and SMO-assigned Case Number **must** be recorded on each sample taken during a sampling event (see Section 1.4.1.1). Samplers can record these numbers on the sample bottle or container using permanent ink. The numbers must also be recorded on the sample tag, if required.

Note: Dissolved metal samples and total metal samples taken from the same sampling location cannot have the same CLP Sample Number because two different sets of data will be generated.

3.2.2 Complete TR/COC Records

A Traffic Report is used as physical evidence of sample custody and as a permanent record for each sample collected. A chain-of-custody record documents the exchange and transportation of samples from the field to the laboratory.

The ASB requires samplers to use the FORMS II Lite software to create documentation for all CLP sampling efforts. For assistance with obtaining or using the FORMS II Lite software, please contact the FORMS II Lite Help Desk at 703-818-4200 from 9:00 AM - 5:00 PM ET.

To meet CLP sample documentation and chain-of-custody requirements, the sampler must attach a separate TR/COC Record to each cooler they ship. The TR/COC Record must document each sample within the cooler. Samples shipped in other coolers should not be documented. This practice maintains the chain-of-custody for all samples in case of incorrect shipment.

If more than one TR/COC Record is used for the samples within one cooler, all of the records must have complete header information and original signatures. Samplers are responsible for the care and custody of samples from the time of collection to the time of shipment to the laboratories for analysis. A sample is considered under custody if:

- It is in possession or in view after being in possession;
- It was in possession and then secured or sealed to prevent tampering; or
- It was in possession when placed in a secured area.

Each time the custody of samples is turned over to another person, the TR/COC Record must be signed off by the former custodian and accepted by the new custodian. Samplers are, therefore, responsible for properly completing any forms or other Region-required documentation used to establish the chain-of-custody for each sample during a sampling event.

3.2.2.1 Complete a TR/COC Record Using the FORMS II Lite Software

Once the sampler inputs sample collection information into FORMS II Lite, a TR/COC Record will be generated electronically. The software automatically displays only the information to be entered by the sampler. FORMS II Lite then generates a laboratory and a Regional copy of the TR/COC Record (see Figures 3-2 through 3-5). The sampler can print out multiple copies of the TR/COC Record as necessary. The sampler must sign and submit original copies of the TR/COC Record as appropriate.

An electronic TR/COC Record created using the FORMS II Lite software contains basic header information; however, the sampler can also include some additional detailed information. For example, not only is the sample matrix listed on the electronic TR/COC Record, but the name of the sampler taking the sample can also be entered. Samplers should note that certain information will not appear on the electronic TR/COC Record (e.g., matrix and preservative descriptions).

3.2.2.2 Indicate Modified Analysis on FORMS II Lite TR/COC Records

When completing a TR/COC Record using FORMS II Lite, the sampler should identify any samples that will be analyzed using a CLP Modified Analysis. Samplers should indicate use of a Modified Analysis by creating a new analysis within the FORMS II Lite Wizard or through the FORMS II Lite Reference Tables. This newly-created analysis should contain the Modification Reference Number within the name assigned to the analysis. For example, if a Region submits a Modified Analysis for an additional analyte, and SMO assigns the Modification Reference Number 1301.0, the FORMS II Lite analysis could be named "VOA by M.A. 1301.0". The associated abbreviation for this analysis could be "VOA M.A.". If you have any questions regarding identification of Modified Analysis using FORMS II Lite, please contact the FORMS II Lite Help Desk at 703-818-4200 from 9:00 AM - 5:00 PM ET.

3.2.2.3 Make Manual Edits to Printed FORMS II Lite TR/COC Records

If a FORMS II Lite TR/COC Record has been printed and deletions or edits need to be made by the sampler, the following procedures must be followed:

- If making a deletion, manually cross out the information to be disregarded from the TR/COC Record, initial and date the deletion.
- If making an addition, enter the new information and initialsign and date the newly added information.

All modifications made on a printed TR/COC Record must be initialed and dated.

USEPA Contract Laboratory Program
Organic Traffic Report & Chain of Custody Record

Case No:	**39400**
DAS No:	DAS9000
SDG No:	

L

Date Shipped:	2/20/2001
Carrier Name:	DHL
Airbill:	121212
Shipped to:	Organic Laboratory 1234 Smith Drive Anywhere, USA 12345 (123) 456-7890

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

For Lab Use Only

Lab Contract No:
Unit Price:
Transfer To:
Lab Contract No:
Unit Price:

ORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		INORGANIC SAMPLE No.	FOR LAB USE ONLY Sample Condition On Receipt
C0075	Industrial Process Wastewater/ BOBBY SAMPLER	H/C	BNA/PEST (21), VOA (21)	6486, 6487 (2)	LOCATION ONE	S: 2/20/2001 E: 2/23/2001	16:02 16:02	MC0075	
C0076	Ground Water/ JOE SAMPLER	L/C	BNA/PEST (21), VOA (21)	6494, 6495 (2)	LOCATION TWO	S: 2/20/2001 E: 2/21/2001	16:01 16:01	MC0076	
C0077	Industrial Effluent Wastewater/ JOE SAMPLER	M/G	BNA/PEST (21), VOA (21)	6502, 6503 (2)	LOCATION ONE	S: 2/16/2001 E: 2/20/2001	15:55 15:55	MC0077	

Shipment for Case Complete?N	Sample(s) to be used for laboratory QC: C0077	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G		Custody Seal Intact? ___ Shipment Iced? ___

BNA/PEST = CLP TCL Semivolatiles and Pesticides/PC, VOA = CLP TCL Volatiles

TR Number: 3-103823254-022001-0001

LABORATORY COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-4602

F2V5.1.047 **Page 1 of 1**

Figure 3-2. Organic Traffic Report & Chain of Custody Record (Laboratory Copy)

0800059

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 39400
DAS No: DAS9000
SDG No:
L

Date Shipped:	2/20/2001
Carrier Name:	DHL
Airbill:	121212
Shipped to:	Inorganic Laboratory 1234 Smith Drive Anywhere, USA 12345 (123) 456-7890

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

For Lab Use Only
Lab Contract No:
Unit Price:
Transfer To:
Lab Contract No:
Unit Price:

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	FOR LAB USE ONLY Sample Condition On Receipt
MC0075	Industrial Process Wastewater/ BOBBY SAMPLER	H/C	Al (21), Ba (21), Ca (21), Cr (21), TM/CN (21)	6481, 6482, 6483, 6484, 6485 (5)	LOCATION ONE	S: 2/20/2001 E: 2/23/2001	16:02 16:02	C0075	
MC0076	Ground Water/ JOE SAMPLER	L/C	Al (21), Ba (21), Ca (21), Cr (21), TM/CN (21)	6489, 6490, 6491, 6492, 6493 (5)	LOCATION TWO	S: 2/20/2001 E: 2/21/2001	16:01 16:01	C0076	
MC0077	Industrial Effluent Wastewater/ JOE SAMPLER	M/G	Al (21), Ba (21), Ca (21), Cr (21), TM/CN (21)	6497, 6498, 6499, 6500, 6501 (5)	LOCATION ONE	S: 2/16/2001 E: 2/20/2001	15:55 15:55	C0077	

Shipment for Case Complete?N	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:	
	MC0077				
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G		**Custody Seal Intact?** ___	**Shipment Iced?** ___

Al = Aluminum, Ba = Barium, Ca = Calcium, Cr = Chromium, TM/CN = CLP TAL Total Metals and Cyanide

TR Number: 3-103823254-022001-0003

LABORATORY COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-4602

F2V5.1.047 Page 1 of 1

Figure 3-3. Inorganic Traffic Report & Chain of Custody Record (Laboratory Copy)

0800060

EPA USEPA Contract Laboratory Program
Organic Traffic Report & Chain of Custody Record

Case No: 39400 R
DAS No: DAS9000

Region:	3	Date Shipped:	2/20/2001
Project Code:	QW-123	Carrier Name:	DHL
Account Code:	ACCT000	Airbill:	121212
CERCLIS ID:		Shipped to:	Organic Laboratory 1234 Smith Drive Anywhere, USA 12345 (123) 456-7890
Spill ID:	ID3		
Site Name/State:	REAL SITE, UT		
Project Leader:	DAN SAMPLER		
Action:	Other		
Sampling Co:	SMITH CO.		

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

ORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	INORGANIC SAMPLE No.	QC Type
C0075	Industrial Process Wastewater/ BOBBY SAMPLER	H/C	BNA/PEST (21), VOA (21)	6486, 6487 (2)	LOCATION ONE	S: 2/20/2001 16:02 E: 2/23/2001 16:02	MC0075	--
C0076	Ground Water/ JOE SAMPLER	L/C	BNA/PEST (21), VOA (21)	6494, 6495 (2)	LOCATION TWO	S: 2/20/2001 16:01 E: 2/21/2001 16:01	MC0076	Spike
C0077	Industrial Effluent Wastewater/ JOE SAMPLER	M/G	BNA/PEST (21), VOA (21)	6502, 6503 (2)	LOCATION ONE	S: 2/16/2001 15:55 E: 2/20/2001 15:55	MC0077	--

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: C0077	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____
BNA/PEST = CLP TCL Semivolatiles and Pesticides/PC, VOA = CLP TCL Volatiles			

TR Number: 3-103823254-022001-0001

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-4602

F2V5.1.047 Page 1 of 1

Figure 3-4. Organic Traffic Report & Chain of Custody Record (Region Copy)

0800061

0800061

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No:	Y6767
DAS No:	DAS9000

R

Region:	3
Project Code:	QW-123
Account Code:	ACCT000
CERCLIS ID:	
Spill ID:	ID3
Site Name/State:	REAL SITE, UT
Project Leader:	DAN SAMPLER
Action:	Other
Sampling Co:	SMITH CO.

Date Shipped:	2/20/2001
Carrier Name:	DHL
Airbill:	121212
Shipped to:	Clayton Environmental Consultants, Inc 22345 Roethel Drive Novi MI 48375 (248) 344-1770

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC0075	Industrial Process Wastewater/ BOBBY SAMPLER	H/C	Al (21), Ba (21), Ca (21), Cr (21), TM/CN (21)	6481, 6482, 6483, 6484, 6485 (5)	LOCATION ONE	S: 2/20/2001 E: 2/23/2001	16:02 16:02	C0075	--
MC0076	Ground Water/ JOE SAMPLER	L/C	Al (21), Ba (21), Ca (21), Cr (21), TM/CN (21)	6489, 6490, 6491, 6492, 6493 (5)	LOCATION TWO	S: 2/20/2001 E: 2/21/2001	16:01 16:01	C0076	Spike
MC0077	Industrial Effluent Wastewater/ JOE SAMPLER	M/G	Al (21), Ba (21), Ca (21), Cr (21), TM/CN (21)	6497, 6498, 6499, 6500, 6501 (5)	LOCATION ONE	S: 2/16/2001 E: 2/20/2001	15:55 15:55	C0077	--

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____
Al = Aluminum, Ba = Barium, Ca = Calcium, Cr = Chromium, TM/CN = CLP TAL Total Metals and Cyanide			

TR Number: 3-103823254-022001-0003

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-4602

F2V5.1.047 **Page 1 of 1**

Figure 3-5. Inorganic Traffic Report & Chain of Custody Record (Region Copy)

0800062

0800062

3.2.3 Complete and Attach Custody Seals

Custody seals are usually pre-printed stickers that are signed (or initialed) and dated by the sampler after sample collection and placed on sample bottles or containers and/or shipping coolers or containers (see Figure 3-6). The custody seals document who sealed the sample container and verifies that the sample has not been tampered with. The seals must be placed such that they will break if the sample bottle or container or the shipping cooler or container is tampered with or opened after leaving custody of samplers. Custody seals can also be used to maintain custody of other items such as envelopes containing videotapes of the sample collection process.

Custody seals should never be placed directly onto a coring tool used as a transport device (e.g., 5 g Sampler) or tared, 40 mL closed-system vials. The seals must be placed on the bag for the coring tool used as a transport device, or on the bag used to enclose the vials. Refer to Appendix B for details.

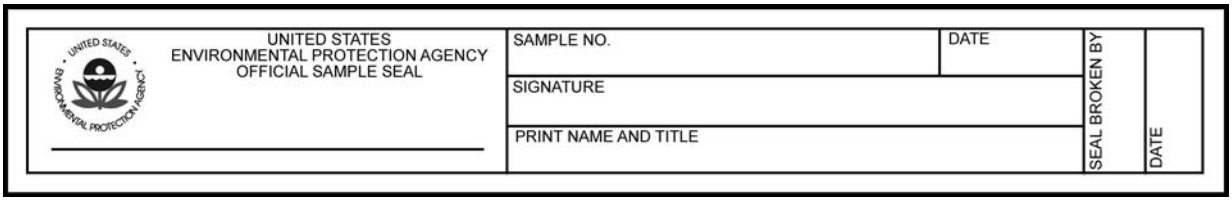

Figure 3-6. Custody Seal

Instructions for completing and attaching a custody seal are included in Table 3-5.

Table 3-5. Completing and Attaching a Custody Seal

Step	Action	Important Notes
1	Record the CLP Sample Number.	The space for the CLP Sample Number does not need to be completed on custody seals being placed on the opening of a cooler, only on those being placed on the opening of sample bottles or containers.
2	Record the month, day, and year of sample collection.	
3	Sign the seal in the Signature field.	
4	Print your name and title in the Print Name and Title field.	
5	Place the custody seal over the edge of the sample bottle or container such that it will break if tampered with.	Custody seals can be placed directly on any sample container except for coring tools used as a transport device (e.g., 5 g Samplers) and tared VOA bottles. If packing coring tools used as a transport device or tared VOA bottles, place them in a clear plastic bag and place the custody seal on the outside of the bag.
6	If possible, cover the custody seal with clear plastic tape to protect it.	Take special care to not place the protective tape over the seal in such a way that it can be removed and then re-attached without signs of tampering.

The use and type of custody seals can vary by Region or collecting organization. Samplers should obtain the appropriate custody seals and specific instructions for correctly attaching them from the RSCC.

3.2.4 Complete and Attach Sample Labels

Samplers affix sample labels to each sample container. A sample label must contain the associated CLP Sample Number (either written or pre-printed), SMO-assigned Case Number, and the preservative used. It must also denote the analysis/fraction. Samplers may also include additional information such as the station location or the date/time of collection. Samplers should use FORMS II Lite to create and print sample labels. The sampler can print two labels and attach one to the sample container or bottle, and place the other label on the sample tag that should also be attached to the sample container or bottle. The

labels should then be covered with clear packaging tape to protect the label and maintain legibility. If handwriting a sample label, the sampler should complete the label information using waterproof ink, place the label on the outside of the sample bottle or container, then cover the label with clear packaging tape to protect the label and maintain legibility (see Figure 3-1).

Do not attach labels to tared VOA sample vials. A label should already be pre-attached to the tared vial.

3.2.5 Complete and Attach Sample Tags

To support use of sample data in potential enforcement actions, sample characteristics other than on-site measurements (e.g., pH, temperature, conductivity) can be identified with a sample tag. Typically, site-specific information is written on the tags using waterproof ink. The use and type of sample tags may vary by Region. For each sampling event, samplers should receive the required sample tags and type of information to include from the RSCC. The sampler can use FORMS II Lite to create and print out multiple sample labels, one of which can be attached to the sample tag and then covered with clear packaging tape to protect the label and maintain legibility. If FORMS II Lite-created sample labels are not available, a detailed set of instructions for completing and attaching a handwritten sample tag are included in Table 3-6.

The use and type of sample tags may vary among Regions.

Table 3-6. Completing and Attaching a Handwritten Sample Tag

Step	Action	Important Notes
1	Under the "Remarks" heading, record the CLP Sample Number and SMO-assigned Case Number.	Make sure to record the correct CLP Sample Number and SMO-assigned Case Number in a legible manner.
2	Record the project code (e.g., Contract Number, Work Assignment Number, Interagency Agreement Number, etc.) assigned by USEPA.	
3	Enter the station number assigned by the sampling team coordinator.	
4	Record the month, day, and year of sample collection.	
5	Enter the military time of sample collection (e.g., 13:01 for 1:01 PM).	
6	Identify the designate and place an "X" in either the "Comp." or "Grab" box if the sample is either a composite or grab sample.	
7	Record the station location.	
8	Sign the sample tag in the Signature area.	
9	Place an "X" in the box next to Yes or No to indicate if a preservative was added to the sample.	
10	Under "Analyses", place an "X" in the box next to the parameters for which the sample is to be analyzed.	
11	Leave the box for "Laboratory Sample Number" blank.	
12	It is recommended that the sample tag be attached to the neck of the sample bottle or container using regular string, stretch string, or wire (see Figure 3-1).	Do **NOT** use wire to attach a sample tag to a metals sample.

An example of a completed sample tag is included in Figure 3-7 below:

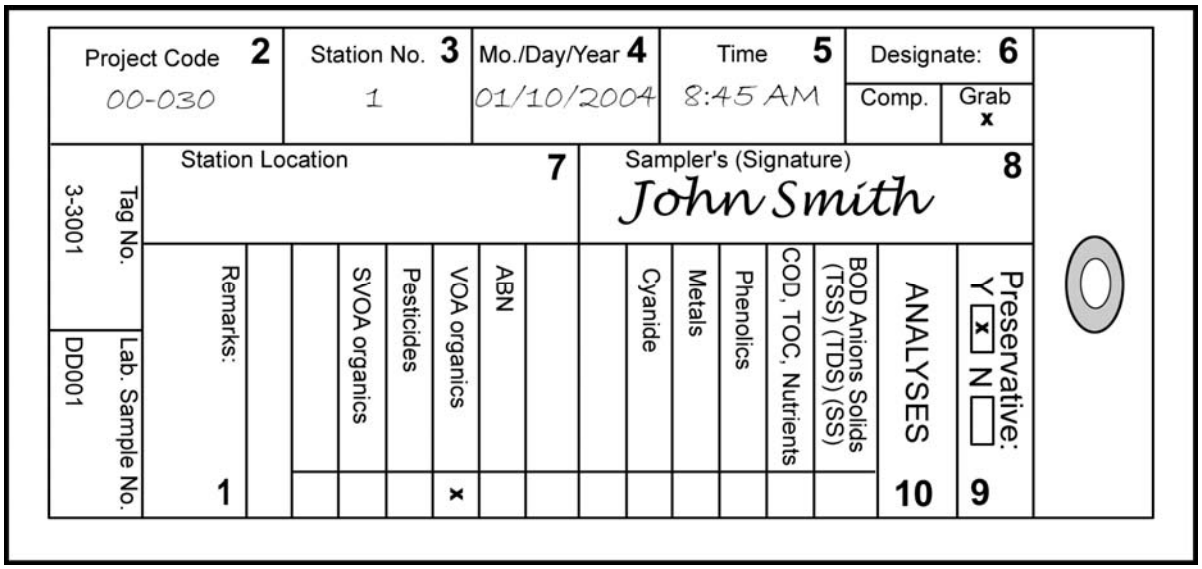

Figure 3-7. Completed Sample Tag

3.3 Provide Sample Receipt

After samples have been taken from private property, the sampler should prepare a receipt for these samples and provide this receipt to the property owner. This is especially important when sampling on private property since these samples could be used during future litigation and the receipt will verify that the owner granted approval for the removal of the samples from the property. An example of a sample receipt created using FORMS II Lite is shown in Figure 3-8.

EPA Region 3
U.S. ENVIRONMENTAL PROTECTION AGENCY

RECEIPT FOR SAMPLES

PROJECT NO.	PROJECT NAME	NAME & LOCATION OF FACILITY/SITE
QW-123		EXAMPLE SITE
SAMPLERS: (SIGNATURES)		

STATION NO.	LOCATION/DESCRIPTION	DATE	TIME	Comp/Grab	NO. OF EPA CONTAINERS	SPLIT SAMPLE Y OR N	EPA SAMPLE TAG NO.'S
STATION ONE	LOCATION ONE	2/20/2001	15:55	G	11	Yes	112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122
STATION ONE	LOCATION TWO	2/20/2001	16:01	C	11	Yes	123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133
STATION TWO	LOCATION ONE	2/20/2001	16:02	C	11	Yes	134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144

SPLIT SAMPLES TRANSFERRED BY: (PRINT)	DATE	SPLIT SAMPLES RECEIVED BY ☐ OR DECLINED BY ☐ (PRINT)	DATE/TIME
(SIGN)	TIME	(SIGN)	TELEPHONE
		TITLE	

F2V5.1.047 Page 1 of 1

Figure 3-8. Sample Receipt Created Using the FORMS II Lite Software

3.4 Pack and Ship Samples

Once the samples have been collected, it is very important that the sampler properly package the samples for shipment and ensure that the samples are sent to the appropriate laboratory as quickly as possible. Prompt and proper packaging of samples will:

- Protect the integrity of samples from changes in composition or concentration caused by bacterial growth or degradation from increased temperatures;
- Reduce the chance of leaking or breaking of sample containers that would result in loss of sample volume, loss of sample integrity, and exposure of personnel to toxic substances; and
- Help ensure compliance with shipping regulations.

3.4.1 Sample Containers

Once samples are collected, they must be stored in conditions that maintain sample integrity. All samples should be placed in shipping containers or other suitable containers with ice to reduce the temperature as soon as possible after collection. Ideally, all samples should be shipped the day of collection for overnight delivery to the laboratory. If samples cannot be shipped on the day of collection, the sample temperature should be maintained at 4°C (±2°C) until they are shipped to the laboratory.

One CLP RAS sample may be contained in several bottles and vials. For example, one soil sample may consist of all containers needed for three of the analytical fractions available under this service (i.e., SVOA fraction, Pesticide fraction, and Aroclor fraction), even though the fractions are collected in separate containers. Therefore, the analysis to be performed and the matrix type will determine the type of container(s) that will be used, as well as the volume that must be collected for that particular sample fraction.

3.4.2 Inventory of Samples and Documentation

Prior to shipment, samplers should conduct an inventory of the contents of the shipping cooler or container against the corresponding TR/COC Record when packing for shipment to laboratories. An inventory will ensure that the proper number of containers have been collected for each analysis of the samples, that the required PE and QC samples and cooler temperature blanks are included, and the correct Sample Numbers and fractions have been assigned to each sample.

3.4.3 Shipping Regulations

Sample shipping personnel are legally responsible for ensuring that the sample shipment will comply with all applicable shipping regulations. For example, hazardous material samples must be packaged, labeled, and shipped in compliance with all IATA Dangerous Goods regulations or DOT regulations and USEPA guidelines. Refer to Appendix B for detailed shipping guidelines when using SW-846 Method 5035A to preserve and ship samples.

3.4.4 Sample Packaging for Shipment

Samplers are responsible for the proper packaging of samples for shipment. To ensure that samples are appropriately packaged (e.g., to avoid breakage and/or contamination) the sampler should consult their respective project plans to determine the proper packing and shipping procedures. The sampler must determine the sample type, pack the shipping containers correctly, include necessary paperwork, label and seal shipping containers or coolers, and ship the samples.

3.4.4.1 Determine the Sample Type and Container

Samplers should know what kinds of samples they are handling to ensure proper packaging. Samplers should refer to their appropriate project plans to determine which type of sample container should be used for each type of sample being taken during the sampling event.

Please follow Regional guidance with reference to samples containing dioxin or radioactive waste.

3.4.4.2 Pack Shipping Containers

It is imperative that samples are correctly and carefully packed in shipping containers to prevent the sample containers from breaking or leaking. Samplers must prepare and pack a shipping cooler or container according to the instructions outlined in Table 3-7.

Table 3-7. Packing Samples for Shipment

Step	Action	Important Notes
1	Seal all drain holes in the shipping container, both inside and out, to prevent leakage in the event of sample breakage.	
2	Check all lids/caps to make sure the samples are tightly sealed and will not leak.	
3	Seal samples within a clear plastic bag.	Custody seals can be placed directly on any sample container except for coring tools used as a transport device (e.g., 5 g Samplers) and tared VOA bottles. If packing coring tools used as a transport device or tared VOA bottles, place them in a clear plastic bag and place the custody seal on the outside of the bag.
4	Fully chill samples to 4°C (±2°C) prior to placement within suitable packing materials.	
5	Prior to placing samples within the shipping cooler, it is recommended that samplers line shipping containers with non-combustible, absorbent packing material.	
6	Place samples in CLEAN, sealed, watertight shipping containers (metal or hard plastic coolers).	
7	Conduct an inventory of the contents of the shipping cooler/container against the corresponding TR/COC Record.	
8	Cover samples in double-bagged ice to prevent water damage to packing materials.	Do NOT pour loose ice directly into the sample cooler. The ice is used to maintain the temperature of the samples within the shipping cooler.
9	It is recommended a temperature blank be included within each cooler being shipped.	The temperature blank is generally a 40 L vial filled with water and labeled “temperature blank” but does not have a Sample Number.
10	Ensure that the site name or other site-identifying information does not appear on any documentation being sent to the laboratory.	The laboratory should not receive any site-identifying information.

3.4.4.3 Include Necessary Paperwork

Samplers must properly place the necessary paperwork in the shipping cooler. All paperwork must be placed in a plastic bag or pouch and then secured to the underside of the shipping cooler lids (see Figure 3-9).

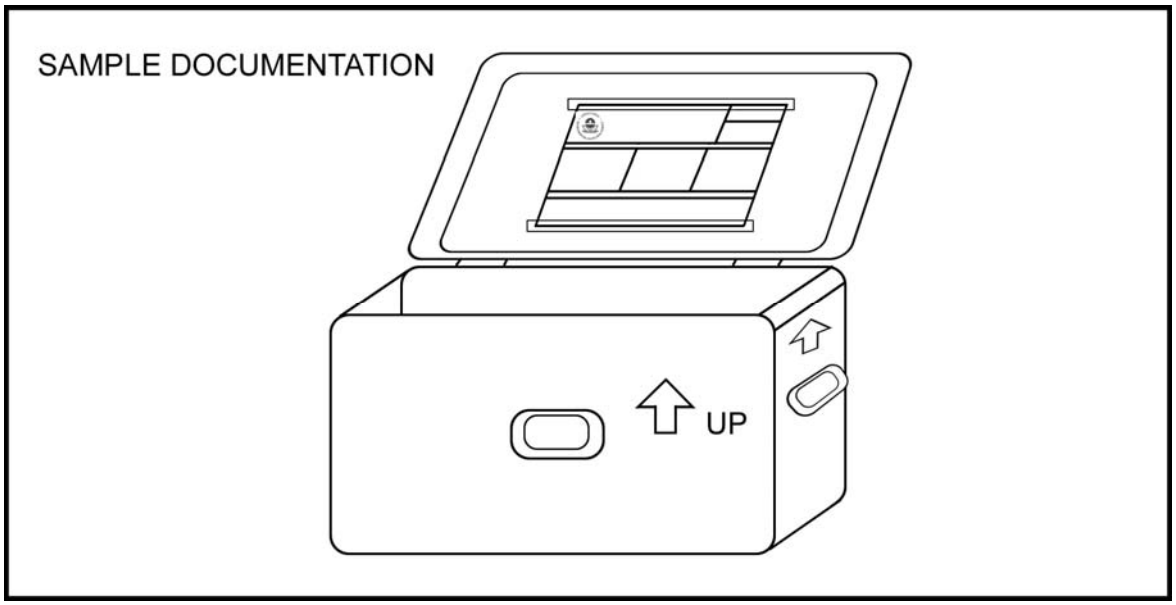

Figure 3-9. Sample Cooler with Attached TR/COC Record and Cooler Return Documentation

Necessary paperwork includes TR/COC Records and sample weight logs (see Figure 3-10), if required (for VOA samples). Samplers should contact their RSCC (or designee) for specific paperwork requirements.

USEPA Contract Laboratory Program
Sample Weight Log

Shipped to: AAA Testing Laboratory
1700 Mill Avenue
Houston TX 77099
(281) 983-1234

Case No. 39563
DAS No. DAS34
Date Shipped: 9/29/2003

Sample No.	Matrix	Analysis	Preservative	Bottle/ Tag Number	Tared Weight (g)	Final Weight (g)	Sample Weight (g)	Laboratory Weight	Traffic Report No.
C0036	Subsurface Soil (>12")	CLP TCL Volatiles	Ice Only	199548	32.80	37.20	4.40		3-103018225-092903-0001
C0036	Subsurface Soil (>12")	CLP TCL Volatiles	Ice Only	199547	32.10	38.30	6.20		3-103018225-092903-0001
C0036	Subsurface Soil (>12")	CLP TCL Volatiles	Ice Only	199549	31.20	38.60	7.40		3-103018225-092903-0001
C0037	Surface Soil (0"-12")	CLP TCL Volatiles	Ice Only	199552	32.00	36.90	4.90		3-103018225-092903-0001
C0037	Surface Soil (0"-12")	CLP TCL Volatiles	Ice Only	199551	32.40	37.10	4.70		3-103018225-092903-0001
C0037	Surface Soil (0"-12")	CLP TCL Volatiles	Ice Only	199550	31.90	35.90	4.00		3-103018225-092903-0001

Completed By:	Date:

All weights are measured in grams

Figure 3-10. Sample Weight Log

3.4.4.4 Return Sample Shipping Coolers

CLP laboratories must routinely return sample shipping coolers within 14 calendar days following shipment receipt. Therefore, the sampler should also include cooler return instructions with each shipment. The sampler (not the CLP laboratory) is responsible for paying for return of the cooler and should also include shipping airbills bearing the sampler's account number, as well as a return address to allow for cooler return.

3.4.4.5 Label and Seal Sample Shipping Coolers

After samples are packaged within shipping coolers, samplers must carefully secure the top and bottom of the coolers with tape, place return address labels clearly on the outside of the cooler, and attach the required chain-of-custody seals (see Figure 3-11).

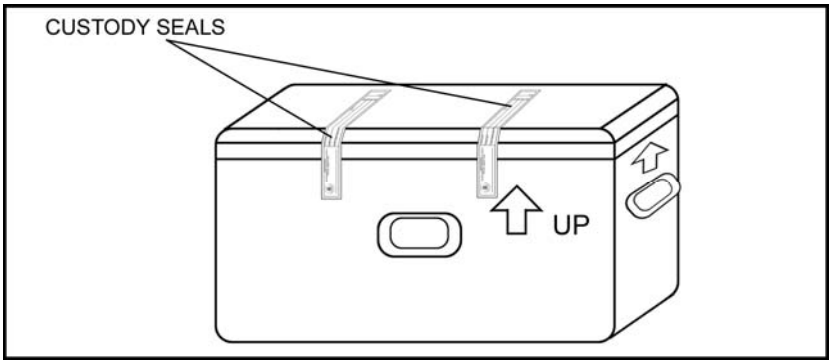

Figure 3-11. Shipping Cooler with Custody Seals

If more than one cooler is being delivered to a laboratory, samplers should mark each cooler as "1 of 2", "2 of 2", etc. In addition, samplers must accurately complete and attach shipping airbill paperwork for shipment of the samples to the laboratory. An airbill, addressed to the Sample Custodian of the receiving laboratory, should be completed for each cooler shipped. Samplers should receive the correct name, address, and telephone number of the laboratory to which they must ship samples from the RSCC or SMO. To avoid delays in analytical testing, samplers should make sure they are sending the correct types of samples to the correct laboratory when collecting samples for multiple types of analysis. For example, inorganic samples may be shipped to one laboratory for analysis, while organic samples may need to be shipped to another laboratory.

3.4.4.6 Ship Samples

The sampling contractor should ensure that samplers know the shipping company's name, address, and telephone number. In addition, they should be aware of the shipping company's hours of operation, shipping schedule, and pick-up/drop-off requirements.

Overnight Delivery

It is imperative that samples be sent via overnight delivery. Delays caused by longer shipment times may cause technical holding times to expire, which in turn may destroy sample integrity or require the recollection of samples for analysis.

Saturday Delivery

For shipping samples for Saturday delivery, the sampler MUST contact the RSCC (or their designee) or SMO so that SMO will receive the delivery information by 3:00 PM ET on the Friday prior to delivery.

3.4.5 Shipment Notification

When samples are shipped to CLP Laboratories, samplers **must immediately** report all sample shipments to the RSCC (or their designee) or to SMO. **Under no circumstances should the sampler contact the laboratory directly.** If samplers are shipping samples after 5:00 PM ET, they must notify the RSCC (or

designee) or SMO by 8:00 AM ET on the following business day. Samplers should receive the name and phone number of the appropriate SMO coordinator to contact from the Region/RSCC.

Samplers must provide the following information to the RSCC (or their designee) or to SMO:

- Name and phone number at which they can easily be reached (preferably closest on-site phone number if still in the field);
- SMO-assigned Case Number (see Section 2.4.1);
- Number, concentration, matrix and analysis of samples being shipped;
- Name of laboratory (or laboratories) to which the samples were shipped;
- Airbill number(s);
- Date of shipment;
- Case status (i.e., whether or not the Case is complete);
- Problems encountered, special comments, or any unanticipated issues;
- When to expect the next anticipated shipment; and
- An electronic export of the TR/COC Record (must be sent as soon as possible after sample shipment). For information regarding electronic export of TR/COC Records, refer to the following Web site:

http://www.epa.gov/superfund/programs/clp/f2lsubmit.htm

For Saturday delivery, samplers MUST contact the RSCC (or their designee) or SMO so that SMO will receive the delivery information by 3:00 PM ET on the Friday prior to delivery.

Samplers should be aware if their Region requires them to notify the RSCC (or designee) and/or SMO of sample shipment.

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Appendix A: Functions within a Sampling Project

The following table describes Quality Assurance Project Plan (QAPP) requirements taken from *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5).

Functions Within a Sampling Project	Elements of that Function
Project Management	
Project/Task Organization	Identifies the individuals or organizations participating in the project and defines their specific roles and responsibilities.
Problem Definition/Background	States the specific problem to be solved or decision to be made and includes sufficient background information to provide a historical and scientific perspective for each particular project.
Project/Task Description	Describes the work to be performed and the schedule for implementation to include: • Measurements to be made during the course of the project; • Applicable technical, regulatory, or program-specific quality standards, criteria, or objectives; • Any special personnel and equipment requirements; assessment tools needed; and • A work schedule and any required project and quality records, including types of reports needed.
Quality Objectives and Criteria	Describes the project quality objectives and measurement performance criteria.
Special Training/Certification	Ensures that any specialized training for non-routine field sampling techniques, field analyses, laboratory analyses, or data validation should be specified.
Documents and Records	• Itemizes the information and records that must be included in the data report package and specifies the desired reporting format for hard copy and electronic forms, when used. • Identifies any other records and/or documents applicable to the project such as audit reports, interim progress reports, and final reports that will be produced. • Specifies or references all applicable requirements for the final disposition of records and documents, including location and length of retention period.
Data Generation and Acquisition	
Sampling Process Design (Experimental Design)	• Describes the experimental design or data collection design for the project. • Classifies all measurements as critical or non-critical.
Sampling Methods	• Describes the procedures for collecting samples and identifies sampling methods and equipment. Includes any implementation requirements, support facilities, sample preservation requirements, and materials needed. • Describes the process for preparing and decontaminating sampling equipment to include the disposal of decontamination by-products, selection and preparation of sample containers, sample volumes, preservation methods, and maximum holding times for sampling, preparation, and/or analysis. • Describes specific performance requirements for the method. • Addresses what to do when a failure in sampling occurs, who is responsible for corrective action, and how the effectiveness of the corrective action shall be determined and documented
Sample Handling and Custody	• Describes the requirements and provisions for sample handling and custody in the field, laboratory, and transport, taking into account the nature of the samples, the maximum allowable sample holding times before extraction and analysis, and the available shipping options and schedules. • Includes examples of sample labels, custody forms, and sample custody logs.

Analytical Methods	• Identifies the analytical methods and equipment required, including sub-sampling or extraction methods, waste disposal requirements (if any), and specific method performance requirements. • Identifies analytical methods by number, date, and regulatory citation (as appropriate). If a method allows the user to select from various options, the method citations should state exactly which options are being selected. • Addresses what to do when a failure in the analytical system occurs, who is responsible for corrective action, and how the effectiveness of the corrective action shall be determined and documented. • Specifies the laboratory turnaround time needed, if important to the project schedule. • Specifies whether a field sampling and/or laboratory analysis Case Narrative is required to provide a complete description of any difficulties encountered during sampling or analysis.
Quality Control (QC)	• Identifies required measurement QC checks for both the field and laboratory. • States the frequency of analysis for each type of QC check, and the spike compounds sources and levels. • States or references the required control limits for each QC check and corrective action required when control limits are exceeded and how the effectiveness of the corrective action shall be determined and documented. • Describes or references the procedures to be used to calculate each of the QC statistics.
Instrument/Equipment Testing, Inspection, and Maintenance	• Describes how inspections and acceptance testing of environmental sampling and measurement systems and their components will be performed and documented. Identifies and discusses the procedure by which final acceptance will be performed by independent personnel. • Describes how deficiencies are to be resolved and when re-inspection will be performed. • Describes or references how periodic preventative and corrective maintenance of measurement or test equipment shall be performed. • Identifies the equipment and/or system requiring periodic maintenance. • Discusses how the availability of spare parts identified in the operating guidance and/or design specifications of the systems will be assured and maintained.
Instrument/Equipment Calibration and Frequency	• Identifies all tools, gauges, instruments, and other sampling, measuring, and test equipment used for data collection activities affecting quality that must be controlled, and at specific times, calibrated to maintain performance within specified limits. • Identifies the certified equipment and/or standards used for calibration. • Describes or references how calibration will be conducted using certified equipment and/or standards with known valid relationships to nationally recognized performance standards. If no such standards exist, documents the basis for calibration. • Indicates how records of calibration shall be maintained and traced to the instrument.
Inspection/Acceptance of Supplies and Consumables	• Describes how and by whom supplies and consumables shall be inspected and accepted for use in the project. • States acceptance criteria for such supplies and consumables.
Non-direct Measurements	• Identifies any types of data needed for project implementation or decision-making that are obtained from non-measurement sources (e.g., computer databases, programs, literature files, historical databases). • Describes the intended use of data. • Defines the acceptance criteria for the use of such data in the project. • Specifies any limitations on the use of the data.
Data Management	• Describes the project data management scheme, tracing the data path from generation in the field or laboratory to their final use or storage. • Describes or references the standard record-keeping procedures, document control system, and the approach used for data storage and retrieval on electronic media.

Appendix B: CLP Sample Collection Guidelines for VOAs in Soil by SW-846 Method 5035A

A. Preferred Options for the Contract Laboratory Program (CLP) are Options 1, 2, and 3:

Soil samples must be placed on their sides prior to being frozen.

Option 1.

Closed-system Vials:

Container - tared or preweighed 40 mL VOA Vials containing a magnetic stir bar.

Collect 5 g of soil per vial (iced or frozen in the field).

Regular Samples	3 Vials - Dry (5 g soil per vial) 1 Vial - Dry (filled with soil, no headspace) 4 Total Vials
Regular Samples Requiring QC Analysis	9 Vials - Dry (5 g soil per vial) 1 Vial - Dry (filled with soil, no headspace) 10 Total Vials

Option 2.

Closed-system Vials Containing Water:

Container - tared or pre-weighed 40 mL VOA vials containing a magnetic stir bar and 5 mL water.

Collect 5 g of soil per vial (iced or frozen in the field).

Regular Samples	2 Vials with water added (5 g soil and 5 mL water per vial) 1 Vial - Dry (5 g soil in vial) 1 Vial - Dry (filled with soil, no headspace) 4 Total Vials (2 with water and 2 dry)
Regular Samples Requiring QC Analysis	6 Vials with water added (5 g soil and 5 mL water per vial) 5 Vials - Dry (5 g soil per vial) 1 Vial - Dry (filled with soil, no headspace) 12 Total Vials (6 with water and 6 dry)

Option 3.

Coring Tool used as a Transport Device

Container - 5 g Samplers or equivalent.

All Samplers should be iced or frozen in the field and bagged individually.

Regular Samples	3 Samplers (5 g soil per Sampler) 1 Vial - Dry (filled with soil, no headspace) 4 Total (3 Samplers and 1 Vial)
Regular Samples Requiring QC Analysis	9 Samplers (5 g soil per Sampler) 1 Vial - Dry (filled with soil, no headspace) 10 Total (11 Samplers and 1 Vial)

B. Options 4, 5, and 6 are NOT preferred options for the CLP:

Option 4.

Closed-system Vials:

Container - tared or preweighed 40 mL VOA Vials containing a magnetic stir bar and preservative.

Collect 5 g of soil per vial and add Sodium bisulfate ($NaHSO_4$) preservative (5 mL water + 1 g $NaHSO_4$) - iced or frozen in the field.

Caution: This option is NOT a Preferred Option for the CLP because:

NaHSO4 preservation creates low pH conditions that will cause the destruction of certain CLP target analytes (e.g., vinyl chloride, trichloroethene, trichlorofluoromethane, cis- and trans-1,3-dichloropropene). Projects requiring the quantitation of these analytes should consider alternative sample preservation methods. NaHSO4 also cannot be used on carbonaceous soils. Check the soil before using this method of collection! Soil can be checked by placing a test sample in a clean vial, then adding several drops of NaHSO4 solution. If the soil bubbles, use Option 4b and note this issue on the TR/COC Record.

Option 4a. Samples preserved in the field

Regular Samples	2 Vials with $NaHSO_4$ preservative added (5g soil per vial) 1 Vial without $NaHSO_4$ preservative added (5g soil per vial) 1 Vial - Dry (filled with soil, no headspace) 4 Total Vials (2 with $NaHSO_4$ preservative and 2 without)
Regular Samples Requiring QC Analyses	4 Vials with $NaHSO_4$ preservative added (5g soil per vial) 5 Vials without $NaHSO_4$ preservative added (5 g soil per vial) 1 Vial - Dry (filled with soil, no headspace) 10 Total Vials (4 with $NaHSO_4$ and 6 without)

Option 4b. Samples are preserved by the laboratory (No $NaHSO_4$ preservative is added to these samples in the field).

Regular Samples	3 Vials - Dry (5 g soil per vial) 1 Vial - Dry (filled with soil, no headspace) 4 Total Vials
Regular Samples Requiring QC Analyses	9 Vials - Dry (5 g soil per vial) 1 Vial - Dry (filled with soil, no headspace) 10 Total Vials

Option 5.

Methanol Preservation (medium-level analysis only):

Container - tared or pre-weighed 40 mL VOA vials containing 5-10 mL methanol.

Collect 5 g of soil per vial (iced in the field).

Caution: This is NOT a preferred option for the CLP because:

Samples preserved with methanol can only be analyzed by the medium-level method. Low-level Contract Required Quantitation Limit (CRQLs) cannot be achieved when samples are preserved this way.

Additional problems associated with use of methanol as a preservative in the field include:

- Possible contamination of the methanol by sampling-related activities (e.g., absorption of diesel fumes from sampling equipment);
- Leakage of methanol from the sample vials during shipping, resulting in loss of VOAs prior to analysis.

Regular Samples	2 Vials (5 g soil and 5-10 mL methanol per vial) 1 Vial - Dry (filled with soil, no headspace) 3 Total Vials (2 with methanol and 1 dry)
Regular Samples Requiring QC Analysis	6 Vials (5 g soil and 5-10 mL methanol per vial) 1 Vial -Dry (filled with soil, no headspace) 7 Total Vials (6 with methanol and 1 dry)

If shipping samples containing methanol as a preservative, a shipping label must be used to indicate methanol. This label must also contain the United Nations (UN) identification number for methanol (UN 1230), and indicate Limited Quantity.

Option 6.

Glass Containers filled with sample - No Headspace:

Container - 4 oz Glass Jars.

Glass container filled with soil with no headspace and iced.

Caution: This is NOT a preferred option for the CLP because:

Samples collected in this manner lose most of their volatile analytes prior to analysis when the sample containers are opened and sub-sampled in the laboratory. This option is only available due to Regional requirements.

Regular Samples	2 Glass Jars (4 oz) filled with sample, no headspace 1 Vial - Dry (filled with soil, no headspace) 3 Total Containers
Regular Samples Requiring QC Analysis	2 Glass Jars (4 oz) filled with sample, no headspace 1 Vial - Dry (filled with soil, no headspace) 3 Total Containers

C. Caution:

1. Extreme care must be taken to ensure that frozen samples do not break during shipment.
2. Before adding soil to pre-weighed vials containing a stir bar, weigh the vials to confirm the tared weight. If the weight varies by more than 0.1 g, record the new weight on the label and the sample documentation. Do NOT add labels to these vials once the tared weight has been determined/confirmed.

D. Dry Samples:

All options include taking a sample in a dry 40 mL VOA vial (or a 4 oz wide mouth jar) with no headspace. No additional water, $NaHSO_4$, or methanol is added to this sample. This sample is taken to determine moisture content; therefore, it does not need to be tared or have a stir bar.

E. Iced or Frozen Samples:

1. Iced means cooled to 4°C (±2°C) immediately after collection.
2. Frozen means cooled to between -7°C and -15°C immediately after collection.

F. Sample Delivery:

CLP strongly recommends that all samples reach the laboratory by COB the next day after sample collection.

G. Notes:

1. For Option 4, samples can be preserved with $NaHSO_4$ either:
   - In the field; or
   - In the laboratory upon receipt. In this case, the sampler should put the following information in the Preservation Column of the TR/COC Record - "To be preserved at lab with $NaHSO_4$". This Regional Request should also be communicated to SMO so that the laboratory can be notified.
2. Regional QAPPs may require the use of Option 5. Please note that this option is for medium-level analysis ONLY.
3. If water, methanol, or $NaHSO_4$ preservative is added to the vials in the field, a field blank containing the appropriate liquid used in the vials should be sent to the laboratory for analysis.

H. Number of Containers Rationale:

The rationale for the number of containers (vials or samplers) required for the field sample and the required laboratory QC for each option is given as follows:

Option 1.

Rationale for Regular Vials:	1 vial for low-level analysis (water purge) 1 vial for backup low-level analysis 1 vial for medium-level analysis (methanol extraction)
Rationale for QC Vials:	2 vials for MS and MSD low-level analysis 2 vials for MS and MSD medium-level analysis 2 vials for backup (MS and MSD) low-level or medium-level analysis

Option 2.

Rationale for Regular Vials:	1 vial for low-level analysis (water purge) 1 vial for back up low-level analysis 1 vial dry for medium-level analysis (methanol extraction)
Rationale for QC Vials:	2 vials for MS and MSD low-level analysis 2 vials for MS and MSD medium-level analysis 2 vials for backup (MS and MSD) low-level or medium-level analysis
Medium-level: Analysis	Methanol will be added in the laboratory

Option 3.

Rationale for Regular Samples:	1 sampler for low-level analysis (water purge) 1 sampler for back up low-level analysis 1 sampler for medium-level analysis (methanol extraction)
Rationale for QC Samples:	2 samplers for MS and MSD low-level analysis 2 samplers for backup MS and MSD low-level analysis 2 samplers for MS and MSD medium-level analysis 2 samplers for backup MS and MSD medium-level analysis

Option 4a ($NaHSO_4$ added in the field).

Rationale for Regular Vials:	1 vial with water for low-level analysis (water purge) 1 vial with water for backup low-level analysis 1 vial dry for medium-level analysis (methanol extraction)
Rationale for QC Vials:	2 vials with water for MS and MSD low-level analysis 2 vials dry for MS and MSD medium-level analysis 2 vials for backup (MS and MSD) low-level or medium-level analysis

Option 4b ($NaHSO_4$ added in the laboratory).

Rationale for Regular Vials:	1 vial for low-level analysis (water purge) 1 vial for backup low-level analysis 1 vial for medium-level analysis (methanol extraction)
Rationale for QC Vials:	2 vials for MS and MSD low-level analysis 2 vials for MS and MSD medium-level analysis 2 vials for backup (MS and MSD) low-level or medium-level analysis

Option 5.

Rationale for Regular Samples:	1 vial for regular medium-level analysis 1 vial for back up medium-level analysis
Rationale for QC Samples:	2 samples for MS and MSD 2 samples for backup MS and MSD

Option 6.

In this option, all Regular and QC samples for both low-level and medium analysis are taken as subsamples from the same container.

Rationale for Regular Analysis	1 glass jar for low-level analysis and medium-level analysis **1 glass jar for backup low-level analysis and medium-level analysis**
Rationale for QC Analysis:	1 glass jar for low-level analysis and medium-level analysis **1 glass jar for backup low-level analysis and medium-level analysis**

Appendix C: General CLP Sample Collection Guidelines VOAs in Water

Regional guidance and/or specific Project Plan requirements will supersede the guidelines listed below.

Collect the following:

- At least two 40 mL glass containers with polytetrafluoroethylene (PTFE)-lined septa and open top screw-caps that are filled to capacity with no air bubbles, preserved to a pH of 2 with HCl, and cooled to 4°C (±2°C) immediately after collection. DO NOT FREEZE THE SAMPLES.
- If Selected Ion Monitoring (SIM) analysis is requested, at least two additional 40 mL glass containers with PTFE-lined septa and open top screw-caps that are filled to capacity with no air bubbles, preserved to a pH of 2 with HCl, and cooled to 4°C (±2°C) immediately after collection.

Test for Carbonates, Residual Chlorine, Oxidants, and Sulfides:

- It is very important that samplers obtain Regional guidance when testing and ameliorating for:
  - Carbonates;
  - Residual chlorine (e.g., municipal waters or industrial waste waters that are treated with chlorine prior to use or discharge); or
  - Oxidants.
- VOA samples containing carbonates react with the acid preservative causing effervescence (due to formation of carbon dioxide), which can cause loss of volatile analytes.
- Residual chlorine present in VOA samples can continue to react with dissolved organic matter. This continuous reaction may lead to inaccurate quantitation of certain analytes present in the sample at the time of collection.
- Residual chlorine and oxidants present in VOA samples can cause degradation of certain volatile analytes (e.g., styrene).

Perform the following for *Pre-Preserved* Vials:

1. Pour the sample slowly down the edge of the sample vial to avoid excess aeration or agitation of the sample during filling.
2. Fill the vial completely so that a reverse (convex) meniscus is present and ensure that there are no air bubbles present (either in the body or especially at the top of the vial).
3. Place the septum on the vial so that the PTFE side is in contact with the sample, and then firmly tighten the cap.
4. Gently flip the vial a few times to ensure that the sample is mixed with the acid preservative.
5. While holding the vial upright, gently tap the sample to check for air bubbles (either in the body or especially at the top of the vial).
6. If air bubbles are present, discard the sample and select a new vial in which to recollect a new sample. Repeat Steps 1 - 5 above.
7. Do NOT mix or composite samples for VOAs.
8. Cool sample to a temperature of 4°C (±2°C). Samplers should begin the cooling process in the field as samples are being collected. Double-bagged ice should be used. DO NOT FREEZE WATER SAMPLES.
9. Immediately transfer the vial to the sample shuttle (device that contains a "set" of VOA vials) once it has been collected. Do NOT allow ice to touch the vials.

Perform the Following for *Empty* Vials:

1. Rinse the vial with sample water prior to actual sample collection and preservation.

Regions vary in their approach to pre-rinsing and/or re-using sample vials (e.g., some Regions do not recommend pre-rinsing and/or re-use of pre-cleaned containers using sample water). Be sure to follow Regional guidance.

2. Add 1-2 mL of acid preservative to the vial. Check to ensure that the sample you are collecting requires a preservative (follow Regional guidance).
3. Pour the sample slowly down the edge of the sample vial to avoid excess aeration and agitation of the sample.
4. Fill the vial completely so that a reverse (convex) meniscus is present and ensure that there are no air bubbles present (either in the body or especially at the top of the vial).
5. Place the septum on the vial so that the PTFE side is in contact with the sample, and then firmly tighten the cap.
6. Gently flip the vial a few times to ensure that the sample is mixed with the acid preservative.
7. While holding the vial upright, gently tap the vial to check for air bubbles (either in the body or especially at the top of the vial).
8. If air bubbles are present, discard the sample and recollect a new sample using the same sample vial. Repeat Steps 1 - 7 above.
9. Check the recollected sample for air bubbles. If air bubbles are present, additional sample water may be added to the vial to eliminate air bubbles. If there are air bubbles after three consecutive attempts to eliminate air bubbles by the addition of sample water, the entire sample and sample vial should be discarded and a new sample collected.
10. Do NOT mix or composite samples for VOAs.
11. Cool sample to a temperature of 4°C (±2°C). Samplers should begin the cooling process in the field as samples are being collected. Double-bagged ice should be used. DO NOT FREEZE WATER SAMPLES.
12. Immediately transfer the vial to the sample shuttle (device which contains a "set" of VOA vials) once it has been collected. Do NOT allow ice to touch the vials.

Things to Remember:

- Samples must be shipped as soon as possible, preferably on the same day as sample collection to avoid exceeding sample holding times. If overnight transit is not possible, samples should be maintained at 2 - 4°C until they are shipped to the laboratory.
- If samples are not preserved (a requirement for certain analytes), the technical holding time is shortened to 7 days.

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Appendix D: Sampling Techniques and Considerations

During a sampling event, the sampler is expected to follow prescribed sampling techniques. The sampler should also be aware of any special sampling considerations, contaminant issues, and sample compositing and mixing methods that could affect their sampling efforts.

Regional guidance will take precedence over any of the techniques and considerations listed below.

D.1 General Sampling Techniques

Information regarding surface water, sediment, soil, and groundwater sampling can be found in many documents including, but not limited to, the following sources:

- Compendium of ERT Surface Water and Sediment Sampling Procedures, EPA/540/P-91/005;
- Compendium of ERT Soil Sampling and Surface Geophysics Procedures, EPA/540/P-91/006;
- Compendium of ERT Groundwater Sampling Procedures, EPA/540/P-91/007;
- Quality Assurance Sampling Plan for Environmental Response (QASPER) software, Version 4.1, ERT; and
- *Requirements for the Preparation of Sampling and Analysis Plans*; United States Army Corps of Engineers, February 1, 2001, EM 200-1-3.

When working with potentially hazardous materials, samplers should follow USEPA and OSHA requirements, specific health and safety procedures, and DOT requirements.

D.2 Special Sampling Considerations

Samplers should refer to Regionally-developed SOPs to obtain specific procedures for properly collecting and preserving samples in the field. For additional guidance regarding sampling for VOAs in soil and water, see Appendices B and C. Samplers should obtain Regional guidance when testing and ameliorating for:

- Carbonates in VOA soil and water;
- Residual chlorine in VOA soil and water, or cyanide water;
- Oxidants in VOA soil and water; or
- Sulfides in cyanide.

D.3 Contaminant Sampling

Certain compounds can be detected in the parts-per-billion (ppb) and/or parts-per-trillion (ppt) range. Extreme care MUST be taken to prevent cross-contamination of these samples. The following precautions should be taken when trace contaminants are a concern:

- Disposable gloves should be worn each time a different location is sampled.
- When collecting both surface water and sediments, surface water samples should be collected first. This reduces the chance of sediment dispersal into surface water, and the resulting loss of surface water sample integrity.
- Sampling should occur in a progression from the least to the most contaminated area, if this information is known to the sampling team.
- Samplers should use equipment constructed of PTFE, stainless steel, or glass that has been properly pre-cleaned for collection of samples for trace organic and/or inorganic analyses. Equipment constructed of plastic or polyvinyl chloride (PVC) should NOT be used to collect samples for trace organic compound analyses.
- Equipment constructed of stainless steel should NOT be used to collect samples for trace metals analysis.

D.4 Sample Compositing

Sample compositing is a site-specific activity that must be conducted according to the SAP. Compositing is typically used for large sites under investigation to improve the precision (i.e., lower the variance) of the estimated average contaminant concentrations. **Samples for VOA analysis should NOT be composited to minimize loss of VOAs/analytes.**

Composite samples consist of a series of discrete grab samples that are mixed together to characterize the average composition of a given material. The discrete samples are usually of equal volume, but may be weighted to reflect an increased flow or volume. Regardless, all discrete samples must be collected in an identical manner and the number of grab samples forming a composite should be consistent. There are several compositing techniques that may be required such as:

- Flow-proportioned – Collected proportional to the flow rate during the compositing period by either a time-varying/constant volume or a time-constant/varying volume method. This technique is usually associated with wastewater or storm water runoff sampling.
- Time – Composed of a varying number of discrete samples collected at equal time intervals during the compositing period. This technique is typically used to sample wastewater and streams, and in some air sampling applications.
- Areal – Collected from individual grab samples collected in an area or on a cross-sectional basis. Areal composites are comprised of equal volumes of grab samples where all grabs are collected in an identical manner. This technique is typically used for estimating average contaminant concentrations in soils or sediments. This technique is useful when contaminants are present in nugget form (i.e., TNT chunks, lead shot, etc.), thus exhibiting large differences in concentration over a small sample area.
- Vertical – Collected from individual grab samples but taken from a vertical cross section. Vertical composites are comprised of equal volumes of grab samples where all grab samples are collected in an identical manner. Examples would include vertical profiles of a soil borehole or sediment columns.
- Volume – Collected from discrete samples whose aliquot volumes are proportional to the volume of sampled material. Volume composites are usually associated with hazardous waste bulking operations where the sample represents combined or bulked waste.

When compositing solid samples (i.e., sediment, soil, or sludge) for analysis of compounds present in trace quantities, use a stainless steel or PTFE bowl and spatula.

D.5 Sample Mixing and Homogenizing

Mixing of the sample for the remaining parameters is necessary to create a representative sample media. It is extremely important that solid samples be mixed as thoroughly as possible to ensure that the sample is as representative as possible of the sample location. Please refer to the project-specific SAP regarding instructions on removal of any extraneous materials (e.g., leaves, sticks, rocks, etc.). The mixing technique will depend on the physical characteristics of the solid material (e.g., particle size, moisture content, etc.). The mixing container should be large enough to hold the sample volume and accommodate the procedures without spilling. Both the mixing container (generally a bowl or tray) and the mixing implement should be properly decontaminated before use. Samples should be homogenized according to procedures listed in the project-specific SAP.

Samples for VOA analysis should not be mixed to minimize loss of volatile analytes.

Table D-1 provides a short procedure for mixing a soil sample with a small particle size (less than 1/4 in) and filling sample containers in the field.

Table D-1. Mixing a Sample and Filling Sample Containers

Step	Action
1	Roll the contents of the compositing container to the middle of the container and mix.
2	Quarter the sample and move to the sides of the container.
3	Mix each quarter individually, then combine and mix OPPOSITE quarters, then roll to the middle of the container.
4	Mix the sample once more, and then quarter the sample again.
5	Mix each quarter individually, then combine and mix ADJACENT corners, then roll to the middle of the container. The goal is to achieve a consistent physical appearance before sample containers are filled.
6	Flatten piled material into an oblong shape.
7	Using a flat-bottomed scoop, collect a strip of soil across the entire width of the short axis and place it into a sample container.
8	Repeat Step 7 at evenly-spaced intervals until the sample containers are filled.
9	Record the approximate quantity of each subsample in the field log book.

Appendix E: Sampling Checklists

Appendix E-1: Personnel Preparation Checklist

(Page 1 of 1)

Personnel Briefing	Yes	No	Comments:
1. Did you review sampling team responsibilities and identify individual(s) responsible for corrective actions?			
2. Did you ensure that you have met the appropriate personal safety and protection requirements?			
3. Did you identify sampling locations and receive permission to access them, as appropriate?			
4. Did you contact the appropriate utility companies PRIOR to the start of sampling? Note By law, utility companies must be contacted prior to the start of digging/sampling so that any underground utilities (gas lines, water lines, electrical lines, etc.) can be marked. A list of one-call centers for each state may be found at: http://www.digsafely.com/contacts.htm.			
5. If sampling on private property, do you have sample receipts to provide to the property owner for all samples taken and removed from the property?			
6. Have you determined the number and type of samples to be collected?			
7. Did you review sample collection methods?			
8. Have you reviewed sample container requirements?			
9. Did you review decontamination requirements, procedures, and locations?			
10. Did you determine holding times and conditions?			
11. Did you determine Performance Evaluation (PE) and Quality Control (QC) sample requirements?			
12. Have you obtained shipping cooler temperature blanks, if required?			
13. Did you review sample label and tag requirements?			
14. Did you review Traffic Report/Chain of Custody (TR/COC) Record and custody seal requirements?			
15. Have you obtained the laboratory name, shipping addresses, and telephone number?			
16. Did you review cooler return instructions?			
17. Have you obtained shipping company information (name, telephone number, account number, pickup schedule)?			
18. Have you obtained shipping schedules?			
19. Did you review shipment reporting requirements and the appropriate contact names and telephone numbers for reporting?			
20. Have you included any sampler comments regarding sampling issues (e.g., low volumes, matrix, suspected concentrations based on field measurements)?			

Appendix E-2: General Sample Collection Checklist

(Page 1 of 1)

General Sample Collection	Yes	No	Comments:
1. Did you identify and mark the sampling location with buoys, flags, or stakes according to the sampling plans, maps, and grids?			
2. If the sampling location is inaccessible, did you contact the appropriate field or Regional personnel for instructions?			
3. Did you use the correct sampling equipment?			
4. Did you follow the correct decontamination procedures?			
5. Did you follow the correct collection procedures?			
6. Did you use the correct sample containers for each sample collected?			
7. Did you collect the correct volume for each sample?			
8. Did you collect the correct type of sample, including primary samples and Quality Control (QC) samples?			
9. Did you properly preserve each sample collected?			
10. Did you correctly document and label each sample with all necessary information? Under no circumstances should the site name appear on any documentation being sent to the laboratory.			
11. If sampling on private property, did you provide a sample receipt to the owner of the property for all samples taken and removed from the property?			

Appendix E-3: Completing Field Logbook Checklist

(Page 1 of 1)

Completing Field Logbook	Yes	No	Comments:
1. Did you use waterproof ink when writing in the field logbook?			
2. Did you document sampling project information such as: • Project name, ID, and location; • Names of samplers; • Geological observations, including maps; • Atmospheric conditions; • Field measurements; and • Sampling dates, times, and locations? Under no circumstances should the site name appear on any documentation being sent to the laboratory.			
3. Did you record sampling activity information such as: • Sampling dates and times; • Sample identifications; • Sample matrices; • Sample descriptions (e.g., odors and/or colors); • Number of samples taken; • Sampling methods/equipment; and • Description of QC samples?			
4. Did you document any and all deviations from the sampling plan?			
5. Did you document any and all difficulties in sampling and/or any unusual circumstances?			
6. Were all errors corrected by crossing a line through the error, initialing the error, dating the error, and then adding the correct information?			

Appendix E-4: Completing Handwritten Sample Labels Checklist

(Page 1 of 1)

Completing Handwritten Sample Labels	Yes	No	Comments:
1. Did the Region provide CLP Sample Numbers and SMO-assigned Case Numbers?			
2. If additional CLP Sample Numbers were needed, did you contact the appropriate Regional personnel?			
3. Were the CLP Sample Numbers and SMO-assigned Case Numbers on the labels correct? Organic CLP Sample Numbers begin with the Regional letter code, followed by letters and numbers. Inorganic CLP Sample Numbers begin with "M", followed by the Regional letter code, and then letters and numbers. The following characters are not used in generating CLP Sample Numbers and should never appear on any paperwork send to the laboratory: I; O; U; and V. Also, the last character of a CLP Sample Number will never be a letter.			
4. Were samples uniquely numbered and designated to only one sample? Samples collected for total metal and dissolved metal analyses must receive separate, unique, CLP Sample Numbers.			
5. Were Quality Control (QC) samples numbered accordingly?			
6. Were the specific requirements followed for total and dissolved metals analysis, QC and Performance Evaluation (PE) samples, and SW-846 Method 5035A?			
7. Were all temperature blanks labeled with "TEMPERATURE BLANK"?			
8. Was a sample label containing the CLP Sample Number, SMO-assigned Case Number, location, concentration, preservative, and the fraction/analysis, attached to each sample bottle or container as the sample was collected? Under no circumstances should the site name appear on any documentation being sent to the laboratory.			
9. Was clear tape placed over the sample labels to protect the labels from moisture and to help the labels adhere to the sample bottle?			
10. Were all errors corrected by crossing a line through the error, initialing the error, dating the error, and then adding the correct information?			

Appendix E-5: Completing Handwritten Sample Tags & Custody Seals Checklists

(Page 1 of 1)

Completing Handwritten Sample Tags	Yes	No	Comments:
1. Was waterproof ink used on the sample tags?			
2. If Regionally required for individual sample containers, was the project code on the sample tag completed?			
3. Was the station number on the sample tag completed?			
4 Was the date filled in using the format MM/DD/YYYY?			
5. Was the time of sample collection indicated in military time format HH:MM?			
6. Was the box checked indicating composite or grab sample?			
7. Was the station location on the sample tag completed?			
8. Did you indicate whether or not the sample was preserved by checking "yes" or "no?"			
9. Was the appropriate analysis indicated on the sample tag?			
10. Were the appropriate CLP Sample Number and SMO-assigned Case Number indicated and cross-referenced with the numbers on the sample label?			
11. Did you sign the sample tags?			
12 Did you attach the sample tag to the neck of the sample bottle with striang, stretch string, or wire (recommended method)? Do **NOT** use wire to attach a sample tag to a metal sample.			
13. Were all errors corrected by crossing a line through the error, initialing the error, dating the error, and then adding the correct information?			

Completing Custody Seals	Yes	No	Comments:
1. Did you sign and date the custody seal?			
2. Did you attach a completed custody seal to the sample bottle, container, or plastic bag, placing the seal over the cap or lid of each sample bottle or container or on the bag opening such that it will be broken if the sample bottle, container, or bag is opened or tampered with?			
3. As appropriate, did you attach the completed custody seal to the sample shipping container or cooler, placing the seal such that it will be broken if the container or cooler is opened or tampered with?			
4. Were all errors corrected by crossing a line through the error, initialing the error, dating the error, and then adding the correct information?			

Appendix E-6: Packing Sample Container Checklist

(Page 1 of 1)

Packing Sample Container	Yes	No	Comments:
1. Did you follow all State, Federal, Department of Transportation (DOT), and International Air Transportation Association (IATA) regulations governing the packaging of environmental and hazardous samples? If samples contain methanol preservation (e.g., samples to be analyzed by SW-846 Method 5035A), refer to the packaging instructions in Appendix A.			
2. Were all CLP Sample Numbers, SMO-assigned Case Numbers, fractions/analyses, labels, tags, and custody seals attached to the correct sample containers?			
3. Was an inventory conducted of CLP Sample Numbers, SMO-assigned Case Numbers, fractions/analyses, and containers, and verified against the TR/COC Records?			
4. Were the correct number and type of Performance Evaluation (PE) and Quality Control (QC) samples collected?			
5. Were all sample containers sealed in clear plastic bags with the sample label and tag visible through the packaging?			
6. Were all soil/sediment samples known to contain dioxin securely enclosed in metal cans (e.g., paint cans) with the lids sealed?			
7. Was suitable absorbent packing material placed around the sample bottles or containers?			
8. Were the outsides of metal containers labeled properly with the CLP Sample Number, SMO-assigned Case Number, and the fraction/analysis of the sample inside?			

Appendix E-7: Packing Shipping Container Checklist

(Page 1 of 1)

Packing Shipping Container	Yes	No	Comments:
1. Were you shipping samples in a clean waterproof metal or hard plastic ice chest or cooler in good condition?			
2. Were all non-applicable labels from previous shipments removed from the container?			
3. Were all inside and outside drain plugs closed and covered with suitable tape (e.g., duct tape)?			
4. Was the inside of the cooler lined with plastic (e.g., large heavy-duty garbage bag)?			
5. Was the lined shipping cooler packed with noncombustible absorbent packing material?			
6. Were sample containers placed in the cooler in an upright position not touching one another?			
7. Was a sample shipping cooler temperature blank included in the cooler?			
8. Did the documentation in the cooler only address the samples in that cooler?			
9. Was the site name absent from all documentation? Under no circumstances should the site name appear on any documentation being sent to the laboratory.			
10. Was there sufficient packing material around and in between the sample bottles and cans to avoid breakage during transport?			
11. If required, was double-bagged ice placed on top and around sample bottles to keep the samples cold at 4°C (± 2° C)? Do Not Pack Loose Ice Into the Cooler!			
12. Was the top of the plastic liner fastened and secured with tape?			
13. Was a completed custody seal placed around the top of the fastened plastic liner (if required by the Region)?			
14. Were all sample documents enclosed within the cooler (e.g., TR/COC Record and cooler return instructions) in a waterproof plastic bag?			
15. Was the plastic bag, containing the documentation, taped to the underside of the cooler lid?			
16. Were cooler return instructions and airbills, if required, taped to the underside of the cooler lid?			
17. Was the return address of the cooler written with permanent ink on the underside of the cooler lid?			
18. Was tape placed around the outside of the entire cooler and over the hinges?			
19. Were the completed custody seals placed over the top edge of the cooler so the cooler cannot be opened without breaking the seals?			
20. Was the return address label attached to the top left corner of the cooler lid?			
21. Were instructional labels attached to the top of the cooler, as necessary (e.g., "This End Up," "Do Not Tamper With," or "Environmental Laboratory Samples")?			
22. If shipping hazardous samples, were the correct labels attached to the cooler (e.g., "Flammable Liquids", "Caution", or "Poison")?			
23. If shipping samples containing methanol as a preservative (e.g., samples to be analyzed by SW-846 Method 5035A), was a label used to indicate methanol, the United Nations (UN) identification number for methanol (UN 1230), and Limited Quantity?			

Appendix E-8: Shipping & Reporting CLP Samples Checklist

(Page 1 of 1)

Shipping CLP Samples	Yes	No	Comments:
1. Did you follow all State, Federal, Department of Transportation (DOT), and International Air Transportation Association (IATA) regulations governing the shipment of environmental and hazardous samples?			
2. Was a separate airbill filled out for each cooler being shipped?			
3. Was the airbill filled out completely, including correct laboratory name, address, and telephone number, identification of recipient as "Sample Custodian," and appropriate delivery option (e.g., overnight or Saturday)?			
4. Was the completed airbill attached to the top of the cooler with the correct laboratory address?			
5. If more than one cooler was being shipped to the same laboratory, were they marked as "1 of 2," "2 of 2," etc.?			
6. Were the samples being shipped "overnight" through a qualified commercial carrier?			
Reporting CLP Samples	**Yes**	**No**	**Comments:**
1. Did you contact the Contract Laboratory Program Sample Management Office (SMO) on the same day samples were shipped?			
2. If the samples were shipped after 5:00 PM Eastern Time (ET), were they reported to the RSCC (or designee) or to SMO by 8:00 AM ET the following business day?			
3. Did you notify the RSCC (or designee) or SMO so that SMO will receive the delivery information by 3:00 PM ET on Friday for sample shipments that will be delivered to the laboratory on Saturday?			
4. Did you provide the RSCC (or designee) or SMO with: • Your name, phone number, and Region number; • Case Number of the project; • Exact number of samples, matrix(ces), concentration(s), and type of analysis; • Laboratory(ies) to which the samples were shipped; • Carrier name and airbill number; • Date of shipment; • Date of next shipment; and • Any other information pertinent to the shipment?			

Appendix F: Glossary

Analyte -- The element, compound, or ion that is determined in an analytical procedure; the substance or chemical constituent of interest.

Analytical Services Branch (ASB) -- Directs the Contract Laboratory Program (CLP) from within the United States Environmental Protection Agency's (USEPA's) Office of Superfund Remediation and Technology Innovation (OSRTI) in the Office of Solid Waste and Emergency Response (OSWER).

Aroclor -- Polychlorinated biphenyls (PCBs) or a class of organic compounds with 1 to 10 chlorine atoms attached to biphenyl and a general chemical formula of $C_{12}H_{10-x}Cl_x$. PCBs, commercially produced as complex mixtures containing multiple isomers at different degrees of chlorination, were marketed in North America under the trade name Aroclor.

Case -- A finite, usually predetermined, number of samples collected over a given time period from a particular site. Case Numbers are assigned by the Sample Management Office (SMO). A Case consists of one or more Sample Delivery Groups (SDGs).

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) -- Initiated in December 1980, CERCLA provided broad federal authority to respond directly to the release or possible release or hazardous substances that may endanger human health or the environment. CERCLA also established a trust fund to provide for cleanup when no responsible party could be identified; hence CERCLA is commonly referred to as "Superfund".

Contract Laboratory Program (CLP) -- A national program of commercial laboratories under contract to support the USEPA's nationwide efforts to clean up designated hazardous waste sites by providing a range of chemical analytical services to produce environmental data of known and documented quality. This program is directed by USEPA's Analytical Services Branch (ASB).

Contract Laboratory Program Project Officer (CLP PO) -- Monitors technical performance of the contract laboratories in each Region.

Contract Laboratory Program Sample Management Office (CLP SMO) -- A contractor-operated facility operated under the CLP, awarded and administered by the USEPA, which provides necessary management, operations, and administrative support to the CLP. SMO coordinates and schedules sample analyses, tracks sample shipments and analyses, receives and tracks data for completeness and compliance, and processes laboratory invoices.

Custody Seal -- An adhesive label or tape that is used to seal a sample bottle or container that maintains chain-of-custody and that will break if the sample bottle or container is opened or tampered with.

Cyanide (Total) -- Cyanide ion and complex cyanides converted to hydrocyanic acid (HCN) by reaction in a reflux system of a mineral acid in the presence of magnesium ion.

Data Quality Objective (DQO) -- The requirements established to maintain the quality of the data being collected.

Data Validation -- Data validation is based on Region-defined criteria and limits, professional judgment of the data validator, and (if available) the Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP).

Equipment Blank -- A sample used to check field decontamination procedures. See Field Blank.

Field Blank -- Any blank sample that is submitted from the field. Each field blank is assigned its own unique USEPA Sample Number. A Field Blank checks for cross-contamination during sample collection, sample shipment, and in the laboratory. A field blank includes trip blanks, rinsates, equipment blanks, etc.

Field Duplicate -- Checks reproducibility of laboratory and field procedures and indicates non-homogeneity.

Field Operations Reporting Management System (FORMS) II Lite -- A stand-alone, Windows-based software application that enables samplers to automatically create and generate sample documentation both prior to and during a sampling event.

Field QC Sample -- Used to detect for contamination or error in the field.

Field Sample -- Primary sample material taken out in the field from which other samples, such as duplicates or split samples are derived. A field sample can be prepared in the field and sent for analysis in one or multiple containers, and is identified by a unique EPA Sample Number.

Field Sampling Plan (FSP) -- Developed to outline the actual steps and requirements pertaining to a particular sampling event, and explains, in detail, each component of the event to all involved samplers.

Holding Time -- The elapsed time expressed in hours, days, or months from the date of collection of the sample until the date of its analysis.

> **Contractual** -- The lengths of time that the CLP laboratory must follow to comply with the terms of the contract, and are described in the CLP analytical services Statements of Work (SOWs).
>
> **Technical** -- The maximum lengths of time that samples may be held from time of collection to time of preparation and/or analysis and still be considered valid.

Laboratory Blank -- See Method Blank.

Laboratory Duplicate -- A sample required by the laboratory's contract to check the precision of inorganic analyses.

Laboratory QC Sample -- An additional volume of an existing sample, as required by the laboratory's contract, used to detect contamination or error in the laboratory's practices.

Matrix -- The predominant material of which a sample to be analyzed is composed.

Matrix Spike (MS) -- Sample required by the laboratory's contract to check the accuracy of organic and inorganic analyses. It is an aliquot of a sample (water or soil) that is fortified (spiked) with known quantities of a specific compound and subjected to the entire analytical procedure. See Matrix Spike Duplicate.

Matrix Spike Duplicate (MSD) -- Sample required by the laboratory's contract to check the accuracy and precision of organic analyses. It is a second aliquot of the same matrix as the Matrix Spike (MS) that is spiked to determine the precision of the method. See Matrix Spike.

Method Blank -- An analytical control consisting of all reagents, internal standards and surrogate standards [or System Monitoring Compounds (SMCs) for volatile organic analysis], that is carried throughout the entire analytical procedure. The method blank is used to define the level of laboratory, background, and reagent contamination, also referred to as laboratory blank when defining the level of laboratory contamination.

Performance Evaluation (PE) Sample -- A sample of known composition provided by the USEPA for contractor analysis. Used by USEPA to evaluate contractor performance.

Pesticides -- Substances intended to repel, kill, or control any species designated a "pest", including weeds, insects, rodents, fungi, bacteria, and other organisms. Under the CLP, only organochlorine pesticides are analyzed (e.g., DDT, Dieldrin, Endrin, etc.).

Polychlorinated Biphenyls (PCBs) -- A group of toxic, persistent chemicals used in electrical transformers and capacitors for insulating purposes, and in gas pipeline systems as a lubricant. The sale and new use of PCBs were banned by law in 1979.

Quality Assurance (QA) -- An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the customer.

Quality Assurance Project Plan (QAPP) -- Document written to meet requirements outlined in the document *EPA Guidance for Quality Assurance Project Plans* (EPA QA/R-5). Prepared in advance of field activities and used by samplers to develop any subsequent plans such as the Sampling Analysis Plan (SAP) or the Field Sampling Plan (FSP).

Quality Control (QC) -- The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality.

Regional Sample Control Center (RSCC) Coordinator -- In most Regions, coordinates sampling efforts and serves as the central point-of-contact for sampling questions and problems. Also assists in coordinating the level of Regional sampling activities to correspond with the monthly projected demand for analytical services.

Regional Site Manager -- Coordinates the development of data quality objectives and oversees project-specific remedial or removal contractors, State officials, or private parties conducting site sampling efforts.

Rinse Blank -- A sample used to check decontamination procedures. Also see Field Blank.

Routine Analytical Service (RAS) -- The standard inorganic and organic analyses available through the CLP.

Sample -- A discrete portion of material to be analyzed that is contained in single or multiple containers, and identified by a unique Sample Number.

Sample Delivery Group (SDG) – A unit within a sample Case that is used to identify a group of samples for delivery. An SDG is defined by the following, whichever is most frequent:

- Each Case of field samples received; or
- Each 20 field samples (excluding PE samples) within a Case; or
- Each 7 calendar day period (3 calendar day period for 7-day turnaround) during which field samples in a Case are received (said period beginning with the receipt of the first sample in the SDG).

In addition, all samples and/or sample fractions assigned to an SDG must have been scheduled under the same contractual turnaround time. Preliminary Results have no impact on defining the SDG. Sample may be assigned to SDGs by matrix (e.g., all soil samples in one SDG, all water samples in another) at the discretion of the laboratory.

Sample Label -- An identification label attached to a sample bottle or container to identify the sample.

Sample Number -- A unique number used to identify and track a sample. This number can be recorded on a sample label or written on the sample bottle or container using indelible ink.

Sample Tag -- A tag attached to a sample that identifies the sample and maintains chain-of-custody.

Sampling Analysis Plan (SAP) -- A document that explains how samples are to be collected and analyzed for a particular sampling event.

Semivolatile Organic Analyte (SVOA) -- A compound amenable to analysis by extraction of the sample using an organic solvent.

Statement of Work (SOW) -- A document that specifies how laboratories analyze samples under a particular Contract Laboratory Program (CLP) analytical program.

Superfund -- The program operated under the legislative authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA) that funds and carries out USEPA removal and remedial activities at hazardous waste sites. These activities include establishing the National Priorities List (NPL), investigating sites for inclusion on the list, determining their priority, and conducting and/or supervising cleanup and other remedial actions.

Superfund Amendments and Reauthorization Act (SARA) -- The 1986 amendment to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Traffic Report/Chain of Custody (TR/COC) Record -- A record that is functionally similar to a packing slip that accompanies a shipment of goods. Used as physical evidence of sample custody and functions as a permanent record for each sample collected.

Trip Blank -- A sample used to check for contamination during sample handling and shipment from field to laboratory. Also see Field Blank.

Volatile Organic Analyte (VOA) -- A compound amenable to analysis by the purge-and-trap technique. Used synonymously with the term purgeable compound.

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APPENDIX B

SITE-SPECIFIC DATA QUALITY OBJECTIVES

APPENDIX B

SITE-SPECIFIC DATA QUALITY OBJECTIVES

DATA QUALITY OBJECTIVE NO. 1
JACKPILE-PAGUATE URANIUM MINE
MEDIA OF CONCERN: WASTE SOURCE SOILS

STEP 1. STATE THE PROBLEM	
Contaminated mine tailings may be present at the former Jackpile Mine representing a threat to human health and the environment.	
STEP 2. IDENTIFY THE DECISION	
Waste source soil samples will be collected from the mine area to (1) identify the source areas and areas of observed contamination (2) classify the source type (3) identify the contaminants of concern (COCs) associated with each source area or area of observed contamination (4) calculate the hazardous waste quantity for each source.	
IDENTIFY THE ALTERNATIVE ACTIONS THAT MAY BE TAKEN BASED ON THE DECISIONS.	• If COCs identified in waste soil samples are CERCLA hazardous substances as defined in CERCLA Sections 101(14) and 101(33), then an area of observed contamination has been established and COCs can contribute to Hazard Ranking System (HRS) evaluation. • If no COCs in the waste soil samples then an area of observed contamination has not been established and the soil represented by the samples will not require additional attention.
STEP 3. IDENTIFY INPUTS TO THE DECISION	
IDENTIFY THE INFORMATIONAL INPUTS NEEDED TO RESOLVE A DECISION.	• Review historical site operations contributing to contamination. • Contaminant concentrations in waste soil samples collected during sampling.
IDENTIFY THE SOURCES FOR EACH INFORMATIONAL INPUT AND LIST THE INPUTS THAT ARE OBTAINED THROUGH ENVIRONMENTAL MEASUREMENTS.	• Waste soil sample locations as shown in Figure 3-1. • Analytical results from alpha spec analysis of uranium ions by ASTM D3972 and total metals with mercury and cyanide by SW846 6010C/7471B and 9012B.
BASIS FOR THE CONTAMINANT SPECIFIC ACTION LEVELS.	Waste source soil samples will be used to determine and area of observed contamination and attribution to the surface water pathway (DQO No. 2)
IDENTIFY POTENTIAL SAMPLING TECHNIQUES AND APPROPRIATE ANALYTICAL METHODS.	• Alpha Spec of uranium ions by ASTM D3972 • Total Analyte List (TAL) Metals by SW-846 Method 6010C • Mercury by SW-846 Method 7471B • Total Cyanide by SW-846 Method 9012B
STEP 4. DEFINE THE BOUNDARIES OF THE STUDY	
DEFINE THE DOMAIN OR GEOGRAPHIC AREA WITHIN WHICH ALL DECISIONS MUST APPLY.	Soil at the three uranium mine pits and from waste areas located within Jackpile Mine.
SPECIFY THE CHARACTERISTICS THAT DEFINE THE POPULATION OF INTEREST.	Contaminant concentrations in waste soils samples.
DEFINE THE SCALE OF DECISION MAKING.	Results of waste soil samples will be used to determine and area of observed contamination and attribution to the site and surface water pathway including contribution to the HRS evaluation.
DETERMINE THE TIME FRAME TO WHICH THE DATA APPLY.	The data will apply until the waste soil represented by the sample receives appropriate response actions.

DATA QUALITY OBJECTIVE NO. 1
JACKPILE-PAGUATE URANIUM MINE
MEDIA OF CONCERN: WASTE SOURCE SOILS (continued)

STEP 4. DEFINE THE BOUNDARIES OF THE STUDY (Continued)	
DETERMINE WHEN TO COLLECT DATA.	Samples will be collected during the START-3 field effort and prior to HRS evaluation.
IDENTIFY PRACTICAL CONSTRAINTS ON DATA COLLECTION.	• Inclement weather. • Access not attainable.
STEP 5. DEVELOP A DECISION RULE	
SPECIFY THE PARAMETER THAT CHARACTERIZES THE POPULATION OF INTEREST.	Detection of COCs in the waste samples by analytical testing to confirm in CERCLA Sections 101(14) and 101(33) hazardous substances.
SPECIFY THE ACTION LEVEL FOR THE DECISION.	If the COCs identified in the waste soil samples are CERCLA hazardous substances as defined in CERCLA Sections 101(14) and 101(33), then an area of observed contamination has been established. If no COCs in the waste soil samples then an area of observed contamination has not been established and the soil represented by the samples will not require additional attention.
STEP 6. SPECIFY LIMITS ON DECISION ERRORS	
DEVELOP A DECISION RULE.	If waste soil sample is defined as a hazardous substance [CERCLA Sections 101(14) and 101(33)], then an area of observed contamination has been established.
DETERMINE THE POSSIBLE RANGE OF THE PARAMETER OF INTEREST.	Contaminant concentrations may range from 0 µg/mg to more than the contaminant specific action level.
DEFINE BOTH TYPES OF DECISION ERRORS AND IDENTIFY THE POTENTIAL CONSEQUENCES OF EACH.	Type I Error: Deciding that the specified area represented by the waste soil sample does not exceed the specified assessment level when, in truth, the waste soil concentration of the contaminant exceeds its specified assessment level. The consequence of this decision error is that contaminated waste soil will remain in place, possibly endangering human health and the environment. This decision error is more severe. Type II Error: Deciding that the specified area represented by the waste soil sample does exceed the specified assessment level when, in truth, it does not. The consequences of this decision error are that remediation of the waste soil will continue and unnecessary costs will be incurred.
ESTABLISH THE TRUE STATE OF NATURE FOR EACH DECISION RULE.	The true state of nature when the waste soil is decided to be below the specified assessment levels when in fact, it is not below the specified assessment levels, is that the waste soil does need remedial action. The true state of nature when the waste soil is decided to be above the specified assessment levels when in fact, it is not above the specified assessment levels, is that the waste soil does not need remedial action.

DATA QUALITY OBJECTIVE NO. 1
JACKPILE-PAGUATE URANIUM MINE
MEDIA OF CONCERN: WASTE SOURCE SOILS (continued)

STEP 6. SPECIFY LIMITS ON DECISION ERRORS (Continued)	
DEFINE THE TRUE STATE OF NATURE FOR THE MORE SEVERE DECISION ERROR AS THE BASELINE CONDITION OR THE NULL HYPOTHESIS (H_o) AND DEFINE THE TRUE STATE FOR THE LESS SEVERE DECISION ERROR AS THE ALTERNATIVE HYPOTHESIS (H_a).	Ho: The waste represented by the sample is above the specified action level. Ha: The waste represented by the sample is below the specified action level.
ASSIGN THE TERMS "FALSE POSITIVE" AND "FALSE NEGATIVE" TO THE PROPER DECISION ERRORS.	• False Positive Error = Type I • False Negative Error = Type II
ASSIGN PROBABILITY VALUES TO POINTS ABOVE AND BELOW THE ACTION LEVEL THAT REFLECT THE ACCEPTABLE PROBABILITY FOR THE OCCURRENCES OF DECISION ERRORS.	To be assigned based on discussions with EPA SAM.
STEP 7. OPTIMIZE THE DESIGN	
REVIEW THE DQOs.	Due to insufficient historical data, determination of the standard deviation was not possible. Therefore, sample size calculation using the traditional statistical formula may not be the optimal design. In order to select the optimal sampling program that satisfies the DQOs and is the most resource effective, other elements were considered.
DEVELOP GENERAL SAMPLING AND ANALYSIS DESIGN. A total of six waste source samples will be collected from the uranium mine pits and waste areas within the Jackpile Mine and analyzed to determine the presence of hazardous substances as defined by CERCLA, waste source characterization, and to show potential attribution to the pathways of concern used for HRS evaluation. The samples will be analyzed for Alpha Spec uranium ions, TAL metals, mercury and total cyanide.	

DATA QUALITY OBJECTIVE NO. 2
JACKPILE-PAGUATE URANIUM MINE
MEDIA OF CONCERN: SURFACE WATER AND/OR SEDIMENT

STEP 1. STATE THE PROBLEM	
Are surface water/sediment samples collected from the surface water pathway above three times the maximum background concentrations resulting in an observed release?	
STEP 2. IDENTIFY THE DECISION	
Are the concentrations of chemicals of concern in surface water/sediment, represented by a sample, above three times the maximum background concentrations?	
IDENTIFY THE ALTERNATIVE ACTIONS THAT MAY BE TAKEN BASED ON THE DECISIONS.	• If any contaminant exceeds three times the background concentrations in the surface water/sediment, the surface water/sediment represented by that sample will be considered contaminated and will require additional attention. • If no contaminants exceed three times the background concentrations in the surface water/sediment, the surface water/sediment represented by that sample will not require additional attention.
STEP 3. IDENTIFY INPUTS TO THE DECISION	
IDENTIFY THE INFORMATIONAL INPUTS NEEDED TO RESOLVE A DECISION.	• Contaminant concentrations in surface water/sediment samples collected from the surface water pathway (Figure 3-1).
IDENTIFY THE SOURCES FOR EACH INFORMATIONAL INPUT AND LIST THE INPUTS THAT ARE OBTAINED THROUGH ENVIRONMENTAL MEASUREMENTS.	• Surface water/Sediment samples from the surface water pathway. • Analytical results from analysis of isotopic uranium by ASTM 3972-90M, total metals including mercury by SW846 6010B/7470/7471 and cyanide and 9014.
BASIS FOR THE CONTAMINANT SPECIFIC ACTION LEVELS.	The site specific screening levels will be three times the maximum background concentrations.
IDENTIFY POTENTIAL SAMPLING TECHNIQUES AND APPROPRIATE ANALYTICAL METHODS.	• Grab surface water/sediment samples from the surface water pathway analyzed for: • Isotopic Uranium by ASTM 3972-90M • Total Metals including mercury by SW-846 Method 6010B/7470/7471. • Total Cyanide by SW-846 Method 9014
STEP 4. DEFINE THE BOUNDARIES OF THE STUDY	
DEFINE THE DOMAIN OR GEOGRAPHIC AREA WITHIN WHICH ALL DECISIONS MUST APPLY.	The boundaries for the Jackpile-Paguate Uranium Mine site are shown along with the proposed surface water/sediment sample locations in Figure 3-1.
SPECIFY THE CHARACTERISTICS THAT DEFINE THE POPULATION OF INTEREST.	Contaminant concentrations in surface water/sediments at the sample locations.
DEFINE THE SCALE OF DECISION MAKING.	The scale of decision will be for the site activities occurring at the time of the sample collection.
DETERMINE THE TIME FRAME TO WHICH THE DATA APPLY.	The analytical data will apply until the surface water/sediment represented by the sample receives appropriate response action.

DATA QUALITY OBJECTIVE NO. 2
JACKPILE-PAGUATE URANIUM MINE
MEDIA OF CONCERN: SURFACE WATER AND/OR SEDIMENT (continued)

STEP 4. DEFINE THE BOUNDARIES OF THE STUDY (Continued)	
DETERMINE WHEN TO COLLECT DATA.	Surface water/sediment samples will be collected during the field sampling activities.
IDENTIFY PRACTICAL CONSTRAINTS ON DATA COLLECTION.	• Inclement weather. • Access not attainable.
STEP 5. DEVELOP A DECISION RULE	
SPECIFY THE PARAMETER THAT CHARACTERIZES THE POPULATION OF INTEREST.	The sample concentrations at each sample location will be compared to three times the maximum background concentrations.
SPECIFY THE ACTION LEVEL FOR THE DECISION.	The site specific screening levels will be three times the maximum background concentrations.
DEVELOP A DECISION RULE.	If any result in a surface water/sediment sample is above three times the maximum background concentrations, then the surface water/sediment represented by that sample will require additional attention, otherwise the surface water/sediment does not require additional attention. Additional attention means more sampling, surface water/sediment collection and treatment, or other action deemed necessary by EPA.
STEP 6. SPECIFY LIMITS ON DECISION ERRORS	
DETERMINE THE POSSIBLE RANGE OF THE PARAMETER OF INTEREST.	Contaminant concentrations may range from 0 mg/kg for surface water/sediment to more than three times the maximum background concentrations.
DEFINE BOTH TYPES OF DECISION ERRORS AND IDENTIFY THE POTENTIAL CONSEQUENCES OF EACH.	Type I Error: Deciding that the specified area represented by the surface water/sediment sample does not exceed three times the maximum background concentrations when, in truth, the surface water/sediment concentration of the contaminant exceeds three times the maximum background concentrations. The consequence of this decision error is that contaminated surface water/sediment will remain in place, possibly endangering human health and the environment. This decision error is more severe. Type II Error: Deciding that the specified area represented by the surface water/sediment sample does exceed three times the maximum background concentrations when, in truth, it does not. The consequences of this decision error are that remediation of the surface water/sediment will continue and unnecessary costs will be incurred.

DATA QUALITY OBJECTIVE NO. 2
JACKPILE-PAGUATE URANIUM MINE
MEDIA OF CONCERN: SURFACE WATER AND/OR SEDIMENT (continued)

STEP 6. SPECIFY LIMITS ON DECISION ERRORS (Continued)	
ESTABLISH THE TRUE STATE OF NATURE FOR EACH DECISION RULE.	The true state of nature when the surface water/sediment is decided to be below three times the maximum background concentrations when in fact, it is not below three times the maximum background concentrations, is that the surface water/sediment does need remedial action. The true state of nature when the surface water/sediment is decided to be above three times the maximum background concentrations when in fact, it is not above three times the maximum background concentrations, is that the surface water/sediment does not need remedial action.
DEFINE THE TRUE STATE OF NATURE FOR THE MORE SEVERE DECISION ERROR AS THE BASELINE CONDITION OR THE NULL HYPOTHESIS (H_o) AND DEFINE THE TRUE STATE FOR THE LESS SEVERE DECISION ERROR AS THE ALTERNATIVE HYPOTHESIS (H_a).	Ho: The surface water/sediment represented by the sample is above three times the maximum background concentrations. Ha: The surface water/sediment represented by the sample is below three times the maximum background concentrations.
ASSIGN THE TERMS "FALSE POSITIVE" AND "FALSE NEGATIVE" TO THE PROPER DECISION ERRORS.	• False Positive Error = Type I • False Negative Error = Type II
ASSIGN PROBABILITY VALUES TO POINTS ABOVE AND BELOW THE ACTION LEVEL THAT REFLECT THE ACCEPTABLE PROBABILITY FOR THE OCCURRENCES OF DECISION ERRORS.	The assignment of probability values is not applicable to these DQOs because a nonprobablistic (judgment-based) process has been specified.
STEP 7. OPTIMIZE THE DESIGN	
REVIEW THE DQOs.	Surface water/sediment sample locations were selected based on the location of on-site waste source areas and proximity of the probable point of entry (PPEs) along the surface water pathway.
DEVELOP GENERAL SAMPLING AND ANALYSIS DESIGN. A total of 15 surface water and 24 sediment samples (including duplicates) will be collected from 21 locations along the surface water pathway. The samples will be analyzed for isotopic uranium, total metals, mercury and total cyanide.	

APPENDIX C

WESTON STANDARD OPERATING PROCEDURES

APPENDIX C

WESTON STANDARD OPERATING PROCEDURES

INTRODUCTION

The following Standard Operating Procedure (SOP) is to describe the procedures for collecting representative soil samples. Analysis of soil samples may determine whether concentrations of specific soil pollutants exceed established action levels, or if the concentrations of soil pollutants present a risk to public health, welfare, or the environment. This SOP is similar to SOP Number 1001.03 for collecting near surface soil samples with a hand auger.

PROCEDURE

Surface soil samples may be collected using a variety of methods and equipment. The methods and equipment used are dependent on the depth of the desired sample, the type of sample required (disturbed versus undisturbed), and the type of soil. Near-surface soils may be easily sampled using a spade, trowel, or hand scoop.

Sample Preservation

Cooling to 4°C ± 2°C, supplemented by a minimal holding time, is suggested.

Interferences and Potential Problems

There are two primary interferences or potential problems associated with soil sampling: cross-contamination of samples and improper sample collection. Cross-contamination problems can be eliminated or minimized through the use of dedicated (disposable) sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results. Homogenization may also affect sample representativeness where the analytical requirements include volatile organic compounds.

Equipment or Apparatus

The equipment used for sampling may be selected from the following list, as appropriate:

- Tape measure
- Survey stakes or flags
- Stainless steel, plastic, or other appropriate homogenization bucket or bowl
- Ziploc plastic bags
- Logbook
- Labels
- Chain-of-custody forms and seals
- Coolers
- Ice
- Decontamination supplies and equipment
- Canvas or plastic sheet
- Spatulas/spades/shovels
- Scoops

- Plastic or stainless steel spoons
- Trowel

Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and what equipment and supplies are required.
2. Obtain necessary sampling and monitoring equipment from the list above.
3. Prepare schedules, and coordinate with staff, client, and regulatory agencies, if appropriate.
4. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
5. Decontaminate or preclean equipment, and ensure that it is in working order.
6. Use stakes, buoys, or flagging to identify and mark all sampling locations. Consider specific site factors, including extent and nature of contaminant, when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations will be utility-cleared by the property owner or other responsible party prior to soil sampling.
7. Evaluate safety concerns associated with sampling that may require use of personal protective equipment and/or air monitoring.

Surface Soil Sample Collection

Collect samples from the near-surface soil with tools such as spades, shovels, and scoops. Surface material can be removed to the required depth with this equipment, then a stainless steel or plastic scoop can be used to collect the sample. The use of a flat, pointed mason trowel to cut a block of the desired soil can be helpful when undisturbed profiles are required. A stainless steel scoop, lab spoon, or plastic spoon will suffice in most other applications. Avoid the use of devices plated with chrome or other target analyte materials.

The following procedures should be followed when collecting surface soil samples:

1. Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.
2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.
3. If volatile organic analysis is to be performed, transfer a portion of the sample directly into an appropriate, labeled sample container(s) with a stainless steel lab spoon, plastic lab spoon, or equivalent and secure the cap(s) tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into an appropriate, labeled container(s) and secure the cap(s) tightly; or if composite samples are to be collected, place a sample from another sampling interval into the

homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled container(s) and secure the cap(s) tightly.

4. Fill hole created through sampling with unused material or other appropriate backfill material (sand).
5. Record applicable information into field log book or appropriate forms as documentation of sampling.

SOP	**1001.04**				
GROUP	Sampling Procedures				
SUB-GROUP	Soil Sampling Prodedures				
TITLE	Sampling of Stockpiled Soil				
DATE	11/19/2001	**FILE**	1001-04.DOC	**PAGE**	1 of 1

INTRODUCTION

The following Standard Operating Procedure (SOP) describes the procedure for collecting representative samples of stockpiled soil. Representative soil samples may be collected for analysis to determine whether concentrations of specific soil pollutants exceed established action levels, or if the concentrations of soil pollutants present a risk to public health and welfare, or the environment. Soil samples are also typically collected from stockpiles for classification prior to entry into a soil treatment process or offsite disposal, or after treatment to verify the effectiveness of the treatment system. This soil sampling procedure is closely related to SOP Nos. 1001.01, 1001.03, and 1001.10 regarding soil sampling procedures.

PROCEDURE

Stockpiles will be sampled as follows:

- Soil may be collected from the surface of a stockpile using the surface soil sampling procedure (SOP 1001.01) or from deeper within the stockpile according to the hand augering procedure (SOP 1001.03) as appropriate to obtain the required soil material. The procedure to be used to physically collect soil samples from stockpiles are described in SOP Nos. 1001.01, 1001.03, and 1001.10 (soil compositing). Reference should be made to these SOPs for specific sampling equipment, procedures, and other general guidelines. Equipment that may be used as part of the soil compositing procedure is identified under SOP Nos. 1001.01 and 1001.03 where general soil sampling methods are described.

- Each project may have different stockpile sampling objectives and requirements. Therefore, the sampling of stockpiles should be addressed in a site-specific Sampling and Analysis Plan and the soil sampling implemented in accordance with this plan.

- Samples may be collected from discrete locations in a pile and submitted for laboratory analysis, as described in SOP Nos. 1001.01 and 1001.03. More typical is that several samples from a single stockpile will be collected and composited to prepare a single sample for laboratory analysis. Collecting composite samples from a stockpile is recommended and will generally be performed to better characterize the soil in the pile. The number of samples to collected from a stockpile and composite will depend on the size of the stockpile and the particular requirements of the project. Typically compositing for characterization purposes is on the order of 1 composite soil sample for every 50 cubic yards. Compositing will be performed in accordance with SOP 1001.10.

REFERENCES

SOP No. 1001.01 - Standard Operating Procedure, Surface Soil Sampling
SOP No. 1001.03 - Standard Operating Procedure, Shallow Subsurface and Near Surface Soil Sampling
SOP No. 1001.10 - Standard Operating Procedure, Soil Compositing

SOP	**1001.10**				
GROUP	Soil Sampling Procedures				
SUB-GROUP					
TITLE	Soil Compositing				
DATE	2/23/2010	**FILE**	1001-10.DOC	**PAGE**	1 of 2

INTRODUCTION

The following Standard Operating Procedure (SOP) describes the procedure for compositing soil samples. Soil samples are typically collected for laboratory analysis, and sometimes it is necessary to composite (mix together) samples from several locations for one combined analysis at the laboratory. This soil sampling procedure is closely related to SOP Nos. 1001.01, 1001.03, and 1001.10 regarding soil sampling procedures. This procedure serves as an alternative method of sample preparation prior to placing the samples in containers, as described in the other named SOPs.

PROCEDURE

Equipment

Equipment that may be used as part of the soil compositing procedure is identified under SOP Nos. 1001.01 and 1001.03 where soil sampling methods are described. Specific equipment typically used during the compositing process after discrete samples are collected includes:

- Mixing bowls or buckets
- Scoops, spatulas, and knives
- Sample containers
- Personal protection clothing
- Plastic Sheeting
- Decontamination equipment and supplies

Method

The procedure to be used to physically collect soil samples are described in SOP Nos. 1001.01 and 1001.03. Reference should be made to these SOPs for specific sampling equipment, procedures, and other general guidelines. As soil samples are collected, the site-specific Sampling and Analysis Plan may required compositing (mixing together) of two or more samples to create a single sample that will be sent to the laboratory for analysis. When this is the case, the following compositing procedure will generally be used:

- The soil will be collected in general accordance with SOP 1001.01 or 1001.03, with the exception that samples from discrete locations will generally not be immediately placed into sample containers and an additional preparation step (i.e., compositing) will be performed.

- As they are collected, soil samples selected for compositing will be staged in a clean mixing bowl or mixing bucket until each sample to be included in the composite sample is obtained. Depending on site requirements and analytical procedures to be requested, it may be necessary to temporarily stage individual discrete-location samples within clean sample jars, aluminum foil, or other appropriate materials for the project. The method for sample staging should be specified in the site-specific sampling and analysis plan.

- For composite samples that will be analyzed for volatile organic compounds, an equal portion of soil will be removed directly from each discrete-location sample and placed into a final sample jar without homogenizing the soil.

- For analyses other than volatile organics, equal portions of soil will be removed from each discrete-location sample and placed in a clean mixing bowl. The equal portions of the samples will then be broken up and homogenized together using a scoop or spatula. Homogenization will generally continue until the discrete samples being combined are reasonably indistinquishable as indivual individual samples in the soil mixture. However, it is recognized that homogenization can be difficult for highly plastic clays. In this case, equal amounts of the the soil core of each clay sample will be cut into small, roughly cubical pieces using a stainless steel knife, and an equal numbers of pieces of each discrete sample will be placed into the bowl and homogenized to extent practical.

- The composited soil sample will be collected from the mixing bowl containing the individual homogenized samples after homogenization is performed. The composited sample will be collected using a stainless steel or disposable plastic scoop or similar tool. The sample will be placed in a clean sample container and then handled in accordance with soil sampling SOPs 1001.01 and 1001.03.

Variations on this procedure are allowable to accomodate different soil conditions and any site requirements specifically identified in the site-specific Sampling and Analysis Plan.

The number of discrete samples that may be composited into a single sample typically ranges from two to six. The number of discrete samples that may be composited for the project in question will be specified in the site-specific Sampling and Analysis Plan.

REFERENCES

SOP No. 1001.01 - Standard Operating Procedure, Surface Soil Sampling
SOP No. 1001.03 - Standard Operating Procedure, Shallow Subsurface and Near Surface Soil Sampling

SOP	**1002.01**				
GROUP	Sampling Procedures				
SUB-GROUP	Surface Water				
TITLE	Surface Water Sampling				
DATE	11/19/2001	**FILE**	1002-01.DOC	**PAGE**	1 of 3

INTRODUCTION

The following Standard Operating Procedure (SOP) is to describe the procedures for collecting representative surface water samples. Analysis of surface samples may determine whether concentrations of specific soil pollutants exceed established action levels, or if the concentrations of pollutants present a risk to public health, welfare, or the environment.

PROCEDURE

Surface water samples may be collected using a variety of methods and equipment. The methods and equipment used are usually dependent on the location of the body of water being sampled. Sampling can be performed by merely submerging the sample container, a weighted-bottle sampler with stopper, a bailer, or by pump assisted methods. Several types of pumps can be used for sampling depending on the objectives of sampling and the site conditions.

Sample Preservation

Samples are to be preserved in conformance with the site-specific Quality Assurance Project Plan, Sampling and Analysis Plan or work plan. In general these requirements include refrigeration to 4°C, addition of appropriate additives (HCl, H_2SO_4, NaOH) to adjust and fix pH, and a defined maximum holding time. If a site-specific plan is not available, the analytical laboratory should be consulted for the appropriate preservation procedures.

Interferences and Potential Problems

There are two primary interferences or potential problems associated with surface water sampling: cross-contamination of samples and improper sample collection. Cross-contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, undue disturbance of the sample matrix, or improper sample location.

Equipment or Apparatus

- Ziploc plastic bags
- Logbook
- Labels
- Chain-of-custody forms and seals
- Coolers
- Ice
- Decontamination supplies and equipment
- Discharge tubing
- Sample containers
- Sampling devices

Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are required.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or preclean equipment, and ensure that it is in working order.
4. Prepare schedules, and coordinate with staff, client, and regulatory agencies, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.

Surface Water Sampling

Samples from shallow depths can be readily collected by merely submerging the sample container. In flowing surface water bodies, the container's mouth should be positioned so that it faces upstream, while the sampling personnel stand downstream so as not to stir up sediment that could potentially contaminate the sample.

Collecting a representative sample from a larger body of surface water requires that samples be collected near the shore unless boats are feasible and permitted. If boats are used, the body of water should be cross sectioned, and samples should be collected at various depths across the body of water in accordance with the specified sampling plan. For this type of sampling, a weighted-bottle sampler is used to collect samples at a predetermined depth. The sampler consists of a glass bottle, a weighted sinker, a bottle stopper, and a line that is used to open the bottle and to lower and raise the sampler during sampling. The procedure for use is as follows:

- Assemble the weighted bottle sampler.
- Gently lower the sampler to the desired depth so as not to remove the stopper prematurely.
- Pull out the stopper with a sharp jerk of the sampler line.
- Allow the bottle to fill completely, as evidenced by the cessation of air bubbles.
- Raise the sampler and cap the bottle.
- Wipe the bottle clean. The sampling bottle can be also be used as the sample container for shipping.

Teflon bailers have also been used where feasible for collecting samples in deep bodies of water.

Another method of extending the reach of sampling efforts is the use of a small peristaltic pump. In this method the sample is drawn through heavy-wall Teflon tubing and pumped directly into the sample container. This system allows the operator to reach into the liquid body, sample from depth, or sweep the width of narrow streams.

The general sampling procedures are listed below:

1. Collect the sample using whichever technique, submerged bottle, bottle sampler with stopper, pump & tubing, or bailer.

2. The collected sample may be collected in the sample containers or may be transferred to the appropriate sample containers in order of the volatile organics first and inorganics last.

3. Label sample containers, place on ice in a cooler, remove, and decontaminate equipment as necessary.

REFERENCES

SOP 0110.01 Sample Nomenclature
SOP 1005.01 Field Duplicate Collection
SOP 1005.02 Rinse Blank Preparation
SOP 1005.03 Field Blank Preparation
SOP 1101.01 Sample Custody - Field
SOP 1102.01 Sample Shipping
SOP 1201.01 Sampling Equipment Decontamination
SOP 1501.01 Field Logbook

INTRODUCTION

The following Standard Operating Procedure (SOP) is to describe the procedures for collecting representative sediment samples using a trowel, piston corer, WILDCO KB Core Sampler, a Ponar Grab Sampler, or other similar equipment. Analysis of sediment samples may be performed to determine whether concentrations of specific sediment pollutants exceed established action levels, or if the concentrations of sediment pollutants present a risk to public health, welfare, or the environment.

PROCEDURE

Overview

Sediment samples may be collected using trowels, core and Ponar sampler, or a variety of similar methods and equipment. The methods and equipment used are dependent on the depth of the desired sample, the type of sample required (disturbed versus undisturbed), and the type of sediment (fines versus coarse). Sampling in shallow areas or streams near the surface may only require a hand trowel, while sampling at depth may be performed using a core or Ponar sampler.

Sample Preservation

Refrigeration to 4° C $\pm$ 2° C, supplemented by a minimal holding time, is suggested.

Interferences and Potential Problems

There are two primary interferences or potential problems associated with sediment sampling: cross-contamination of samples and improper sample collection. Cross-contamination problems can be eliminated or minimized through the use of dedicated (disposable) sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in mixing of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results. Homogenization may also affect sample representativeness when the analytical requirements include volatile organic compounds.

Equipment or Apparatus

The equipment selected for the sampling effort may include the following as appropriate:

- Tape measure
- Survey stakes or flags
- Stainless steel, plastic, or other appropriate homogenization bucket or bowl
- Ziploc plastic bags
- Logbook
- Labels
- Chain-of-custody forms and seals
- Coolers
- Ice

- Decontamination supplies and equipment (i.e. brushes and buckets)
- Canvas or plastic sheeting
- Spatulas
- Scoops
- Plastic or stainless steel spoons
- Trowel
- Auger bucket
- Extension rods
- T-handle
- KB Core Sampler
- Ponar Grab Sampler
- Air monitor

Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are required.
2. Obtain necessary sampling and monitoring equipment from the list above. Additional equipment may be added to this list as appropriate to perform other sampling.
3. Decontaminate or preclean equipment, and ensure that it is in working order.
4. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
5. Use stakes, buoys, or flagging to identify and mark all sampling locations. Consider specific site factors, including extent and nature of contaminant, when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and obstructions.

Sediment Sampling in Shallow Waters

The following procedures should be used when collecting sediment samples in shallow waters:

1. Collect sediments as specified in the work plan or as determined during office preparation activities, using a stainless steel trowel, piston corer or similar device and a stainless steel, tempered glass or aluminum container.
2. Standing downstream of the sample stations, collect discrete sediment samples from each station and, if required in the work plan, composite in stainless steel, tempered glass or aluminum container.
3. Collect sediment samples of deposited material from the depth specified in the work plan or as determined during the office preparation activities. Record the depth in the logbook. Selective removal of the top sediment layers may be required and should be accomplished by carefully removing the sediments with a stainless steel trowel or scoop. In streams where water velocity is insufficient to disturb sediment fines during sediment sampling, a stainless

steel trowel or scoop may be used for sampling. Where water velocities are high, a stainless steel corer will be utilized.

4. When applicable, composite discrete sediment samples by placing equal volumes of sediment material collected from the sample points into the container and mixing thoroughly to obtain a homogeneous mixture. Samples may be sieved or hand picked, if necessary, to remove larger materials, such as leaves, sticks, gravel, or rocks. Record in the logbook the nature of any materials removed from the sediment samples.
5. Place each sediment sample into the proper clean, unused sample container, as required by the work plan or laboratory. Sampling personnel must avoid placing sediment into the sample container and decanting off the excess liquid in analyzing for volatile organics and water soluble compounds in the sediment and reduces accurate representation of sediment analysis.
6. Fill out labels with waterproof ink and attach to the sample container.
7. Decontaminate sampling equipment between samples.

Sediment Sampling in Deep Waters

Procedures for sampling in deep waters are the same as for shallow waters except the sampling equipment is different. Soft, fine-grained sediments collected in deep waters will be sampled with a WILDCO KB Core Sampler or similar equipment . Coarse-grained sediments will be collected utilizing a Ponar Grab Sampler or similar equipment. Both samplers will be operated from a boat following appropriate safety procedures. Documentation, containerization, labeling and decontamination procedures are the same as for sediment samples collected in shallow waters.

Sediment Sampling in Drainage Ditches and Intermittent Streams

Procedures for sediment sampling in drainage ditches and the dry portions of intermittent streams are as specified for shallow water sediments.

SOP	**1005.01**				
GROUP	Sampling Procedures				
SUB-GROUP	Field QA/QC Sampling				
TITLE	Field Duplicate Collection				
DATE	4/27/2005	**FILE**	1005-01.DOC	**PAGE**	1 of 2

INTRODUCTION

The following Standard Operating Procedure (SOP) describes the procedure for collecting field duplicate soil and water samples. When samples are collected for analysis, it is typically desired that independent data allowing evaluation of laboratory precision (i.e., the degree to which a laboratory result can be repeated) on site-specific samples be collected.

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The sample containers are assigned an identification number in the field such that they cannot be identified (blind duplicate) as duplicated samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field duplicate samples prior to the beginning of sample collection.

The duplicate soil sampling procedure is closely related to SOP Nos. 1001.01, 1001.03, and 1001.10 regarding soil sampling procedures. This procedure serves as an alternative method or extension of sample preparation prior to placing the samples in containers, as described in the 1001 series of the SOPs (e.g. 1001.01 and 1001.03).

DUPLICATE SOIL SAMPLING PROCEDURE

The procedure to be used to physically collect soil samples are described in SOP Nos. 1001.01 and 1001.03. Reference should be made to these SOPs for specific sampling equipment, procedures, and other general guidelines. As soil is collected, the following procedure will be used to prepare a field duplicate sample:

- The soil will be collected in general accordance with SOP 1001.01 or 1001.03, with the exception that samples will generally not be immediately placed into sample containers and an additional preparation step (i.e., sample splitting) will be performed.

- As they are collected, soil samples to be submitted as field duplicates will be staged in a clean mixing bowl or mixing bucket.

- For samples that will be analyzed for volatile organic compounds, the soil sample will be split in half and an equal portion of soil will be placed directly into two or more different sample containers, each container representing a different sample for laboratory analysis. The soil will not be homogenized to minimize the potential for volatilization of the organic compounds potentially in the sample.

- For analyses of chemicals other than volatile organic compounds, the soil removed from the discrete sample location will be homogenized in a clean mixing bowl using a clean scoop or spatula (as described in SOPs 1001.01 and 1001.03). Homogenization will generally continue until the discrete samples being combined are reasonably indistinguishable as individual samples in the soil mixture. However, it is recognized that homogenization can be difficult for highly plastic clays. In this case, equal amounts of the soil core of each clay sample will be cut into small, roughly cubical pieces using a stainless steel knife and placed into a bowl and homogenized to extent practical.

- The field duplicate sample (except for volatiles as note above) will be collected from the mixing bowl containing the homogenized samples after homogenization is performed. The composited sample will be collected using a stainless steel or disposable plastic scoop or similar tool. The sample will be placed in a clean sample container and then handled in accordance with soil sampling SOPs 1001.01 and 1001.03.

Another difference from the referenced SOPs is that additional soil volume may need to be collected from a discrete sample location during the sampling process to provide sufficient sample volume for two or more sets of laboratory analyses. If the collection of additional sample volume will result in the sample interval expanding to greater depths or laterally outward, the sampling tools identified in 1001 series of the SOPs can be used at two immediately vertically or laterally adjacent locations, as appropriate. If sampling from two adjacent but distinct locations is necessary to obtain adequate sample volume, the soil from the two locations should be composited in accordance with SOP 1001.10. Field duplicates of composited samples may also be performed using this SOP for field duplicate samples.

Variations on this procedure are allowable to accommodate different soil conditions and any site requirements specifically identified in the site-specific Sampling and Analysis Plan. Equipment that may be used as part of the soil compositing procedure is identified under SOP Nos. 1001.01 and 1001.03 where soil sampling methods are described.

DUPLICATE WATER SAMPLING PROCEDURES

The procedure to be used to physically collect water samples are described in 1002 series of the SOPs (e.g. 1002.01 and 1002.02). Reference should be made to these SOPs for specific sampling equipment, procedures, and other general guidelines. A duplicate water sample will be collected from the same location as the parent sample and within 15 minutes of the collection of the parent sample.

The number of samples that may be submitted as blind field duplicates for the project in question will be specified in the site-specific sampling plan. Blind field duplicates are typically collected at a frequency of 1 per 10 samples of a given environmental media at sites, especially where laboratory analytical data will be used for evaluating regulatory compliance and other engineering judgments. Sampling in support of a routine monitoring program may not require field duplicates. Reference should be made to the site-specific contract and work plans.

REFERENCES

SOP No. 1001.01 - Standard Operating Procedure, Surface Soil Sampling
SOP No. 1001.03 - Standard Operating Procedure, Soil Sampling - Hand Auger Method
SOP No. 1001.10 - Standard Operating Procedure, Soil Compositing

SOP	**1005.02**				
GROUP	Sampling Procedures				
SUB-GROUP	Field QA/QC Sampling				
TITLE	Rinse Blank Preparation				
DATE	2/6/2009	**FILE**	1005-02.DOC	**PAGE**	1 of 1

INTRODUCTION

The following Standard Operating Procedure (SOP) presents a method to prepare a type of quality control sample specific to the field decontamination process, the equipment rinse blank. The rinse blank provides information on the effectiveness of the decontamination process employed in the field. When used in conjunction with field blanks and trip blanks, the rinse blank can be used to assist in evaluating possible compromise of samples from field related activities.

PROCEDURE

The equipment rinse blank is prepared by passing target analyte-free (i.e., deionized) water over and through a field decontaminated sampling device, then collecting the rinse water in appropriate clean sample containers. Rinse blanks will typically be collected from equipment that comes in contact with samples, such as auger buckets, split spoons, bailers, shelby tubes, and stainless steel spoons/trowels. The collected sample will be coded appropriately prior to logging and shipping. Equipment blanks are not required if dedicated sampling equipment is used. Equipment blanks will be collected periodically during the day immediately after decontamination of the sampling equipment being used.

The frequency for collecting equipment blanks will be determined prior to engaging in field activities, and communicated in site-specific quality assurance project plans, sampling and analyses plans, or a type of work plan. Equipment blanks will be collected at a rate relative to each type of sample collection procedure (i.e., surface sample, sample at depth using a hand auger). Equipment blanks will generally be collected at a frequency of 1 per 20 (normal) samples of a given matrix.

SOP	**1101.01**				
GROUP	Sampling Handling				
SUB-GROUP	Sample Custody				
TITLE	Sample Custody in the Field				
DATE	**11/19/2001**	**FILE**	1101-01.DOC	**PAGE**	1 of 4

INTRODUCTION

The following Standard Operating Procedure (SOP) presents procedures for maintaining sample chain of custody (COC) during activities where samples are collected.

PROCEDURE

Sample custody is defined as being under a person's custody if any of the following conditions exist:

- it is in their possession,
- it is in their view, after being in their possession,
- it was in their possession and they locked it up, or
- it is in a designated secure area.

A designated field sampler will be personally responsible for the care and custody of collected samples until they are transferred to another person or properly dispatched to the laboratory. To the extent practicable, as few people as possible will handle the samples.

Sample tags or labels will be completed and applied to the container of each sample. When the tags or labels are being completed, waterproof ink will be used. If waterproof ink is not used, the tags or labels will be covered by transparent waterproof tape. Sample containers may also be placed in Ziploc-type storage bags to help keep them clean in the cooler. Information typically included on the sample tags or labels will include the following:

- Project Code
- Station Number and Location
- Sample Identification Number
- Date and Time of Sample Collection
- Type of Laboratory Analysis Required
- Preservation Required, if applicable
- Collector's Signature
- Priority (optional)
- Other Remarks

Additonal information may include:

- Anticipated Range of Results (Low, Medium, or High)
- Sample Analysis Priority

A COC form will be completed each time a sample or group of samples is prepared for transfer to the laboratory. The form will repeat the information on each of the sample labels and will serve as documentation of handling during shipment. The minimum information requirements of the COC form are listed in Table 1101.01-A. An example COC form is shown in Figure 1101.01-A. The completed COC must be reviewed by the Field Team Leader or Site Manager prior to sample shipment. The COC form will remain each sample shipping container at all times, and another copy will be retained by the member of the sampling team who originally relinquished the samples or in a project file.

TABLE 1101.01-A CHAIN OF CUSTODY FORM

INFORMATION	COMPLETED BY	DESCRIPTION
COC	Laboratory	enter a unique number for each chain of custody form
SHIP TO	Field Team	enter the laboratory name and address
CARRIER	Field Team	enter the name of the transporter (e.g., FedEx) or handcarried
AIRBILL	Field Team	enter the airbill number or transporter tracking number (if applicable)
PROJECT NAME	Field Team	enter the project name
SAMPLER NAME	Field Team	enter the name of the person collecting the samples
SAMPLER SIGNATURE	Field Team	signature of the person collecting the samples
SEND RESULTS TO	Field Team	enter the name and address of the prime contractor
FIELD SAMPLE ID	Field Team	enter the unique identifying number given to the field sample (includes MS, MSD, field duplicate and field blanks)
DATE	Field Team	enter the year and date the sample was collected in the format M/D (e.g., 6/3)
TIME	Field Team	enter the time the sample was collected in 24 hour format (e.g., 0900)
MATRIX	Field Team	enter the sample matrix (e.g., water, soil)
PRESERVATIVE	Field Team	enter the preservative used (e.g., HNO3) or "none"
FILTERED/ UNFILTERED	Field Team	enter "F" if the sample was filtered or "U" if the sample was not filtered
CONTAINERS	Field Team	enter the number of containers associated with the sample
MS/MSD	Field Team or Laboratory	enter "X" if the sample is designated for the MS/MSD
ANALYSES REQUESTED	Field Team	enter the method name of the analysis requested (e.g., SW6010A)
COMMENTS	Field Team	enter comments
SAMPLE CONDITION UPON RECEIPT AT LABORATORY	Laboratory	enter any problems with the condition of any sample(s)
COOLER TEMPERATURE	Laboratory	enter the internal temperature of the cooler, in degrees C, upon opening
SPECIAL INSTRUCTIONS/COMMENTS	Laboratory	enter any special instructions or comments
RELEASED BY (SIG)	Field Team and Laboratory	enter the signature of the person releasing custody of the samples
COMPANY NAME	Field Team and Laboratory	enter the company name employing the person releasing/receiving custody
RECEIVED BY (SIG)	Field Team and Laboratory	enter the signature of the person receiving custody of the samples
DATE	Field Team and Laboratory	enter the date in the format M/D/YY (e.g., 6/3/96) when the samples were released/received
TIME	Field Team and Laboratory	enter the date in 24 hour format (e.g., 0900) when the samples were released/received

FIGURE 1101.01-A CHAIN OF CUSTODY FORM

SOP	**1102.01**				
GROUP	Sample Handling				
SUB-GROUP	Sample Shipping				
TITLE	Sample Shipping				
DATE	11/19/2001	**FILE**	1102-01.DOC	**PAGE**	1 of 1

INTRODUCTION

The following Standard Operating Procedure (SOP) presents the procedures for sample shipping that will be implemented during field work involving sampling activities.

TERMS

COC - Chain-of-Custody

PROCEDURE

Prior to shipping or transferring custody of samples, they will be packed according to D.O.T. requirements with sufficient ice to maintain an internal temperature of 4°C ± 2°C during transport to the laboratory. Samples relinquished to the participating laboratories will be subject to the following procedures for transfer of custody and shipment:

1. Samples will be accompanied by a COC record. When transferring possession of samples, the individuals relinquishing and receiving the samples will sign, date, and note the time of the sample transfer on the record. If sent by common carrier, a bill of lading or airbill should be used. Bill of lading and airbill receipts will be retained in the project file as part of the permanent documentation of sample shipping and transfer. This custody record documents transfer of sample custody from the sampler to another person or to the laboratory. The designated laboratory will accept custody in the field upon sample pick-up or at the laboratory if the samples are delivered via field personnel or a courier service.
2. Samples will be properly packed in approved shipping containers for laboratory pick-up by the appropriate laboratory for analysis, with separate, signed custody records enclosed in each sample box or cooler. Sample shipping containers will be padlocked or custody-sealed for transfer to the laboratory. The preferred procedure includes use of a custody seal wrapped across filament tape that is wrapped around the package at least twice. The custody seal will then be folded over and stuck to itself so that the only access to the package is by cutting the filament tape or breaking the seal to unwrap the tape. The seal will then be signed. The designated laboratory will accept custody of the samples upon receipt.
3. Whenever samples are split with state representatives or other parties, the COC record will be marked to indicate with whom the samples were split.
4. The field sampler will call the designated laboratory to inform them of sample shipment and verify sample receipt as necessary.

INTRODUCTION

The following Standard Operating Procedure (SOP) presents the methods used for minimizing the potential for cross-contamination, and provides general guidelines for sampling equipment decontamination procedures.

PROCEDURE

As part of the Health and Safety Plan (HASP), develop and set up a decontamination plan before any personnel or equipment enter the areas of potential exposure. The decontamination plan should include the following:

- The number, location, and layout of decontamination stations
- Which decontamination apparatus is needed
- The appropriate decontamination methods
- Methods for disposal of contaminated clothing, apparatus, and solutions

Decontamination Methods

Personnel, samples, and equipment leaving the contaminated area of a site will be decontaminated. Various decontamination methods will be used to either physically remove contaminants, inactivate contaminants by disinfection or sterilization, or both. The physical decontamination techniques appropriate for equipment decontamination can be grouped into two categories: abrasive methods and non-abrasive methods.

Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing/scrubbing the surface containing the contaminant. This method includes mechanical and wet blasting methods.

Mechanical cleaning methods use brushes of metal or nylon. The amount and type of contaminants removed will vary with the hardness of bristles, length of brushing time, and degree of brush contact.

Cleaning can also be accomplished by water blasting which is also referred to as steam cleaning and pressure washing. Pressure washing utilizes high-pressure that is sprayed from a nozzle onto sampling equipment to physically remove soil or (potentially) contaminated material. Steam cleaning is a modification of pressure washing where the water is heated to temperatures approaching 100°C to assist in removing organic constituents from equipment.

Disinfection/Rinse Methods

Disinfectants are a practical means of inactivating chemicals or contaminants of concern. Standard sterilization methods involve heating the equipment which is impractical for large equipment. Rinsing removes contaminants through dilution, physical attraction, and solubilization.

The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be target analyte free. Tap water may be used from any municipal water treatment system for mixing of decontamination solutions. An untreated potable water supply is not an acceptable substitute for tap water. Acids and solvents are occasionally utilized in decontamination of equipment to remove metals and organics, respectively, from sampling equipment. Other than ethanol, these are avoided when possible due to the safety, disposal, and transportation concerns associated with them.

Equipment or apparatuses that may be selected for use include the following:

- Personal protective clothing
- Non-phosphate detergent
- Selected solvents for removal of polar and nonpolar organics (ethanol, methanol, hexane)
- Acid washes for removal of metals (nitric acid)
- Long-handled brushes
- Drop cloths or plastic sheeting
- Paper towels
- Galvanized tubs or buckets
- Distilled, deionized, or tap water (as required by the project)
- Storage containers for spent wash solutions
- Sprayers (pressurized and non-pressurized)
- Trash bags
- Safety glasses or splash shield

<u>Field Sampling Equipment Cleaning Procedures</u>

The following procedures should be followed:

1. Where applicable, follow physical removal procedures previously described (pressure wash, scrub wash)
2. Wash equipment with a non-phosphate detergent solution
3. Rinse with tap water
4. Rinse with distilled or deionized water
5. Rinse with 10% nitric acid if the sample will be analyzed for metals/organics
6. Rinse with distilled or deionized water
7. Use a solvent rinse (pesticide grade) if the sample will be analyzed for organics
8. Air dry the equipment completely
9. Rinse again with distilled or deionized water

10. Place in clean bag or container for storage/transport to subsequent sampling locations.

Selection of the solvent for use in the decontamination process is based on the contaminants present at the site. Solvent rinses are not necessarily required when organics are not a contaminant of concern and may be eliminated from the sequence specified below. Similarly, an acid rinse is not required if the analyses do not include inorganics. Use of a solvent is required when organic contamination is present on-site. Typical solvents used for removal of organic contaminants include acetone, ethanol, hexane, methanol, or water. An acid rinse step is required if metals are present on-site. If a particular contaminant fraction is not present at the site, the ten-step decontamination procedure listed above may be modified for site specificity.

Sampling equipment that requires the use of plastic tubing should be disassembled and the tubing replaced with clean tubing before commencement of sampling and between sampling locations. Plastic tubing should not be reused.

SOP	**1501.01**				
GROUP	Field Documentation				
SUB-GROUP					
TITLE	Field Logbook				
DATE	11/19/2001	**FILE**	1501-01.DOC	**PAGE**	1 of 3

INTRODUCTION

The following Standard Operating Procedure (SOP) presents the procedures for documenting activities observed or completed in the field in a field logbook. The documentation should represent all activities of WESTON personnel and entities under WESTON's supervision.

TERMS

FSP - Field Sampling Plan

SAP - Sampling and Analysis Plan

QAPP - Quality Assurance Project Plan

HASP - Health and Safety Plan

PROCEDURE

Field logbooks will be used and maintained during field activities to document pertinent information observed or completed by WESTON personnel or entities that WESTON is responsible for providing oversight. Field logbooks are legal documents that form the basis for later written reports and may serve as evidence in legal proceedings. The Site Manager or Field Team Leader will review field log entries daily and initial each page of entries. Field logbooks will be maintained by the Site Manager or Field Team Leader during field activities and transferred to the project files for a record of activities at the conclusion of the project. General logbook entry procedures are listed below.

- Logbooks must be permanently bound with all pages numbered to the end of the book. Entries should begin on page 1.
- Only use blue or black ink (waterproof) for logbook entries.
- Sign entries at the end of the day, or before someone else writes in the logbook.
- If a complete page is not used, draw a line diagonally across the blank portion of the page and initial and date the bottom line.
- If a line on the page is not completely filled, draw a horizontal line through the blank portion.
- Ensure that the logbook clearly shows the sequence of the day's events.
- Do not write in the margins or between written lines, and do not leave blank pages to fill in later.
- If an error is made, make corrections by drawing a single line through the error and initialing it.
- Maintain control of the logbook and keep in a secure location.

Field logbooks will contain, at a minimum, the following information, if applicable:

General Information

- Name, location of site, and work order number
- Name of the Site Manager or Field Team Leader
- Names and responsibilities of all field team members using the logbook (or involved with activities for which entries are being made)
- Weather conditions
- Field observations
- Names of any site visitors including entities that they represent

Sample Collection Activities

- Date(s) and times of the sample collection or event.
- Number and types of collected samples.
- Sample location with an emphasis on any changes to documentation in governing documents (i.e., SAP, FSP). This may include measurements from reference points or sketches of sample locations with respect to local features.
- Sample identification numbers, including any applicable cross-references to split samples or samples collected by another entity.
- A description of sampling methodology, or reference to any governing document (i.e., FSP, SAP, QAPP).
- Summary of equipment preparation and decontamination procedures.
- Sample description including depth, color, texture, moisture content, and evidence of waste material or staining.
- Air monitoring (field screening) results.
- Types of laboratory analyses requested.

Site Health and Safety Activities

- All safety, accident, and/or incident reports.

- Real-time personnel air monitoring results, if applicable, or if not documented in the HASP.
- Heat/cold stress monitoring data, if applicable.
- Reasons for upgrades or downgrades in personal protective equipment.
- Health and safety inspections, checklists (drilling safety guide), meetings/briefings.
- Calibration records for field instruments.

Oversight Activities

- Progress and activities performed by contractors including operating times.
- Deviations of contractor activities with respect to project governing documents (i.e., specifications).
- Contractor sampling results and disposition of contingent soil materials/stockpiles.
- Excavation specifications and locations of contractor confirmation samples.
- General site housekeeping and safety issues by site contractors.

SOP	**1502.01**				
GROUP	Field Documentation				
SUB-GROUP					
TITLE	Photograph Logs				
DATE	11/19/2001	**FILE**	1502-01.DOC	**PAGE**	1 of 1

INTRODUCTION

The following Standard Operating Procedure (SOP) presents the requirements for collecting information related to photodocumentation of site activities.

PROCEDURE

- Uniquely number each roll of film obtained for use.
- Record the following information for each negative exposed:
    1. Date and Time
    2. Photographer Name
    3. Witness Name
    4. Orientation (Landscape, Portrait, or Panaoramic)
    5. Description (including activity being performed, specific equipment of interest, sample location(s), compass direction photographer is facing)
- Record "NA" for the negatives not used if the roll is not completely used prior to development.
- Record unique roll number on receipt when film is submitted for development.
- Verify descriptions on log with negative numbers when photographs are received from processing.

FORMS

Blank Photograph Logs can be printed from WESTON On-Line from the *Records Management Application.* Selecting the *Reports/Project Planning/Blank Photo Logs* menu option will generate a project specific log with 36 entries.

SOP	**0110.01**				
GROUP	Database Management System				
SUB-GROUP	Data Collection and Acquisition				
TITLE	Sample Nomenclature				
DATE	02/26/2009	**FILE**	0110-20060227.DOC	**PAGE**	1 of 2

INTRODUCTION

The following Standard Operating Procedure (SOP) presents the sample nomenclature for analytical samples that will generate unique sample names compatible with most data management systems. The sample nomenclature is based upon specific requirements for the reporting of these results. A site specific data management plan should be prepared prior to sample collection.

PROCEDURE

SAMPLE NOMENCLATURE – SOIL AND SEDIMENT

Area of Concern – ID – Depth - Collection Type + QC Type

Where:

Area of Concern: A four-digit identifier used to designate the particular Area of Concern (AOC) that the location where the sample was collected.

ID: A three-digit identifier used to designate the particular location in the AOC from which the sample was collected or the center of the composite sample.

Depth: A two-digit code used to designate what depth of sample was collected:

03	0 to 3 inches
06	3 to 6 inches
12	6 to 12 inches

Collection Type: A one-digit code used to designate what type of sample was collected:

1	Surface Water
2	Ground Water
3	Leachate
4	Field QC/water sample
5	Soil/Sediment

6	Oil
7	Waste
8	Other
9	Drinking Water

QC Type: A one-digit code used to designate the QC type of the sample:

1	Normal
2	Duplicate
3	Rinsate Blank
4	Trip Blank
5	Field Blank
6	Confirmation

Examples:

- ***2054-055-06-51:*** Represents the normal soil sample collected from AOC 2054 at location 055 from 3 to 6 inches of depth.
- ***2054-055-06-52***: Represents the duplicate soil sample collected from AOC 2054 at location 055 from 3 to 6 inches of depth.
- ***2054-055-06-43***: Represents the rinsate water sample collected after the last sample of the day if last sample was collected from AOC 2054 at location 055 from 3 to 6 inches of depth.

SAMPLE NOMENCLATURE – WATER (from fixed station or location to be sampled more than once)

WELL OR STATION – YYYYMMDD - Collection Type + QC Type

Where:

Well or Station: For Wells and boreholes always assume there will be 10 or more so Monitoring Well 1 becomes designated MW01 or MW-01. If it is anticipated that there will be over 100 wells designate Monitoring Well 1 as MW001 or MW-001.

YYYYMMDD: A four-digit year + two-digit month + two-digit day

Collection Type: A one-digit code used to designate what type of sample was collected and are shown on page 1.

QC Type: A one-digit code used to designate the QC type of the sample and are shown on page 1.

Examples:

- ***MW01-20090226-21:*** Represents the normal groundwater sample collected from Monitoring Well 1 on 26 February 2009.
- ***MW01-20090226-44:*** Represents the trip blank in the same ice chest as the groundwater sample in the previous collected from Monitor Well 1 on 02/26/2009. All trip blanks must have a sample ID and they must be unique and on the Chain-of -Custody.
- ***2054-000-00-43:*** Represents the rinsate sample from AOC 2054

APPENDIX D

LABORATORY ANALYTE LIST AND REPORTING LIMITS

APPENDIX D

LABORATORY ANALYTE LIST AND REPORTING LIMITS

DACS Report

Matrix **LIQUID**

Analytical Method **SW6010**

Extraction Method **SW3005**

Instrument **ICPTrace**

MDL Exp Date	MDL Active Date
6/8/2010	6/8/2009

Nickname ***TAL6010*** *Program Specification* ***PAI_Standard***

Analyte	Test Type	LCS Limts	MS Limits	Surrogate Limits	RPD	RL	MDL
ALUMINUM	TA	80-120	80-120		20	200.0	8.59
ANTIMONY	TA	80-120	80-120		20	20.0	4.84
ARSENIC	TA	80-120	80-120		20	10.0	2
BARIUM	TA	80-120	80-120		20	100.0	0.0689
BERYLLIUM	TA	80-120	80-120		20	5.0	0.0484
CADMIUM	TA	80-120	80-120		20	5.0	0.288
CALCIUM	TA	80-120	80-120		20	1000.0	13.6
CHROMIUM	TA	80-120	80-120		20	10.0	0.39
COBALT	TA	80-120	80-120		20	10.0	0.778
COPPER	TA	80-120	80-120		20	10.0	0.657
IRON	TA	80-120	80-120		20	100.0	15.1
LEAD	TA	80-120	80-120		20	3.0	1.11
MAGNESIUM	TA	80-120	80-120		20	1000.0	5
MANGANESE	TA	80-120	80-120		20	10.0	0.232
NICKEL	TA	80-120	80-120		20	20.0	0.672
POTASSIUM	TA	80-120	80-120		20	1000.0	54.5
SELENIUM	TA	80-120	80-120		20	5.0	4.44
SILVER	TA	80-120	80-120		20	10.0	0.557
SODIUM	TA	80-120	80-120		20	1000.0	8.13
THALLIUM	TA	80-120	80-120		20	10.0	3.06
VANADIUM	TA	80-120	80-120		20	10.0	0.299
ZINC	TA	80-120	80-120		20	20.0	3.92

Analytical Method **SW7470**

Extraction Method **METHOD**

Instrument **CETAC**

MDL Exp Date	MDL Active Date
11/30/2010	11/30/2009

Nickname ***HG7470*** *Program Specification* ***PAI_Standard***

Analyte	Test Type	LCS Limts	MS Limits	Surrogate Limits	RPD	RL	MDL
MERCURY	TA	80-120	80-120		20	0.2	0.0114

Matrix **LIQUID**

Analytical Method **SW9014**

Extraction Method **SW9010**

Instrument **Spec**

MDL Exp Date	MDL Active Date
3/5/2010	4/23/2009

Nickname ***9014CNT*** *Program Specification* ***PAI_Standard***

Analyte	Test Type	LCS Limts	MS Limits	Surrogate Limits	RPD	RL	MDL
CYANIDE, TOTAL	TA	85-115	75-125		20	10.0	3.63

Matrix **SOLID**

Analytical Method **SW6010**

Extraction Method **SW3050**

Instrument **ICPTrace**

MDL Exp Date	MDL Active Date
6/8/2010	6/8/2009

Nickname ***TAL6010*** *Program Specification* ***PAI_Standard***

Analyte	Test Type	LCS Limts	MS Limits	Surrogate Limits	RPD	RL	MDL
ALUMINUM	TA	80-120	80-120		20	20000.0	1240
ANTIMONY	TA	80-120	80-120		20	2000.0	281
ARSENIC	TA	80-120	80-120		20	1000.0	304
BARIUM	TA	80-120	80-120		20	10000.0	20.2
BERYLLIUM	TA	80-120	80-120		20	500.0	6.99
CADMIUM	TA	80-120	80-120		20	500.0	20.2
CALCIUM	TA	80-120	80-120		20	100000.0	1440
CHROMIUM	TA	80-120	80-120		20	1000.0	79.7
COBALT	TA	80-120	80-120		20	1000.0	40.3
COPPER	TA	80-120	80-120		20	1000.0	68.3
IRON	TA	80-120	80-120		20	10000.0	859
LEAD	TA	80-120	80-120		20	300.0	219
MAGNESIUM	TA	80-120	80-120		20	100000.0	1020
MANGANESE	TA	80-120	80-120		20	1000.0	23
NICKEL	TA	80-120	80-120		20	2000.0	90
POTASSIUM	TA	80-120	80-120		20	100000.0	6670
SELENIUM	TA	80-120	80-120		20	500.0	360
SILVER	TA	80-120	80-120		20	1000.0	54.4
SODIUM	TA	80-120	80-120		20	100000.0	1930
THALLIUM	TA	80-120	80-120		20	1000.0	466
VANADIUM	TA	80-120	80-120		20	1000.0	35.3
ZINC	TA	80-120	80-120		20	2000.0	160

Matrix **SOLID**

Analytical Method **SW7471**

Extraction Method **METHOD**

Instrument **CETAC**

MDL Exp Date	MDL Active Date
11/30/2010	11/30/2009

Nickname ***HG7471-0.05mg/kg*** *Program Specification* ***PAI_Standard***

Analyte	Test Type	LCS Limts	MS Limits	Surrogate Limits	RPD	RL	MDL
MERCURY	TA	80-120	80-120		20	50.0	0.388

Analytical Method **SW9014**

Extraction Method **SW9010**

Instrument **Spec**

MDL Exp Date	MDL Active Date
3/5/2010	4/23/2009

Nickname ***9014CNT*** *Program Specification* ***PAI_Standard***

Analyte	Test Type	LCS Limts	MS Limits	Surrogate Limits	RPD	RL	MDL
CYANIDE, TOTAL	TA	85-115	75-125		20	500.0	182

APPENDIX E

COPY OF START-3 TDD TO-0019-10-02-02

APPENDIX E

START-3 TDD No. TO-0019-10-02-02

EPA

U.S. EPA
Washington, DC 20460

START3
Technical Direction Document

Assessment/Inspection Activities
(CERCLA PIPELINE FUNDS - FOR SITE ASSESSMENT GROUP USE) (0019)
Weston Solutions, Inc.

TDD #: TO-0019-10-02-02
Contract: EP-W-06-042

! = required field

TDD Name:	Jackpile-Paguate Uranium Mine	! Period:	Base Period
! Purpose:	Work Assignment Initiation		
! Priority:	High	! Start Date:	02/04/2010
Overtime:	Yes	! Completion Date:	10/15/2010
! Funding Category:	Removal	Invoice Unit:	
! Project/Site Name:	Jackpile-Paguate Uranium Mine	WorkArea:	ASSESSMENT/INSPECTIONS ACTIVITIES
Project Address:	SR 279, Near Paguate, Laguna Pueblo	Activity:	Hazard Ranking System (HRS)-National Priorities List (NPL) Packages
County:	Cibola	Work Area Code:	2146657436
City, State:	Paguate, NM	Activity Code:	QB
Zip:		EMERGENCY CODE:	☐ KAT ☐ RIT
! SSID:	A6T3	FPN:	
CERCLIS:	NMN000607033	Performance Based:	No
Operable Unit:			

Authorized TDD Ceiling:	Cost/Fee	LOE (Hours)
Previous Action(s):	$0.00	0.0
This Action:	$50,000.00	0.0
New Total:	$50,000.00	0.0

Specific Elements

Description of Work:

All activities performed in support of this TDD shall be in accordance with the contract and TO PWS.
Conduct SI with HRS Package Preparation
Prepare QASP for SI Sampling for SI sampling to be conducted by March 1, 2010
Prepare HRS Package for Jackpile from Information collected during PA/Tribal Files and Sampling.
Prepare draft HRS Package by April 2, 2010
Complete Draft SI report by June 15, 2010
Finalize SI report by July 15, 2010
Address Comments received and work with NPL coordinator to address all issues prior to NPL listing for August 2010 schedule. Coordinate with SAM Brenda Cook.

Accounting and Appropriation Information

SFO: 22

Line	DCN	IFMS	Budget/ FY	Appropriation Code	Budget Org Code	Program Element	Object Class	Site Project	Cost Org Code	Amount
1	PLC018	XXX	09	T	6A00P	302DD2C	2505	A6T3QB00	C001	$36,700.00
2	PLC026	XXX	09	T	6A00P	302DD2C	2505	A6T3QB00	C001	$13,300.00

Funding Summary:	Funding

Funding Category

Previous:	$0.00	Removal
This Action:	$50,000.00	
Total:	$50,000.00	

Section

- Signed by Brenda Cook/R6/USEPA/US on 02/04/2010 03:41:55 PM, according to Cheng Wei Feng/start

: Brenda Cook **Date:** 02/04/2010

Project Officer Section - Signed by Cora Stanley/R6/USEPA/US on 02/05/2010 03:50:44 PM, according to C

Project Officer: Cora Stanley **Date:** 02/05/2010

Contracting Officer Section - Signed by Cora Stanley/R6/USEPA/US on 02/05/2010 03:50:44 PM, according

Contracting Officer: Cora Stanley **Date:** 02/05/2010

Contractor Section - Signed by Cecilia Shappee/start6/rfw-start/us on 02/08/2010 02:39:45 PM, accordir

● No
○ Yes

During the past three (3) calendar years has your company, or any of your employees that will be working at this site, previously performed work at this site /facility?

Contractor Contact: Cecilia Shappee **Date:** 02/08/2010

PROJECT NOTE

TO: Project File

SUBJECT: Jackpile-Paguate Uranium Mine
Paguate, Cibola County, New Mexico
CERCLIS ID No. NMN00607033

TASK DESCRIPTION: Calculating the Latitude and Longitude of the Site

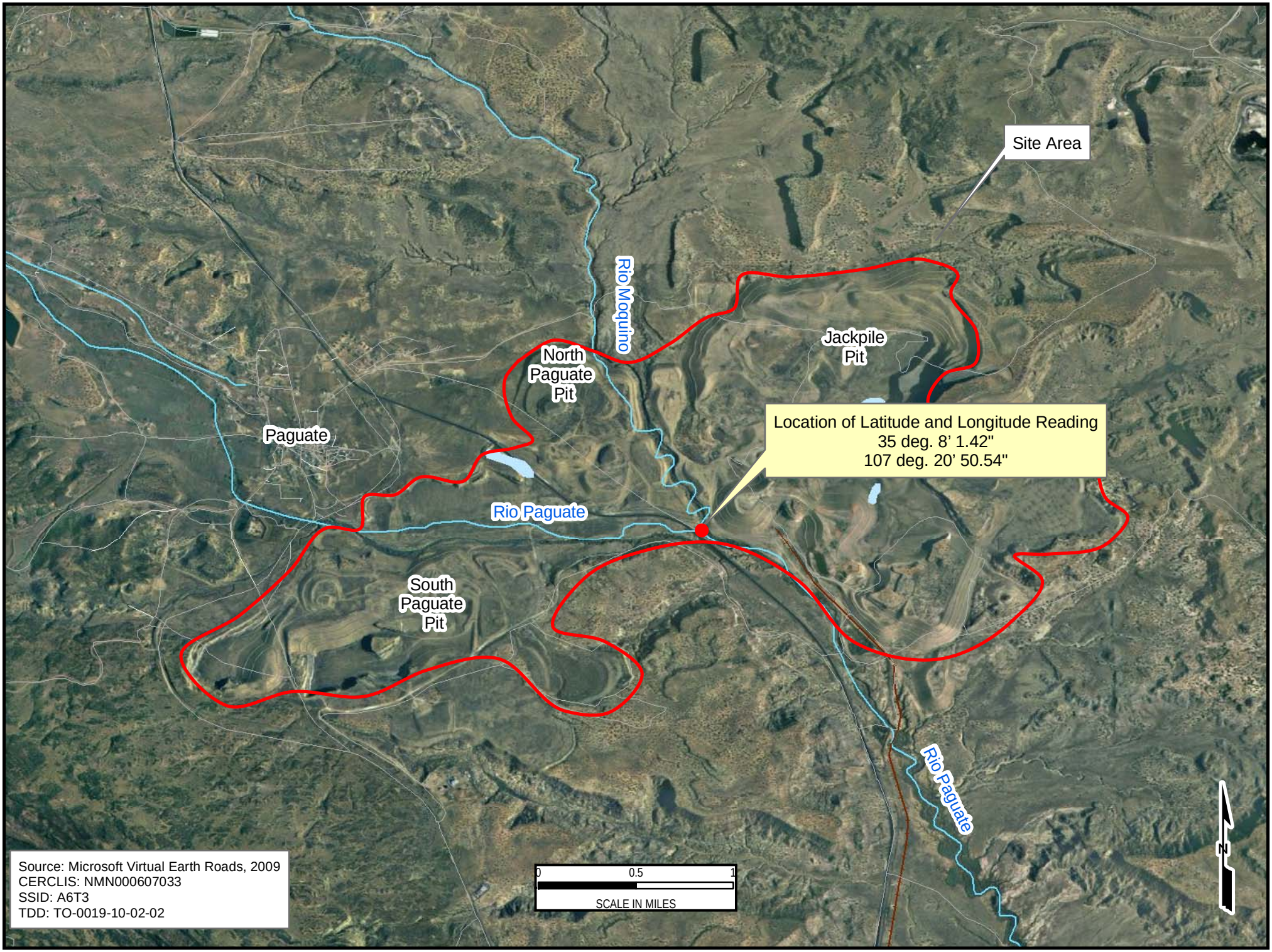
W.O. NO.: 20406.012.019.0514.01

DATE: June 24, 2010

PREPARED BY: Michelle Brown, Weston Solutions, Inc.

TITLE: Senior Project Leader

WESTON utilized the Environmental Systems Research Institute (ESRI) ArcView GIS software version 9.3.1 to calculate the Latitude and Longitude at the convergence of Rio Moquino and Rio Paguate, near the center of the Jackpile- Paguate Uranium Mine.


Site Area
Rio Moquino
Jackpile Pit
North Paguate Pit
Paguate
Location of Latitude and Longitude Reading
35 deg. 8' 1.42"
107 deg. 20' 50.54"
Rio Paguate
South Paguate Pit
Rio Paguate
Source: Microsoft Virtual Earth Roads, 2009
CERCLIS: NMN000607033
SSID: A6T3
TDD: TO-0019-10-02-02
0
0.5
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SCALE IN MILES
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EPA 530-R-94-032
NTIS PB94-2008987

TECHNICAL RESOURCE DOCUMENT

EXTRACTION AND BENEFICIATION OF ORES AND MINERALS

VOLUME 5

URANIUM

January 1995

U.S. Environmental Protection Agency
Office of Solid Waste
Special Waste Branch
401 M Street, SW
Washington, DC 20460

100001

DISCLAIMER AND ACKNOWLEDGEMENTS

This document was prepared by the U.S. Environmental Protection Agency (EPA). The mention of company or product names is not to be considered an endorsement by the U.S. Government or the EPA.

This Technical Resource Document was distributed for review to the U.S. Department of the Interior's Bureau of Mines, the Western Governors Association, the Interstate Mining Compact Commission, the American Mining Congress, and Public Interest Groups. EPA is grateful to all individuals who took the time to review sections of this Technical Resource Document.

Since this document was prepared, and prior to publication, EPA issued final regulations to correct and prevent contamination of groundwater beneath and in the vicinity of inactive uranium processing sites by uranium tailings (60 *Federal Register* 2854, January 11, 1995). These regulations have been included in Appendix C of this document.

The use of the terms "extraction," "beneficiation," and "mineral processing" in the Profile section of this document is not intended to classify any waste streams for the purposes of regulatory interpretation or application. Rather, these terms are used in the context of common industry terminology.

TABLE OF CONTENTS

Page

DISCLAIMER AND ACKNOWLEDGEMENTS i

1.0 MINING INDUSTRY PROFILE: URANIUM 1

1.1 INTRODUCTION 1
1.2 ECONOMIC CHARACTERIZATION OF THE URANIUM INDUSTRY 2
1.3 ORE CHARACTERIZATION 8
1.3.1 Chemical Characterization 8
1.3.2 Types of Uranium Deposits 8
1.3.2.1 Stratabound 10
1.3.2.2 Solution Breccia Pipes 11
1.3.2.3 Vein Deposits 13
1.3.2.4 Phosphatic 13
1.4 URANIUM MINING PRACTICES 14
1.4.1 Extraction 14
1.4.1.1 Open Pit Mining 16
1.4.1.2 Underground Mining 16
1.4.2 Beneficiation 17
1.4.2.1 Conventional Milling 19
1.4.2.2 Solution Mining 25
1.5 EXTRACTION AND BENEFICIATION WASTES AND MATERIALS ASSOCIATED WITH URANIUM MINING OPERATIONS 32
1.5.1 Extraction and Beneficiation Wastes and Materials 33
1.5.1.1 Waste Rock or Overburden 33
1.5.1.2 Mine Water 33
1.5.1.3 Tailings 34
1.5.1.4 Bleed Solution 35
1.5.1.5 Evaporation Pond Sludges 35
1.5.1.6 Drilling Wastes 36
1.5.1.7 Waste Ion Exchange Resins 36
1.5.1.8 Reverse Osmosis Brines 36
1.5.1.9 Acid/Alkaline Leaching, Solvent Extraction, Stripping and Precipitation Circuit Wastes and Materials 36
1.5.2 Waste and Materials Management 37
1.5.2.1 Overburden, Waste Rock, and Ore 37
1.5.2.2 Mine Pits and Underground Workings 37
1.5.2.3 Tailings Impoundments 38
1.5.2.4 Evaporation Ponds 38
1.5.2.5 Settling Ponds 38
1.5.2.6 Land Application Areas 39
1.5.2.7 Deep Disposal Wells 39
1.6 ENVIRONMENTAL EFFECTS 39
1.6.1 Introduction 39
1.6.2 Surface Water 40
1.6.2.1 Mine Dewatering 40
1.6.3 Ground Water 41

1.6.4 Air . . . 43
1.6.4.1 Radon . . . 43
1.6.4.2 Fugitive Dust . . . 43
1.6.4.3 Soils . . . 44
1.7 CURRENT REGULATORY FRAMEWORK . . . 44
1.7.1 Introduction . . . 44
1.7.2 Federal Regulatory Program . . . 45
1.7.2.1 The Uranium Millings Tailings Remediation Control Act . . . 45
1.7.2.2 Nuclear Regulatory Commission . . . 52
1.7.2.3 Department of Energy . . . 56
1.7.3 Clean Air Act . . . 57
1.7.4 Clean Water Act . . . 58
1.7.5 Safe Drinking Water Act . . . 61
1.7.5.1 Class I Nonhazardous Wells . . . 62
1.7.5.2 Class III Wells . . . 64
1.7.5.3 Class V Wells . . . 65
1.7.6 Selected State Regulatory Requirements . . . 65
1.7.6.1 Texas . . . 66
1.7.6.2 Wyoming . . . 68
1.8 REFERENCES . . . 70

APPENDICES

APPENDIX A NPL SUMMARIES RELATED TO URANIUM EXTRACTION AND BENEFICIATION

APPENDIX B ACRONYM LIST

APPENDIX C GROUNDWATER STANDARDS FOR REMEDIAL ACTIONS AT INACTIVE URANIUM PROCESSING SITES (60 FEDERAL REGISTER 2854, JANUARY 11, 1995)

LIST OF TABLES

Page

Table 1-1. Effluent Limitation Guidelines for Discharges from Mines and Mills in the "Uranium, Radium, and Vanadium Ores Subcategory" . . . 60

LIST OF FIGURES

Page

Figure 1-1. Domestic Raw Ore Production–1950 through 1991 . . . 3
Figure 1-2. Location of Active and Inactive Milling Operations in the U.S. as of 1991 . . . 5
Figure 1-3. Location of the Four Types of Uranium Deposits Found in the U.S. . . . 9
Figure 1-4. Raw Ore Production from Open Pit and Underground Uranium Mines–1950 to 1991 . . . 15
Figure 1-5. Schematic of a Conventional Mill . . . 18
Figure 1-6. Comparison of Acid and Alkaline Leaching Circuits . . . 21
Figure 1-7. Well-Field Patterns . . . 27

1.0 MINING INDUSTRY PROFILE: URANIUM

1.1 INTRODUCTION

This Industry Profile presents the results of U.S. Environmental Protection Agency (EPA) research into the domestic uranium mining industry and is one of a series of profiles of major mining industry sectors. Additional profiles describe other industry sectors, including gold, lead/zinc, copper, iron, and several industrial minerals. EPA prepared these profiles to enhance and update its understanding of the mining industry and to support mining program development by states. EPA believes the profiles represent current environmental management practices as described in the literature.

Each profile addresses extraction and beneficiation of ores. The scope of the Resource Conservation and Recovery Act (RCRA) as it applies to mining waste was amended in 1980 when Congress passed the Bevill Amendment, Section 3001(b)(3)(A). The Bevill Amendment states that "solid waste from the extraction, beneficiation, and processing of ores and minerals" is excluded from the definition of hazardous waste under Subtitle C of RCRA (40 CFR 261.4(b)(7)). The exemption was conditional upon EPA's completion of studies required by RCRA Section 8002(f) and (p) on the environmental and health consequences of the disposal and use of these wastes. EPA segregated extraction and beneficiation wastes from processing wastes. EPA submitted the initial results of these studies in the 1985 *Report to Congress: Wastes from the Extraction and Beneficiation of Metallic Ores, Phosphate Rock, Asbestos, Overburden From Uranium Mining, and Oil Shale* (U.S. EPA 1985). In July 1986, EPA made a regulatory determination that regulation of extraction and beneficiation wastes under Subtitle C was not warranted (51 FR 24496; July 3, 1986). EPA concluded that Subtitle C controls were not appropriate and found that a number of existing Federal and State programs already addressed many of the risks posed by extraction and beneficiation wastes. Instead of regulating extraction and beneficiation wastes as hazardous wastes under Subtitle C, EPA indicated that these wastes should be controlled under Subtitle D of RCRA.

EPA reported their initial findings on mineral processing wastes from studies required by the Bevill Amendment in the 1990 *Report to Congress: Special Wastes From Mineral Processing* (U.S. EPA 1990). This report covered 20 specific mineral processing wastes; none involved uranium processing wastes. In June 1991, EPA issued a regulatory determination (56 FR 27300) stating that regulation of these 20 mineral processing wastes as hazardous wastes under RCRA Subtitle C is inappropriate or infeasible. These 20 wastes are subject to applicable state requirements. Any mineral processing wastes not specifically included in this list of 20 wastes no longer qualifies for the exclusion (54 FR 36592).

In addition to preparing profiles, EPA has undertaken a variety of activities to support state mine waste programs. These activities include visits to a number of mine sites; compilation of data from State regulatory agencies on waste characteristics, releases, and environmental effects; preparing summaries of mining-related sites on the Superfund National Priorities List (NPL); and an examination of specific waste management

practices and technologies. EPA has also conducted studies of State mining-related regulatory programs and their implementation.

The purpose of this report is to provide additional information on the domestic uranium mining industry. It should be noted that the uranium industry has been depressed since the early 1980s and that the extent of current operations is limited. The report describes current uranium extraction and beneficiation operations with specific reference to the wastes associated with these operations. It also refers to activities and impacts documented when the uranium mining industry was more active. The report is based on reviews of literature and a limited number of State documents. This report complements, but was developed independently of, other EPA activities, including those described above. Uranium processing wastes are not addressed in this profile.

This report briefly characterizes the geology of uranium ores and the economics of the industry. Following this discussion is a review of uranium extraction and beneficiation methods; this section provides the context for descriptions of wastes and materials managed by the industry, as well as a discussion of the potential environmental effects that may result from uranium extraction and beneficiation. The report concludes with a description of regulatory programs that apply to the uranium mining industry as implemented by EPA, Federal land management agencies, and selected states.

1.2 ECONOMIC CHARACTERIZATION OF THE URANIUM INDUSTRY

The primary demand for uranium is by commercial power generating facilities for use in fuel rods. Prior to 1942, its primary uses were as a coloring agent in glass manufacturing and in the production of certain copper, nickel and steel alloys. After the start of World War II, the U.S. began stockpiling uranium principally for the development of atomic weapons (EIA/DOE, 1991).

In 1946, the Atomic Energy Act (AEA) established the Atomic Energy Commission (AEC) as the sole purchasing agent for domestically produced uranium. The AEA also set fixed prices for uranium ore and provided incentives including access roads, haulage allowances, and buying stations in an effort to bolster development within the domestic uranium mining industry. The AEC acted as the sole purchasing agent for uranium from 1948 through 1970. Since the end of the Federal buying program in 1970, private entities have handled sales of uranium between producers and consumers.

The industry slowed in the late 1960s as a result of the a slowdown of the Federal procurement program which terminated in 1970. Uranium production in the early 1970s remained steady as commercial markets began to emerge. The industry was revitalized shortly thereafter by the prospect of supplying fuel to the developing commercial nuclear power industry. Production and prices peaked in the early 1980s, the same time period when planning and construction of new commercial nuclear power plants came to a halt (EIA/DOE, 1992). Domestic raw ore production figures since 1950 are presented in Figure 1

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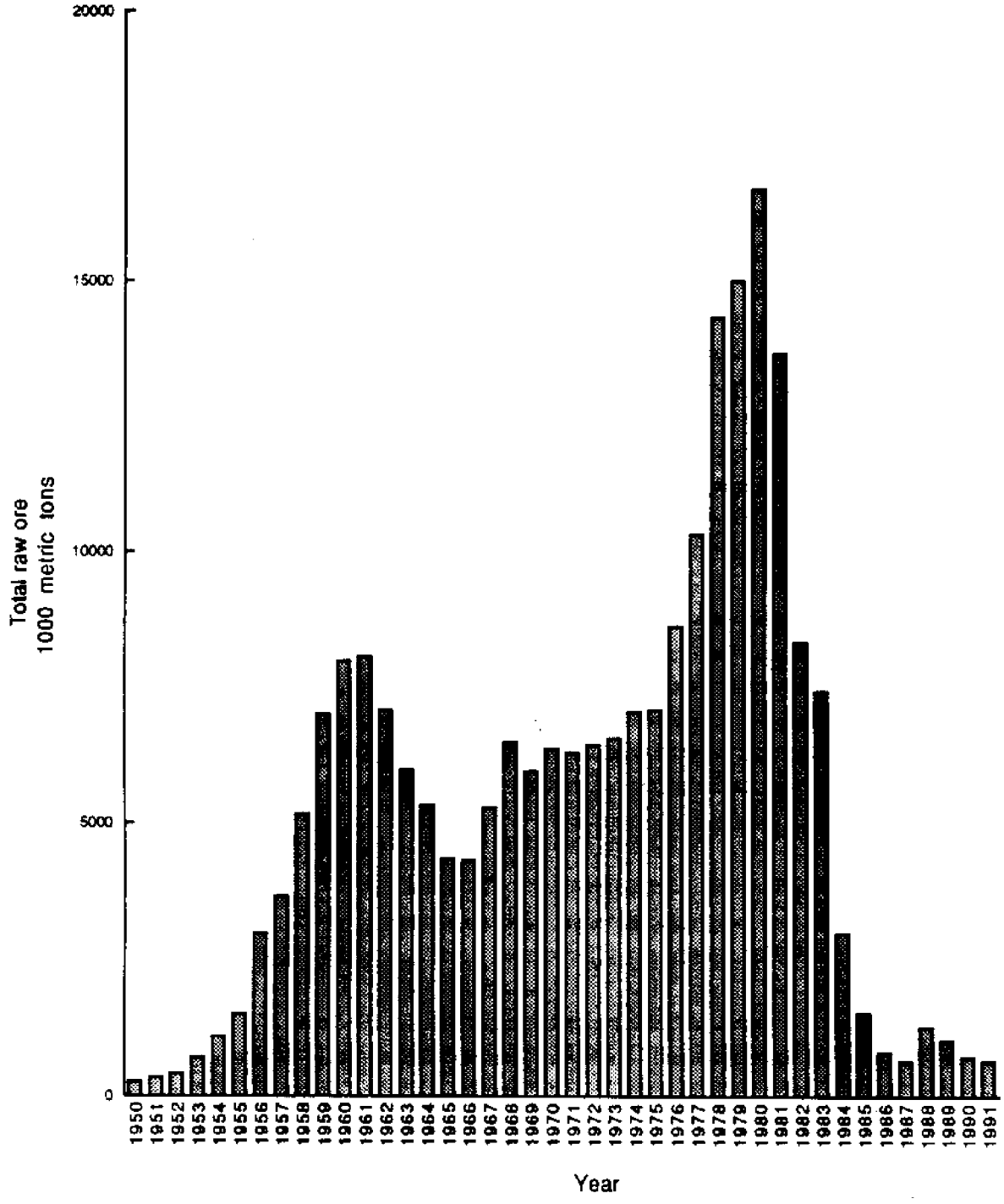

Figure 1-1. Domestic Raw Ore Production–1950 through 1991

(Source: DOE/EIA, 1992)

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In the uranium market, references to ore, intermediate, and some final products, are in terms of percent of uranium oxide or uranium oxide equivalent. Uranium oxide is a generic term for a number of common chemical forms of uranium, the most common being U_3O_8. Yellowcake is another generic term, used to describe the yellow powder generated as the end product of uranium beneficiation. The purity of yellowcake typically ranges from 60 to 75 percent U_3O_8 (Merritt, 1971). A discussion of the different chemical forms of yellowcake is provided in the Extraction and Beneficiation section of this document.

Uranium is sold to commercial utilities in the U.S. by both domestic and foreign suppliers. Government stockpiles supply at least a portion of the uranium required by the defense industry. Suppliers derive their sources from operational mines, natural grade uranium stockpiles (as opposed to the processed, enriched form used as the component of fuel rods) and foreign sources. Domestic suppliers delivered 11,125 metric tons of U_3O_8 equivalent to domestic utilities in 1991; commercial mills in the U.S. provided 3,600 metric tons while suppliers imported almost 2,600 metric tons. Most of the remaining 4,900 metric tons of U_3O_8 equivalent supplied to domestic utilities came from commercial stockpiles. Domestic utilities directly imported an additional 6,400 metric tons of U_3O_8 equivalent in 1991 (EIA/DOE, 1992).

Commercial inventories of U_3O_8 equivalent held in the United States at the end of 1991 stood at over 55,500 metric tons. The Federal government held approximately 21,250 metric tons while the remainder was held by utilities and domestic suppliers (DOE/EIA, 1992).

Uranium mines within the United States produced 522 metric tons (1.4 million pounds) of U_3O_8 equivalent in 1992. Production figures from 1992 indicate a drop of over 70 percent from 1991 levels and the lowest level of production since 1951 (see Figure 1). Uranium prices as well as production are down. In 1992, the average price per pound of uranium oxide equivalent was $8.70, down from an average of $13.66 in 1991 (DOE/EIA, 1993).

In 1981, the United States produced nearly 14,800 metric tons of U_3O_8 equivalent at an average price of over $34 per pound. At the time, the uranium industry reported an employment figure of 13,676 person-years. U_3O_8 equivalent production in 1991 was approximately 3,600 metric tons sold at an average price of $13.66 per pound. The 1992 employment figure of 682 person-years reflects the current trend in production and prices. The EIA reports that in 1992, 51 person-years were expended in exploration, 219 in mining activities, 129 in milling operations and 283 in processing facilities. (DOE/EIA, 1992, 1993).

Uranium has primarily been mined in the western United States; Arizona, Colorado, New Mexico, South Dakota, Texas, Utah, Washington and Wyoming. A total of 17 uranium mines were operational in 1992; five conventional mines (both underground and open pits), four *in situ*, and eight reported as "other" (heap leach, mine water, mill tailings, or low-grade stockpiles). Uranium was also produced to a limited extent as a byproduct of phosphoric acid production at four sites (DOE/EIA, 1993). Figure 2

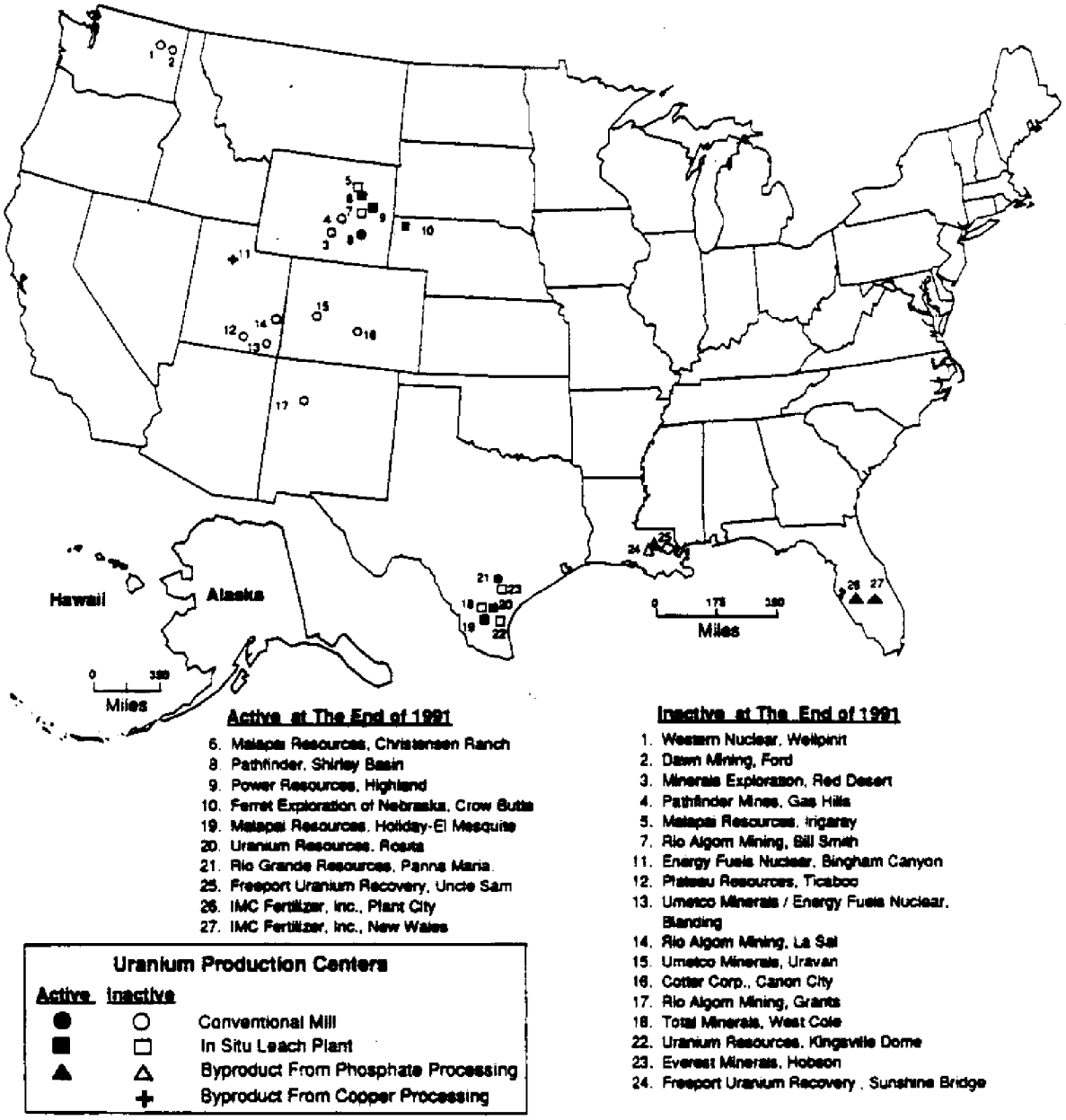

Figure 1-2. Location of Active and Inactive Milling Operations in the U.S. as of 1991

(Source: DOE, 1991)

illustrates the location of operational (operational in this case includes active and inactive mines and mills but not decommissioned mills nor closed (reclaimed) mines) mines and mills in the U.S. in 1991. (DOE/EIA, 1992)

Total milling capacity for active and inactive conventional mills in 1991 was 14,550 tons per day (tpd) of ore (the type of tons was not defined). As of 1991, the two active mills (Hobson, Texas and Shirley Basin, Wyoming) had the capacity to handle a total of 4,800 tpd yet, the total daily feed averaged 1,920 tpd. The average grade of ores processed in 1991 was 0.198 percent uranium oxide (USGS, 1990; DOE/EIA, 1991; DOE/EIA, 1992). These two active mills closed during 1992 and are currently being dismantled.

The percentage of U_3O_8 equivalent produced by conventional and other mills by State is difficult to determine. Texas was the largest producer of U_3O_8 equivalent in 1991 producing 1,063 metric tons of yellowcake. Wyoming, the second largest domestic producer, produced 1,017 metric tons. Production of U_3O_8 equivalent from Arizona, Florida, Louisiana, Nebraska, New Mexico, South Dakota, and Washington combined totalled nearly 2,850 metric tons in 1991 (DOE/EIA, 1992).

As part of the annual viability assessment of the domestic uranium mining and milling industry required by 10 CFR 761, the Secretary of Energy has declared the uranium mining and milling industry nonviable annually from 1984 through 1991 (DOE/EIA, 1992a). (A definition of viability was not provided in the report nor 10 CFR 761). A 1992 summary of various mineral markets published in the Engineering and Mining Journal (E&MJ) noted that the industry remained depressed with large inventories and low prices. The report also indicated that the Cigar Lake project in Canada, with ore reserves capable of supplying most of the uranium needs in the Western Hemisphere, was scheduled to begin production in the near future (Grisafe, 1992). (The ore grade at Cigar Lake is approximately eight percent uranium oxide.)

Projections of spot-market demand versus production (under 1992 conditions) indicate the continuation of a depressed market with demand and production near current levels through the year 2000 (DOE/EIA, 1993).

1.3 ORE CHARACTERIZATION

In order to understand the operations used to mine and concentrate uranium, it is necessary to discuss the chemical and physical make-up of uranium ores. Understanding the characteristics of uranium ore and their host rocks also provides insight into the type of waste products that may be produced as a result of specific mining or beneficiation techniques. This section presents a brief description of the geochemistry of uranium minerals and the genesis and physical characteristics of different types of uranium ore bodies found in the United States.

1.3.1 Chemical Characterization

The element uranium is generally found in naturally occurring minerals in one of two ionic states: U^{6+} (the uranyl "oxidized" ion) and U^{4+} (the uranous "reduced" ion). Minerals containing the uranyl ion tend to be brightly colored (red, yellow, orange and green) and occur in oxidized portions of uranium ore deposits. Common uranyl minerals include tyuyamunite ($Ca(UO_2)_2V_2O_8 \cdot 8H_2O$), autunite ($Ca(UO_2)_2(PO_4)_2 \cdot 8\text{-}12H_2O$), torbernite ($Cu(UO_2)_2(PO_4)_2 \cdot 8\text{-}12H_2O$) and uranophane ($(H_3O)_2Ca(UO_2)_2(SiO_4)_2 \cdot 3H_2O$) (Smith, 1984; Hutchinson and Blackwell, 1984). Minerals containing the uranous ion are more subdued in color, typically brown or black, and occur in reducing environments. Common uranous minerals include uraninite (UO_2), pitchblende (a crystalline variant of uraninite) and coffinite ($USiO_4$) (Smith, 1984; Hutchinson and Blackwell, 1984). Uranium occurs in the minerals as one of three isotopes: U-234, U-235 and the most abundant of the isotopes, U-238 (Tatsch, 1976).

1.3.2 Types of Uranium Deposits

Economically recoverable uranium deposits in the United States generally fit into one of four types of deposits: stratabound, solution breccia pipes, vein, and phosphatic. Figure 3

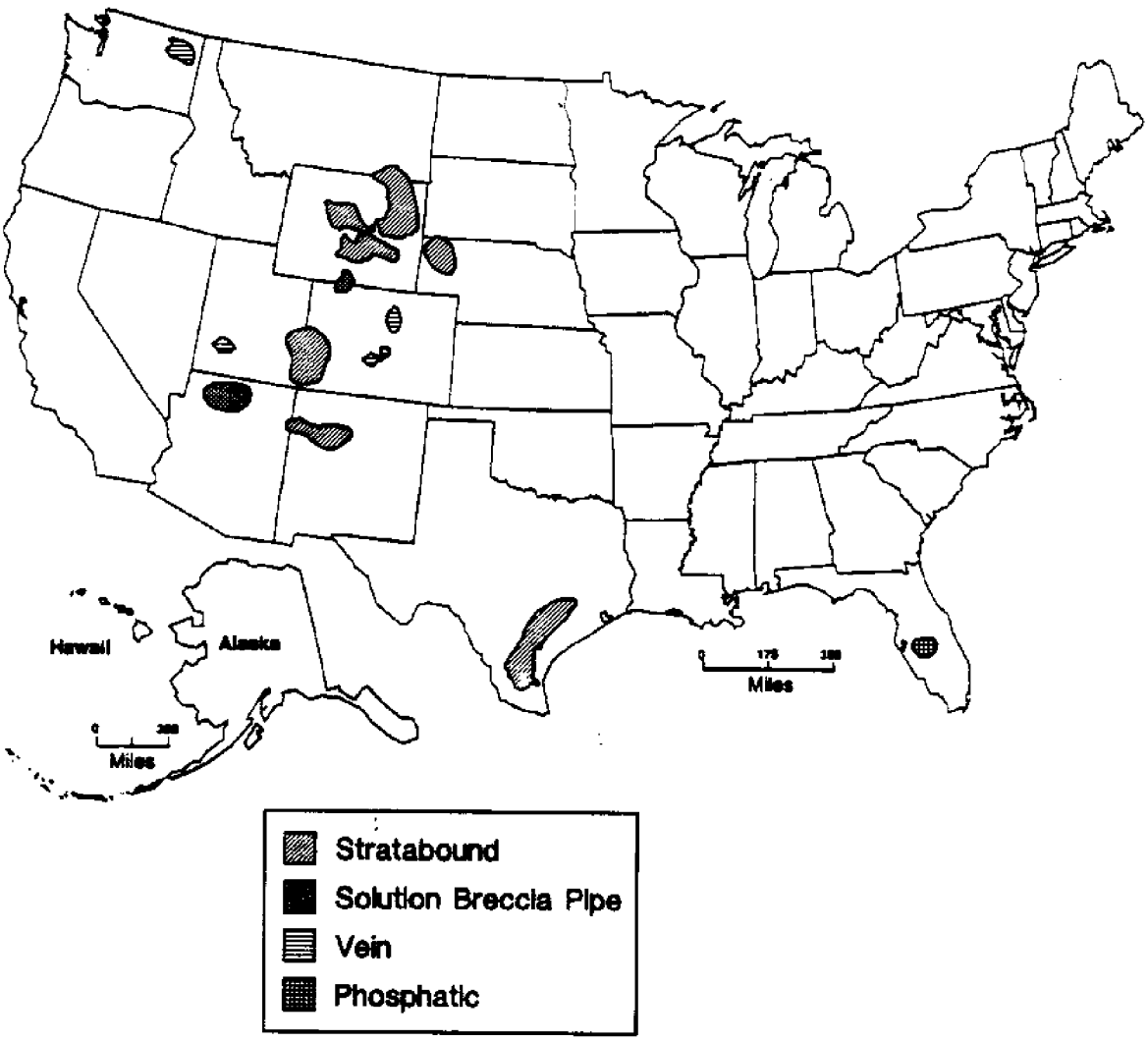

Figure 1-3. Location of the Four Types of Uranium Deposits Found in the U.S.

(Source: DOE, 1991)

depicts the general geographic location of these four types of uranium deposits within the United States. Forty percent of the world's uranium reserves occur in the stratabound uranium deposits in the western United States. These reserves account for more than ninety percent of the U.S. production of uranium and vanadium (an element that is often present in uranium minerals as well as in accessory minerals) (Guilbert and Park, 1985).

1.3.2.1 Stratabound

Stratabound is a term used to describe ore deposits that are contained within a single layer of sedimentary rock. In the United States, stratabound uranium ores are found in three major geographic areas: the Wyoming Basin, south Texas, and the Colorado Plateau. Grades of ore mined from these deposits range from 0.15 to 0.30 percent U_3O_8.

The ore is found in bodies ranging in size from two tons to more than 10 million tons. Several of these bodies may make up one uranium deposit (Tatsch, 1976).

The current theory on the genesis of stratabound uranium orebodies proposes that they formed through the transport of uranium (and associated elements) by oxidizing groundwater. Groundwater flowed through uranium-containing rocks or sediments, leaching uranium from the rock through the oxidation of U^{4+} to U^{6+}. The U^{6+} ion is soluble in groundwater as one of many different uranyl complex ions. These uranium ions remained in solution until they encountered and moved through a reducing environment. There the uranyl ions were reduced and a uranous mineral, such as uraninite, was precipitated.

The uranium deposits of the Wyoming Basin and south Texas are known as "roll-front" deposits, a uranium ore-body deposited at the interface of oxidizing and reducing groundwaters. These deposits are found in permeable sandstone beds that are generally interbedded with silty claystones or shales. Tongues of oxidizing groundwater containing uranium (vanadium, molybdenum, selenium, and sulfur may also be present) in solution flowed through the sandstone beds until reducing groundwater was reached. Precipitation of the uraninite and accessory minerals occurred at the interface of the oxidized fluids and the reducing environment. A zonation of mineralization is typically noted in these deposits; pyrite and calcite are found at the leading edge of the interface, pyrite and uraninite in the ore-zone and siderite ($FeCO_3$), goethite ($FeO{\cdot}OH$) and hematite (Fe_2O_3) on the trailing edge. The deposits display a crescent shape in plan view, resulting from the configuration of the interface between the tongues of oxidizing groundwater and reducing groundwater. As the interface of the oxidizing and reducing environments migrated, the uranous minerals were deposited over a laterally extended area. The roll-front ore bodies may only be a few meters in height, but may extend over a hundred meters in length. These deposits are particularly well suited for *in situ* solution mining techniques (see Beneficiation section) due to the high permeability of the host sandstones and their generally shallow depths (Guilbert and Park, 1985; Texas Department of Water Resources, 1984).

The Salt Wash uranium-vanadium deposits of the Colorado Plateau (includes the Uravan Mineral Belt in Colorado and Utah) were formed when uranium- and vanadium-enriched groundwater flowed through zones

of high permeability containing solids (organic matter), gases (hydrogen sulfide), or liquids capable of reducing the uranyl ion. The uranium and vanadium minerals were deposited in the areas where these substances created reducing environments. The deposits are generally tabular shaped and are found in sandstones, limestones, siltstones and conglomerates scattered throughout western Colorado, eastern Utah, northeastern Arizona and northwestern New Mexico. Grades of these deposits range from 0.16 percent to 0.25 percent U_3O_8. Significant vanadium is also associated with these deposits, which grades about one percent V_2O_5. Other metals associated with these deposits are copper, silver, selenium, molybdenum, chromium, lead, zinc, arsenic, cobalt and nickel. Although the primary ore minerals associated with these deposits are the reduced minerals pitchblende and coffinite, the brightly colored weathering products of these two minerals are also present, the oxidized uranium and vanadium minerals tyuyamunite, carnotite, and montroseite (Guilbert and Park, 1985).

The humate uranium deposits of the Colorado Plateau (located in northwestern New Mexico and known as the Grants Mineral Belt) have provided over 50 percent of the total U.S. uranium production. These deposits occur in sandstones, arkoses and siltstones of the Morrison Formation. The uranium is found associated with tabular layers of organic matter (humates) averaging 0.5 to two meters thick and up to hundreds of meters across. The uranium ore contains the minerals uraninite and coffinite and an organo-uraniferous mineraloid. These compounds coat sand grains, and fill pore spaces and fractures. Locally, some younger oxidizing "roll fronts" have advanced through the uraniferous humate deposits and redistributed the uranium into the characteristic roll-front deposit (Guilbert and Parker, 1985).

1.3.2.2 Solution Breccia Pipes

Solution breccia pipe uranium deposits occur in the Arizona Strip, an area of northern Arizona known for high grade uranium deposits. Between 1980 and 1992, seven mines in the Arizona Strip produced in excess of 19 million pounds of uranium ore averaging 0.64 percent U-238. (Pillmore, 1992). No production figures were available for uranium ores mined prior to 1980.

These solution breccia pipes (not to be confused with breccia pipes of volcanic origin) were created by the flow of groundwater through limestones. The neutral to acidic groundwater began to dissolve the limestone along areas of weakness in the rock. As the dissolution progressed, large cavities formed in the limestone units. The overlying units, no longer supported by the underlying limestone, progressively collapsed into the cavities. This progressive collapse of the overlying units resulted in cylindrical columns of broken rock (commonly referred to as solution breccia pipes). Many of these structures extend a vertical distance of more than 2,000 feet and may reach 250 feet in width (Verbeek, Grout and Gosen, 1988; Pillmore, 1992).

The solution breccia pipes became preferential pathways for fluids as a result of their increased permeability. Sometime after pipe formation, hydrothermal fluids circulated in the pipes and in fractures surrounding the pipes, depositing uranous minerals in the presence of reducing solids (ferrous iron, sulfides or organic matter) or liquids. The source of these hydrothermal solutions and the uranium contained in them is currently open to debate.

Uraninite or pitchblende coats quartz grains and fills small cavities (vugs) in many of the pipes. A variety of copper, iron, zinc and lead sulfides are also found in what appears to be deposition contemporaneous with the uraninite. Following the hydrothermal phase, many of the ore minerals deposited in the pipes were chemically altered as the geological environment changed. Oxidizing, low temperature groundwater migrated thorough the pipes and oxidized the primary uranium ores to tyuyamunite, uranophane, torbernite and other uranyl uranium minerals. Copper and zinc sulfides were altered to carbonate, sulfate and hydrous silicate compounds. In some pipes, this alteration is nearly complete, eliminating all traces of the primary mineral assemblages. Many of these deposits

have been exploited through underground mining methods (Verbeek, Grout, Van Gosen, 1988 and Rich, Holland and Peterson, 1977).

1.3.2.3 Vein Deposits

Uranium vein deposits are formed by the migration of hydrothermal solutions through faults and fractures at moderate temperatures (100 to 300°C) and pressures. As geochemical changes occur in the solutions, pitchblende and other uranium minerals are precipitated in the veins. In addition to the uranium minerals, the vein may also contain many different types of minerals. These accessory minerals may contain any number of metals, including copper, lead, iron and zinc.

Vein deposits of uranium ore may be found in any type of host rock: sedimentary, metamorphic or igneous. Most uranium vein deposits in the U.S. have been relatively unimportant in U.S. production (Rick, Holland and Petersen, 1977). Exceptions to this are the Schwartzwalder mine in Colorado, the Marysvale District in Utah and the Midnite mine in Washington. A current accounting of the total U.S. uranium production originating from vein deposits was not available.

1.3.2.4 Phosphatic

Uranium was extracted to a limited extent, from the phosphate ores of central Florida until recently. In these ores, uranium is a trace constituent of apatite ($Ca_5(PO_4)$), the primary mineral in phosphate deposits. The uranous ion ($U^{4+)}$ substitutes for calcium in the crystalline structure of apatite and a small amount of U^{6+} may be adsorbed onto the mineral surface. (USGS, 1990)

The central Florida phosphate deposits contain uranium concentrations ranging from 90 ppm to 150 ppm in phosphate pellets, the main form of phosphate ore. The uranium was deposited at the same time as the apatite and not as a secondary replacement of the calcium. Secondary enrichment of uranium has occurred in some areas of the phosphate district as a result of leaching by acidic groundwater. As acidic water percolates through the phosphate rock, uranium and apatite are dissolved and transported to a geochemical environment favorable for precipitation. This process secondarily concentrates uranium (up to 1,000 ppm) and apatite (USGS, 1990). Uranium was recovered from the apatite during the manufacture of phosphoric acid. In 1988, two phosphoric acid manufacturing plants recovered about two million pounds of U_3O_8 (21 percent of U.S. production for 1988) from the phosphate rock mined in Florida (USGS, 1990). These operations are now closed.

1.4 URANIUM MINING PRACTICES

The major operational steps in producing commercial uranium products fall into three broad categories: extraction, beneficiation and processing. Extraction involves the removal of ore from a deposit and includes all steps prior to beneficiation. Beneficiation includes the crushing, grinding, leaching of the ore; it also includes concentration and subsequent precipitation of the uraniferous compounds. During the last stage of beneficiation the precipitated yellowcake is washed, dried and packaged for shipment. Typically, yellowcake is shipped to a Federal facility for processing. In the processing step, uranium fluoride (UF_6) is produced from yellowcake. The uranium fluoride is then enriched, an operation that concentrates the U-235 from a concentration of 0.7 percent to approximately two to three percent. The enriched uranium fluoride is further refined to ultimately produce the fuel rods used in nuclear reactors. The terms extraction and beneficiation, for the purposes of this report, are used in the broadest sense and discussions herein should not be construed for regulatory purposes for any specific waste. Extraction and beneficiation methods are discussed further in this section; uranium processing is beyond the scope of the report. A discussion of the wastes generated during each phase of mining and beneficiation is presented in the next chapter.

1.4.1 Extraction

Uranium is typically mined using one of three techniques: surface (open pit), underground, or solution mining. (Solution mining is discussed below in the Beneficiation section). The method of extraction is dependent on the grade, size, location, and geology of the deposit and is based on maximizing ore recovery within economic constraints. A low-grade cutoff point is established on a site-specific basis and depends on recovery costs at the site, the market price of the ore, and feed requirements at the mill. A survey conducted in 1986 indicated that low-grade cutoff values ranged from 0.01 to 0.3 percent U_3O_8 (USEPA, 1986).

Unlike operations in many other mineral sectors, uranium ore production levels from open pit and underground mines were approximately equal for the period of 1978 through 1985 (see Figure 4

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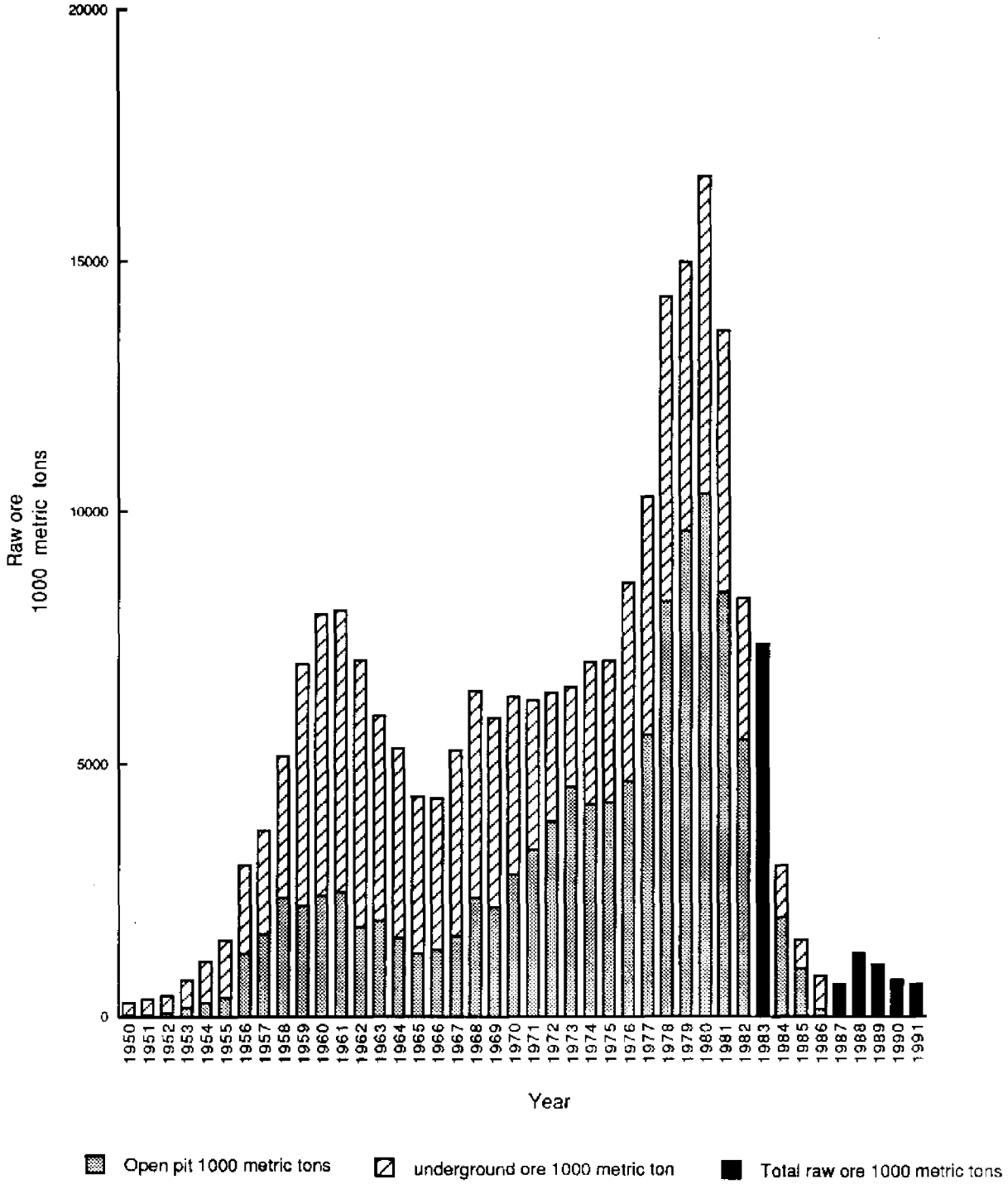

Figure 1-4. Raw Ore Production from Open Pit and Underground Uranium Mines–1950 to 1991

(Source: DOE/EIA, 1992)

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Production figures since 1985 have been withheld as proprietary information, so, more recent comparisons between the two methods were not possible (EIA/DOE, 1991). It is likely that as the price of uranium declines, more costly methods of mining, such as underground, have become less economically feasible.

1.4.1.1 Open Pit Mining

Open pit mining techniques are employed to exploit ore deposits relatively close to the surface of the earth. Topsoil is typically removed separately and stockpiled. Overburden, the material overlying the deposit is removed using scrapers or with trucks and loaders or mechanical shovels.

Depending on the extent of consolidation, the overburden may be ripped with bulldozers or blasted prior to removal. Overburden may be stockpiled outside the pit or placed in mined out portions of the pit once pit development has progressed to an acceptable point. Mining economics typically require that overburden haulage be minimized. Once the ore body is exposed, it is ripped, loaded into trucks, and trucked to an onsite stockpile. The ore can then be moved from the stockpile to the mill site as required.

The depth to which an ore body is mined depends on the ore grade, nature of the overburden, and the stripping ratio. Stripping ratios describe the amount of overburden that must be removed to extract one unit of ore. One report indicates that stripping ratios for open pit uranium mines range from 10:1 to 80:1 with an average of around 30:1 (USEPA, 1983b Vol 2). Stripping ratios at open pit mines currently in operation were not available. The primary advantage of surface mining is the ability to move large amounts of material at a relatively low cost, in comparison with underground operations.

1.4.1.2 Underground Mining

A variety of techniques are employed in underground operations depending on the distribution and orientation of the ore deposit. In general, underground mining involves sinking a shaft (or driving an adit) near the ore body to be mined and extending levels from the main shaft at various depths to the ore. Shafts, adits, drifts and cross-cuts, are developed to access and remove the ore body. Levels and adits often slope slightly upward away from the main shaft to encourage positive drainage of any water seeping into the mine. Ore and development rock, the non-ore bearing material generated during mining, may be removed either through shaft conveyances or chutes, and hoisted in skips (elevators) to the surface or used to backfill mined out areas. Ore is placed in stockpiles while development rock brought to the surface is placed in waste rock. As underground mining techniques are able to leave much of the non-ore bearing material in place, the ratio of waste (development) rock to ore is much lower than stripping ratios in open pit mines. Ratios of waste rock to ore range from 1:1.5 to 1:16 (USEPA, 1983b Vol 2). In shallow underground mines, ore and waste rock may be brought to the surfaced by train or conveyor belt. Often, mining progresses from the edge of the ore deposit or property line toward the main shaft (USDOI, 1980).

As with surface mining operations, ores and sub-grade ores may be stockpiled on the surface. These materials may be beneficiated as market conditions allow or left with mine development rock in waste rock piles.

1.4.2 Beneficiation

Beneficiation of ores and minerals is referenced in 40 CFR 261.4(b)(7) as being the following: crushing; grinding; washing; dissolution; crystallization; filtration; sorting; sizing; drying; sintering; pelletizing; briquetting, calcining to remove water and/or carbon dioxide; roasting; autoclaving, and/or chlorination in preparation for leaching (except where the roasting (and/or autoclaving and/or chlorination)/leaching sequence produces a final or intermediate product that does not undergo further beneficiation or processing); gravity concentration; magnetic separation; electrostatic separation; flotation; ion exchange; solvent extraction; electrowinning; precipitation; amalgamation; and heap, dump, tank, and *in situ* leaching. Beneficiation of conventionally mined ores in the uranium industry involves crushing and grinding the extracted ores followed by a leaching circuit. *In situ* operations bypass the extraction step and perform the leaching step using a leach solution to dissolve desirable metals from deposits in-place. The uranium, in this case, is brought to the surface in solution. Uranium in either case is removed from pregnant leach liquor and concentrated using solvent extraction or ion exchange techniques and precipitated to form yellowcake. Prior to 1980, approximately 90 percent of yellowcake production came from conventional mills; as of 1991, yellowcake production from conventional mills and *in situ* operations is close to equal (USDOI, 1980; DOE/EIA, 1992).

Uranium mills have typically been associated with specific mines or functioned as custom mills, serving a number of mines. The two mills that operated in 1991 closed in 1992 and are in the process of being decommissioned (Stephenson, 1993). The specific circuits employed by those mills for beneficiation, prior to their closure, were not determined. Most available information on milling operations were written when a dozen or more were operational, therefore the following discussions may not precisely describe milling activities being conducted at present. Figure 5

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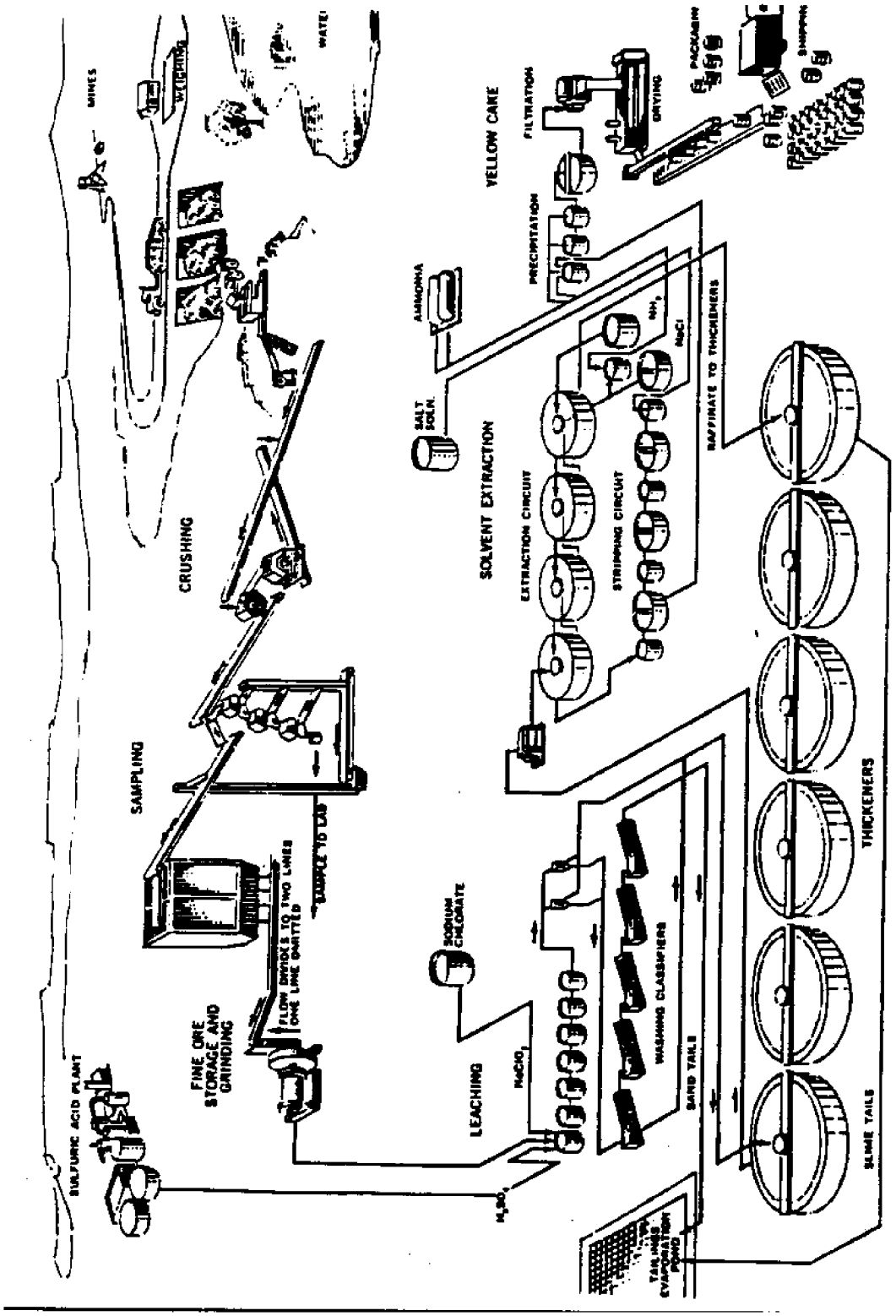

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illustrates operations at a typical conventional mill.

The chemical nature of the ore determines the type of leach circuit required and, in turn, the extent of grinding. Most ores are ground to approximately 28 mesh and acid-leached. Ores containing greater than 12 percent limestone require finer grinding (200 mesh) and are leached with an alkaline solution. Mills may use one type of circuit or the other although in the past, some mills maintained both acid and alkaline leach circuits. Solvent extraction or ion exchange circuits can be used to concentrate the uraniferous compounds from either of the leach circuits (USEPA, 1983a; USDOI, 1980).

The literature indicates that solvent exchange was employed more frequently in conventional milling operations than ion exchange. Where ion exchange was employed by conventional mills, it appears to have been conducted as a resin-in-pulp operation rather than using columns. *In situ* operations usually employ ion exchange columns for concentration of the uraniferous compounds.

Some limitations of ion exchange columns are the inability to treat solutions with solids and the finite life of the fixed resins. Ion exchange is effective for *in situ* operations because of the relative ease with which resin columns can be transported from satellite areas to a centralized uranium stripping/precipitation facility.

Conventional Milling

Crushing and Grinding

The initial step in conventional milling involves crushing, grinding, and wet and/or dry classification of the crude ore to produce uniformly sized particles. A primary crusher, such as a jaw type, is used to reduce ore into particles less than 150 millimeters (about 6 inches) in diameter. Generally, crushing continues using a cone crusher and an internal sizing screen until the ore has a diameter less than 19 mm (3/4 inch). Crushing in jaw and cone crushers is a dry process, with water spray applied only to control dust. Ore feeds from the cone crusher to the grinding circuit where ball and/or rod mills, and/or autogenous or semiautogenous grinding, continue to reduce the size of the ore. Water or leach liquor is added to the system in the grinding circuit to facilitate the movement of the solids, for dust control, and (if leach liquor is added) to initiate leaching (USDOI, 1980).

Classifiers, thickeners, cyclones or screens are used to size the finely ground ore, returning coarse materials for additional grinding. The slurry generated in the grinding circuit contains 50 to 65 percent solids. Fugitive dust generated during crushing and grinding is usually controlled by water sprays or, if collected by air pollution control devices, recirculated into the beneficiation circuit. Water is typically recirculated through the milling circuit to reduce consumption (USEPA, 1983a).

Leaching

After grinding, the slurry is pumped to a series of tanks for leaching. Leaching is defined as dissolving metals or minerals out of ore (USDOI, 1968). Two types of leaching have been employed by uranium mills, acid and alkaline. Acid leaching had been the predominant leaching process employed by conventional mills although the methods in use at the two mills operating in 1991 were not determined. Figure 6

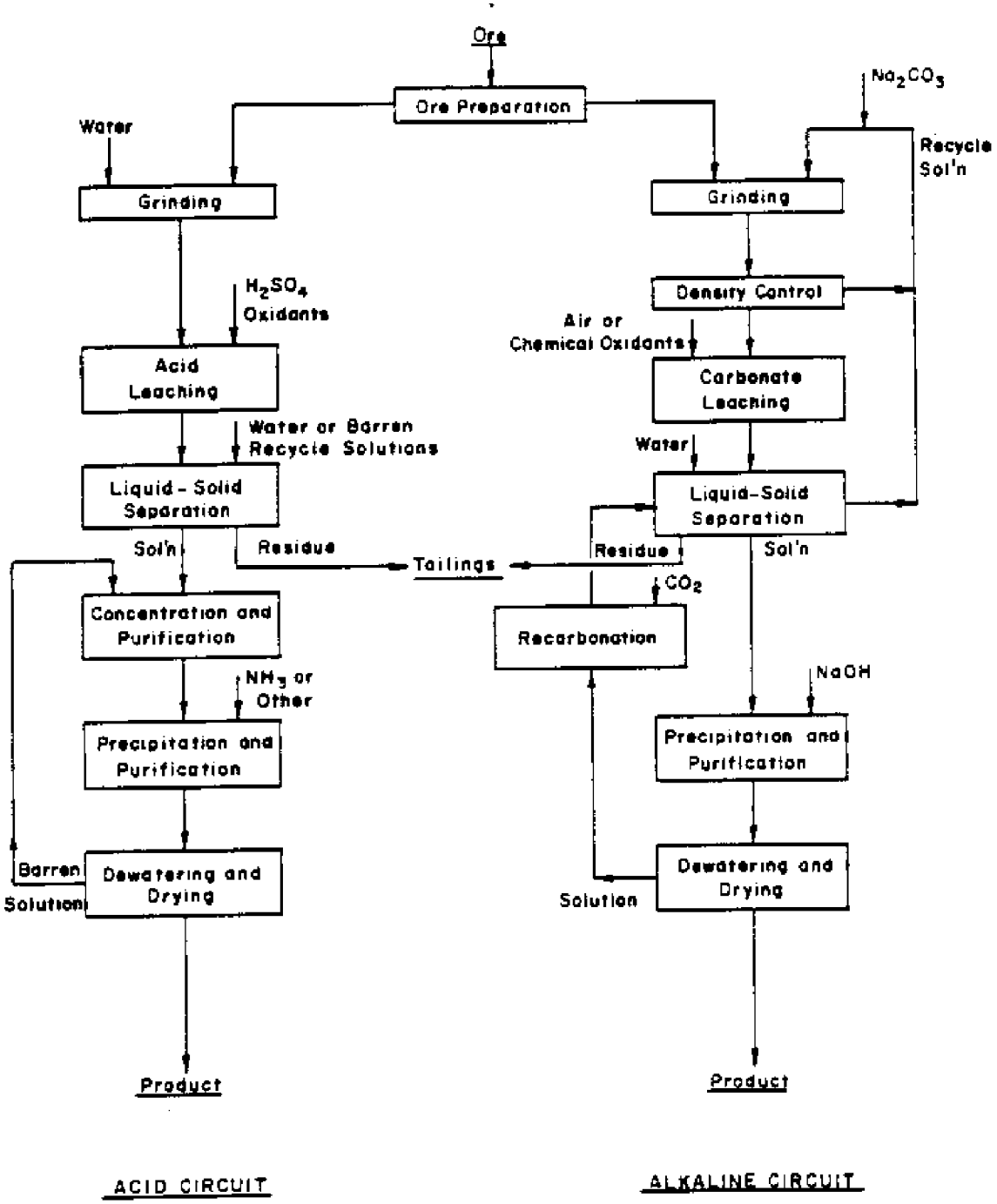

Figure 1-6. Comparison of Acid and Alkaline Leaching Circuits

(Source: Merritt, 1971)

illustrates process flow diagrams for acid and alkaline leaching. In the discussions that follow, an overview of leaching is provided followed by a more detailed description of both acid and alkaline leaches. Generally, leaching is a simple operation. A solvent (lixiviant) is brought into contact with the crushed ore slurry (or, in the case of *in situ*, with the ore in the ground). The desired constituent (uranyl ions) is then dissolved by the lixiviant. The pregnant lixiviant is separated from the residual solids (tails); typically the solids are washed with fresh lixiviant until the desired level of recovery is attained.

The uranyl ions are recovered (stripped) from the pregnant lixiviant. The final steps consist of precipitation to produce yellowcake, followed by drying and packaging (Pehlke, 1973). The stripped lixiviant may be replenished and recycled for use within the leaching circuit or as the liquid component in the crushing/grinding operation. Ultimately, the solids may be washed with water prior to being pumped to the tailings pond; this wash serves to recover any remaining lixiviant and reduce the quantity of chemicals being placed in the tailings impoundment. Wash water may be recycled to the lixiviant or to the crushing and grinding circuits.

The first step in any uranium leaching operation is oxidation of the uranium constituents. Uranium is found as uranium dioxide (UO_2, U^{+4} oxidation state) in many deposits (pitchblende and uraninite). Uranium dioxide is insoluble; to create a soluble form, UO_2 is oxidized from the U^{+4} to the U^{+6} oxidation state. Iron present within the ore, and oxygen, are used to perform oxidation via the following reactions:

(1) alkaline $UO_2 + ½O_2 \rightleftarrows UO_3$
(2) acid $UO_2 + 2Fe^{+3} \rightleftarrows UO_2^{+2} + 2Fe^{+2}$.

(Source: Twidwell *et al*., 1983)

(Note: iron can be readily reoxidized by the addition of O_2, sodium chlorate ($NaClO_3$), or manganese oxide (MnO_2) to the lixiviant.)

The second step in leaching is the stabilization of the uraniferous ions in solution. The uraniferous ions form stable, soluble complexes with sulfate (SO_4^{-2}) or carbonate (CO_3^{-2}). Sulfuric acid is added as the source for sulfate ions; sodium bicarbonate, sodium carbonate, or carbon dioxide are added to alkaline leach circuits to provide a carbonate source. Uraniferous complexes are formed through the following reactions:

(1) alkaline $UO_3 + CO_3^{-2} + 2HCO_3^{-} \rightleftarrows UO_2(CO_3)_3^{-4} + H_2O$
(2) acid $UO_2^{+2} + 6SO_4^{-2} \rightleftarrows UO_2(SO_4)_6^{-4}$.

(Source: Twidwell *et al*., 1983)

In a typical acid leaching operation, sulfuric acid is added to the crushed ore slurry to maintain the pH between 0.5 and 2.0. Twenty to 60 kilograms of sulfuric acid per metric ton of ore are normally required to reach the target pH. $NaClO_3$ or MnO_2 is added to maintain the oxidation by iron. Because iron is normally found in uranium deposits, the ore body itself supplies the iron in the leach step (Twidwell *et al.*, 1983; USEPA, 1983a).

Alkaline leaching is not as effective as acid leaching for uranium recovery and is not used except in cases of high lime-content ores. Typically, ore bodies containing greater than 12 percent carbonates will be alkaline leached. Alkaline leaching is primarily employed in *in situ* mining operations, although a few conventional mills maintained alkaline leach circuits (Merritt, 1971). Alkaline leaching requires the use of a strong oxidant and long retention times to oxidize the uraniferous minerals (Twidwell *et al*., 1983). As stated previously, oxygen and a carbonate source are added to water to make up the lixiviant. The carbonate (CO_3^{-2}) and bicarbonate (HCO_3^-) concentrations are typically 40-50 g/L and 10-20 g/L respectively (Merritt, 1971). For its leaching process, the Highland *in situ* project injects O_2(g) and CO_2(g) into the lixiviant prior to underground injection. The dissolution of CO_2 in the lixiviant produces both CO_3^{-2} and HCO_3^- ions (Hunter, 1991).

Leaching may be performed in tanks, heaps or *in situ*. *In situ* leaching is practiced on low grade ores; (after crushing and grinding) high grade ores are typically leached in tanks. Heap leaching is also applicable to low grade ores; however, the available literature indicates that the application of this technique to uranium ores is limited and consequently it will not be discussed in detail. Depending on the grade of the ore, grain size (amount of grinding), and the method used, the leach times vary. Leaching in tanks may take from four to 24 hours while heap leaching may be measured in days or weeks (Twidwell *et al*., 1983).

Once the uraniferous compounds have been leached from the ore, the pregnant leach solution is separated from the solids using classifiers, hydrocyclones and thickeners. Sand-sized particles are removed first and washed with clean water or raffinate (raffinate is another term used to refer to barren lixiviant). Continued treatment removes the slimes, which are also washed. Depending on the settling time allowed by beneficiation operations, flocculants may be added to the process to encourage settling of suspended solids. After final washing, the solids (sands and slimes) are pumped as a slurry to a tailings pond for further settling. The pregnant leach solution then enters a solvent extraction or ion exchange circuit. Wash solution is recycled to reduce consumption of leach chemicals, solute, and water (USDOI, 1980; USEPA, 1983a).

Solvent Extraction

Solvent extraction is an operation that concentrates specific ions. Generally, solvent extraction uses the immiscible properties of two solvents (the pregnant leach solution and a solvent) and the solubility properties of a solute (uraniferous ions) in the two solvents. Solvent extraction is typically employed by conventional milling operations since solvent extraction can be used in the presence of fine solids (slimes). The pregnant leach solution is mixed in tanks with the solvent. Selection of a solvent in which the target solute (uraniferous ions) is preferentially soluble allows the solute to migrate to the solvent the pregnant leach solution while other dissolved compounds remain in the leach solution. Normally, the solvents are organic compounds that can combine with either solute cations or solute anions. As uranyl-carbonates or sulfates are commonly generated in the leaching step, anionic solvent extraction solutions are typically employed; cationic solvent extraction solutions may be employed depending on unique characteristics of the ores or leaching solutions.

Some anionic SX solutions include:

- Secondary amines with aliphatic side chains
- High molecular weight tri-alkyl tertiary amines
- Quaternary ammonium compounds.

Some cationic SX solutions include:

- Monododecyl phosphoric acid (DDPA)
- Di-2-ethylhexyl phosphoric acid (EHPA)
- Heptadecyl phosphoric acid (HDPA)
- Dialkyl pyrophosphoric acid (OPPA).

(Source: Twidwell *et al*., 1983).

Typically, the solvent extraction solution is diluted in a low cost carrier such as kerosene with a tributyl phosphate modifier or a long chain alcohol (Twidwell *et al*., 1983). The uraniferous ions preferentially move from the aqueous pregnant leach solution into the organic solvent as the two are mixed and agitated (USDOI, 1980). After the uraniferous compounds are thus extracted from the pregnant leach solution, the barren lixiviant (raffinate) is typically recycled to the leaching circuit.

After the solute exchange has taken place, the pregnant solvent extraction liquor must be stripped. The uraniferous solute is typically in an anionic state, and accordingly many solvent extraction solutions are anionic-based. Amine solvent extraction solutions can be stripped by many different agents such as nitrates, chlorides, sulfates, carbonates, hydroxides, and acids. Chlorides are used most frequently due to their cost-effectiveness (Twidwell *et al*., 1983).

The pregnant stripping liquor is then pumped to the precipitation step while the stripped organic solvent is recycled to the beginning of the solvent extraction circuit. Solvent exchange can be done as a batch or continuous process (Twidwell *et al*., 1983).

Ion Exchange

Like solvent extraction, ion exchange operations make use of organic compounds to perform solute concentration. Generally, fixed organic resins contained within a column are used to remove uraniferous compounds from the pregnant leach solution by exchange. After adsorption, the uraniferous compounds attached to the resins are released (eluted) by a stripping solution and sent to precipitation. Ion exchange is used by most if not all *in situ* operations and was employed by some conventional mills. It was not determined if the currently operational mills employ ion exchange circuits within their operations.

Resins are constructed with anionic or cationic functional groups (typically anionic for uranium compounds) that have an affinity for the target compound and specifically bind the compound to the resin. Resins are synthetic polymers in which hydrocarbon groups make up a three-dimensional network that hold stable, reactive functional groups (e.g., strong acid-SO_3H; weak acid-COOH; strong base-NR_3Cl; weak base-

NH_2RCl). Resins containing acid groups are called cation exchangers while resins containing basic groups are termed anion exchangers (Twidwell et al., 1983). Chloride ions can exchange with the anionic component of all the functional groups, thus providing an inexpensive stripping solution (i.e., any chloride salt solution) for any of the resins.

As the pregnant leach solution passes through the ion exchange resins, the uraniferous compounds bind to the resins. The barren leach solution is recycled back to the leaching circuit. As the resins' binding ports are filled by the uranyl ions, the uranyl ion concentration at the outlet of the ion exchange column increases. Once the uranyl ions at the outlet reach a predetermined concentration, the column is considered to be loaded and ready for elution. Typically, the pregnant leach stream is then directed to a fresh vessel of resins. A concentrated chloride salt solution is then directed through the loaded resins, eluting off the uraniferous complexes. The pregnant elute liquor can then be directed to the precipitation circuit. The pregnant elute solution may be acidified slightly to prevent the premature precipitation of uraniferous compounds (Twidwell *et al*., 1983).

Yellowcake Production

Once the uraniferous ions have been concentrated by solvent extraction or ion exchange, they are precipitated out of solution to produce yellowcake. The precipitate is then washed, filtered, dried and drummed. The chloride stripping solution is recycled back to the stripping circuit. The type of ion concentration solution (e.g., acid or alkaline solution) governs the precipitation method employed. With acid pregnant stripping liquors or pregnant elute liquors, neutralization to a pH of 6.5 to 8 using ammonia hydroxide, sodium hydroxide or lime results in the precipitation of ammonium or sodium diuranate (Merritt, 1971). Hydrogen peroxide may also be added to an acid pregnant stripping liquor or pregnant elute liquor to precipitate uranium peroxide (Yan, 1990). All forms of the uraniferous precipitate are known as yellowcake.

Alkaline pregnant stripping liquors or pregnant elute liquors typically contain uranyl carbonates. Prior to precipitation of the uranyl ions, the carbonate ions must be destroyed. An acid (usually hydrochloric acid) is added to the carbonate concentrate solution to break down the carbonates to carbon dioxide; the carbon dioxide is vented off. Once the carbonates have been destroyed, the acidified solution is neutralized with an alkali or treated with hydrogen peroxide to precipitate the uraniferous compounds. Precipitation operations based on neutralization of acid solutions are favored because of the higher purity of the yellowcake product; sodium, carbonate, and, in some cases, vanadium, are impurities that may be present in yellowcake produced from an alkaline neutralization (Merritt, 1971).

The yellowcake is separated from the precipitation solution by filtration. Thickeners may be used in conjunction with filtration units. The filtered yellowcake can then be dried and packaged for shipping (USBOM, 1978). The supernatant generated from precipitation and dewatering circuits can be recycled to the respective solvent extraction or ion exchange stripping solution.

1.4.2.1 Solution Mining

Solution mining is a general term used in the uranium industry to describe operations in which a leach solution, referred to as the lixiviant, is employed to extract uranium from subsurface ore deposits. The chemical reactions involved in *in situ* leaching are the same as those described in the Leaching section above. A number of solution mining techniques have been explored since the 1960s, including *in situ* leaching, stope leaching, borehole mining, and minewater treatment.

Other than *in situ*, the application of solution mining techniques has been limited. Stope leaching involves the injection of lixiviant into mined-out areas or those sections of underground mines that had been backfilled with low grade ore. The lixiviant can be recovered from a sump or well drilled to the bottom of the mine workings. Like other solution mining techniques, this method allows the recovery of uranium from ores not economically minable using conventional methods. Stope leaching was used to a limited extent in Wyoming (Smith Ranch) and in New Mexico (Quivira) (Michel, 1977; Ingle, 1993; Parker, 1990).

Mine water treatment involves recovery of uranium from mine effluent and was used at one point at the inactive Schwarzwalder Mine in Colorado. Available information indicates that uranium was recovered using ion exchange techniques (see above) although the recovered uranium was sent to the Cotter Mill for storage (Cray, 1990).

Borehole mining (or water-jet mining) is a technique the U.S. Bureau of Mines demonstrated on uranium deposits in the late 1970s. Borehole mining combines conventional and *in situ* mining techniques and involves removal of uranium-containing sandstone from underground deposits using a high-pressure water jet. The jet, inserted down one borehole, is used to fragment the sandstone, creating a slurry which is moved to the surface via an adjacent recovery well (USDOI, 1980). No information on the use of borehole techniques in actual production was obtained.

In situ leaching is the most commonly employed solution technique and continues to be employed at present by at least two mines in Wyoming. Nebraska's Department of Environmental Control permitted an *in situ* operation in 1990; it is currently operable (NDEC, 1990). Texas has 17 mines that are permitted for *in situ* operations and only two of these are currently being mined. The rest have groundwater restoration activities underway (Kohler, 1993). Deposits amenable to *in situ* leaching are usually (if not always) within an aquifer. Water quality within a mineral deposit may vary depending on the presence of and boundary between oxidizing and reducing groundwaters. Ore body characteristics, including chemical constituents, grade, and permeability, are key considerations in the development of production methods (selection of lixiviants, arrangement of well patterns). Ideally, the deposit should be confined by impermeable strata above and below the deposit to prevent contamination of adjacent aquifers by excursions (solution leaks from the ore zone). *In situ* production operations consist of three phases: removal of minerals from the deposit, concentration of uraniferous minerals, and generation of yellowcake. In addition to the production operations, water treatment and, in some cases, deep well injection facilities, are employed.

In *in situ* mining, barren lixiviant is pumped down injection wells into the ore body; production wells then bring the pregnant leach solution to the surface for further beneficiation. Numerous well patterns have been investigated since the early 1960s when *in situ* mining techniques were first employed. Five spot well patterns, which consist of four injection wells forming the corners of a square, and a production well in the center, are common in the industry. Alternating injection and production wells are used in narrow deposits (see Figure 7). The spacing between injection and production wells can range from 20 to 200 feet. The number of well patterns in a well field varies, and a specific range of numbers was not obtained. Mining units are portions of the deposit to be mined at one operation, often following "pods" of ore deposited along a roll front.

Mining units may be mined in sequence or simultaneously. Pumping rates at one *in situ* operation in Wyoming ranged from two gallons per minute (gpm) to 30 gpm for injection wells and five gpm to 40 gpm

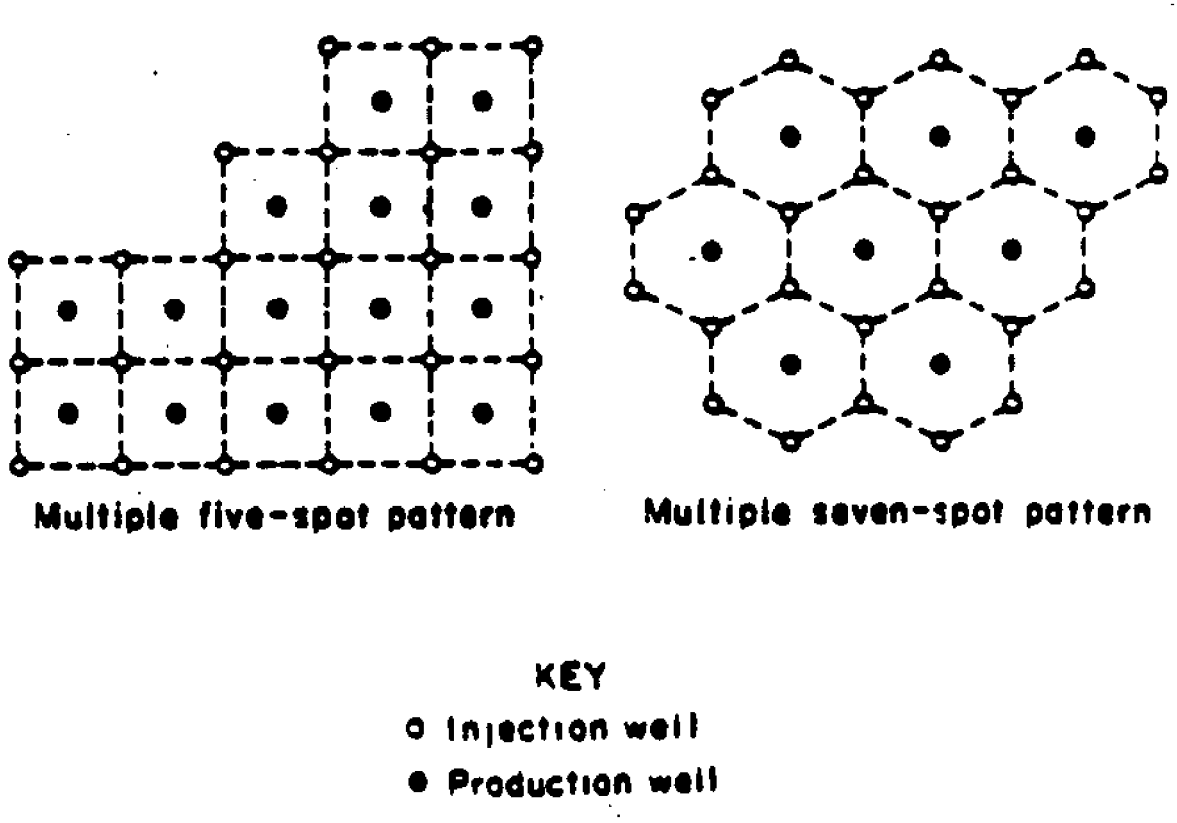

Figure 1-7. Well-Field Patterns

(U.S. BOM, 1978)

for production wells. Approximately one percent of the fluid drawn from the well field is removed as a bleed to generate a cone of depression within the "production zone." Pumping rates can be varied at each well individually in order to compensate for differences in permeability of the deposit and the gradient being generated by the production operation.

Lixiviant is introduced to the deposit through injection wells to initiate the operation. The lixiviant consists of two parts, an oxidizing agent, which acts to solubilize the target minerals, and a complexing agent, which binds to the target minerals, keeping them in solution. In the developmental stages of *in situ* mining, lixiviants were selected based solely on their ability to dissolve and mobilize the target minerals. Sulfuric acid, nitric acid, ammonium carbonate/bicarbonate and sodium carbonate were among the first lixiviants used. Sulfuric acid lacked effectiveness in carbonaceous deposits and, while nitric acid was more effective on carbonaceous ores, the nitrogen component made aquifer restoration difficult. Ammonium carbonate/bicarbonate leach solutions also presented problems in the restoration phase. Sodium-based lixiviants allowed for relatively easy aquifer restoration; however, in some cases, the sodium fraction reacted with clays in the deposits, reducing permeability of the aquifer (in the immediate vicinity of the injection wells) (USBOM, 1981b). According to permit documents, Wyoming *in situ* operations recover uraniferous minerals using oxygen gas as the oxidizer and carbon dioxide, which ultimately forms complexes with uranium to form uranyl carbonates, as the complexing agent (WDEQ, 1991).

The constituents of the lixiviant used at the Highland Uranium Project *in situ* operation in Wyoming are as follows:

Na	50-200 mg/l
Cl	50-900 mg/l
SO_4	100-400 mg/l
TDS	500-1850 mg/l
pH	6.2-6.5
HCO_3	200-1200
O_2	10-600 mg/l

Source: WDEQ, 1991.

Operational steps in *in situ* mining are straightforward. The barren lixiviant is charged with carbon dioxide as the solution leaves the ion exchange facility (discussed in more detail later in this chapter). Oxygen is injected to the solution in the wellfields, immediately before the lixiviant moves into the injection wells. As the solution moves through the deposit, uraniferous minerals are oxidized and move into solution. (A discussion of the oxidation and complexing is provided in the Leaching section above.) Carbon dioxide in the lixiviant reacts with water, forming carbonic acid, which in turn complexes with the solubilized uraniferous ions, forming uranyl carbonates. The uranyl carbonates and gangue minerals solubilized in the operation remain in solution as the pregnant solution is pumped to the surface through production (recovery) wells.

Pregnant lixiviant is pumped from the production wellheads through sand filters to remove any large particulates; the lixiviant is then transferred to the ion exchange units. Depending on the facility, the ion exchange resins may be placed in trailer-mounted tanks or moved via tanker truck from satellite plants to a central processing facility. Ultimately, the uraniferous compounds are stripped from the resins and precipitated to form yellowcake. The ion exchange and precipitation steps are discussed respectively in

sections above. The lixiviant is recharged with carbon dioxide and oxygen following the ion exchange circuit and injected back into the ore body.

Uranium recovery rates at *in situ* operations are highest within the first year of operation; economically viable recovery within a wellfield usually lasts one to three years under recent (1990s) market conditions. The efficiency of recovery is variable; the Highland Uranium Project in Wyoming reportedly recovers 80 percent of the estimated uranium reserve at the end of the production cycle (Hunter, 1991).

When uranium recovery drops below a previously determined point, lixiviant injection is terminated and the restoration phase is established in the wellfield. Aquifer restoration is required under State regulatory programs (see the Current Regulatory Framework chapter below). Normally, an aquifer must be restored to its previous water use classification although not all water quality parameters are necessarily returned to baseline values.

Restoration

Restoration of the aquifer can be conducted using one (or more) of the following techniques: groundwater sweep, forward recirculation, reverse recirculation, and directional groundwater sweeping. In some cases, a reducing agent may be injected prior to any restoration to reverse the oxidizing environment created by the mining process. A reducing agent may also be injected during later stages of restoration if difficulties arise in stabilizing the aquifer (Lucht, 1990).

A groundwater sweep involves the selective operation of production wells to induce the flow of uncontaminated groundwater into the mined zone while the withdrawn water continues to be treated through the ion exchange circuit. Contaminated water withdrawn from the aquifer can be disposed of in lined evaporation ponds or treated and discharged. Groundwater sweeps are most effective in aquifers with "leaky" confining layers, since uncontaminated groundwater can be induced to flow into the mined areas. Typically, two or more pore volumes are required to improve water quality parameters. The disadvantage to groundwater sweeping is its consumptive use of groundwater (Osiensky and Williams, 1990).

Forward recirculation involves the withdrawal and reinjection of groundwater through the same injection and production wells that were used during the mining operation. Groundwater withdrawn from the mined aquifer is treated using ion exchange or reverse osmosis with the clean water being reinjected and recirculated through the system. The water being reinjected is treated to the extent that it meets or exceeds the water quality required at the endpoint of restoration. The method does not allow the removal of any lixiviant or mobilized ions that may have escaped from the mined aquifer. For this reason, forward recirculation is most effective in restoring the portions of the aquifer associated with the interior of the well field (Osiensky and Williams, 1990).

Reverse circulation techniques can also be employed in which the function of production and recovery wells is reversed. Again, "clean" water is injected, this time through the recovery wells, while the injection wells are

employed to withdraw groundwater from the aquifer. This method is also more effective in restoring the aquifer in the interior of the well field than along the perimeter (Osiensky and Williams, 1990).

Directional groundwater sweeping techniques involve the pumping of contaminated groundwater from specific wells while treated water (at or surpassing baseline quality) is injected into the aquifer beyond the mined sections of the aquifer. The clean water is then drawn into the contaminated portions of the aquifer, removing the mobilized ions. Clean water injection can progress across a wellfield as the contaminants are progressively withdrawn (Osiensky and Williams, 1990).

Uranium can be recovered during the early stages of the restoration process as the water from the production wells passes through the ion exchange system. Eventually, uranium recovery is abandoned while restoration continues. A rinse of multiple aquifer pore volumes is typically required to reach a satisfactory level of restoration. The number of pore volumes required depends on ease with which the aquifer returns to baseline conditions and the permit requirements established in State permits (Osiensky and Williams, 1990; BOM, 1979).

Demonstration of successful restoration is accomplished through extended monitoring. The state of Wyoming, for example, requires that selected wells be monitored for stability for a period of at least six months following the return of monitoring parameters to baseline level (WDEQ, 1990).

Monitoring

In situ operations maintain monitor wells and a monitoring plan to detect any migration of the lixiviant from the production zone. Such movement of the lixiviant or any of its constituents from the mined portion of the aquifer into adjacent or overlying aquifers is termed an excursion. Excursions may be either vertical or horizontal. Horizontal excursions typically occur when pumping rates from production wells do not create a large enough cone of depression to maintain the lixiviant within the production zone. These excursions are brought under control by adjusting the pumping rates within the injection and production wells. Vertical excursions occur when lixiviant constituents are detected in an aquifer (typically) above the production zone. Vertical excursions may develop as a result of a leaky confining layer, improper construction of injection or production wells, or, more commonly, from wells previously drilled into the aquifer that were not adequately plugged before mining operations commenced. Vertical excursions are more difficult to remedy and may require extensive

testing to identify the source of the 'leak'. Wells may need to be sealed and new wells installed, depending on the source and severity of the vertical excursion. The number of excursions occurring at *in situ* operations has decreased with the growth in understanding of the causes of excursions and methods to avoid them. This technology developed with expansion of the industry through the 1980s (NRC, 1986).

As part of the monitoring program, upper control limits (UCLs) are established during baseline data collection. UCLs consist of groundwater parameters that would be expected to rise in the event of an excursion (NRC, 1986). Total dissolved solids, chloride, sulfate, bicarbonate and sodium have been used as UCLs by uranium *in situ* operations (WDEQ, 1990). Since horizontal and vertical excursions may occur, monitoring wells are established both above and below the production zone as well as around it. Monitoring for the purpose of detecting excursions is conducted on a regular basis usually established in the operating permit.

1.5 EXTRACTION AND BENEFICIATION WASTES AND MATERIALS ASSOCIATED WITH URANIUM MINING OPERATIONS

This section describes several of the wastes and materials that are generated and/or managed at uranium extraction and beneficiation operations and the means by which they are managed. A variety of wastes and other materials are generated and managed by uranium mining operations.

Some, such as waste rock and tailings, are generally considered to be wastes and are managed as such, typically in on-site management units. Even these materials, however, may be used for various purposes (either on- or off-site) in lieu of disposal. Some quantities of waste rock and tailings, for example, may be used as construction or foundation materials at times during a mine's life. Many other materials that are generated and/or used at mine sites may only occasionally or periodically be managed as wastes. These include mine water removed from underground workings or open pits, which usually is recirculated for on-site use but at times can be discharged to surface waters. Some materials are not considered wastes at all until a particular time in their life cycles.

The issue of whether a particular material is a waste clearly depends on the specific circumstances surrounding its generation and management at the time. In addition, some materials that are wastes within the plain meaning of the word are not "solid wastes" as defined under RCRA and thus are not subject to regulation under RCRA. These include, for example, mine water or process wastewater that is discharged pursuant to an NPDES permit. It is emphasized that any questions as to whether a particular material is a waste at a given time should be directed to the appropriate EPA Regional office.

Wastes and materials generated by uranium mining operations include waste rock, tailings, spent extraction/leaching solutions, and refuse. Mining method (conventional versus solution) has a bearing on the types of wastes and materials produced. Operational mills function independently of specific mines and generate materials that are, in most cases, unique from those generated at the site of extraction. Under the Uranium Mill Tailings Remediation Control Act (UMTRCA, see Regulatory section below), source handling licenses place specific requirements on the disposal of radioactive wastes; the design and construction of tailings impoundments typically address Nuclear Regulatory Commission (NRC) requirements for permanent storage of these wastes. Radionuclide-containing wastes generated by *in situ* operations are typically shipped to tailings impoundments at mill sites.

The greatest volume of waste generated by conventional mineral extraction (open pit and underground mines) is waste rock, which is typically disposed of in waste rock piles. Some waste rock is used for onsite construction (roads, foundations). The generation of acid mine drainage is one of the principal concerns surrounding waste rock in other mineral sectors; the potential for generation of acid drainage from uranium waste rock has not specifically been addressed in the references reviewed for this profile. However, pyrite is typically a constituent of uranium-containing ores, and may present the potential to great acid mine drainage in sufficient concentrations. Other materials generated by open pit and underground mining operations, including low-grade ore and mine water, are typically managed on-site during the active life of the facility.

Low-grade ores that are not beneficiated ultimately become waste rock. If a mill is co-located with a mine, mine water can be used as makeup water in the beneficiation operation. If a mill is not nearby, mine water may be treated and discharged (effluent standards are set forth in 40 CFR 440), or used for dust suppression.

The principal waste generated by conventional beneficiation operations are tailings; *in situ* operations, and to a more limited extent conventional mills, generate waste leaching solutions. Disposal of these wastes is dependent on the type of operation; beneficiation wastes generated by *in situ* operations are disposed of by one of four management methods: evaporation ponds, land application, deep well disposal, or shipment to NRC-licensed waste disposal facilities. Most beneficiation wastes generated at conventional mills are disposed of in tailings impoundments.

Waste constituents of concern include radionuclides (radium, radon, thorium, and to a lesser extent lead), arsenic, copper, selenium, vanadium, molybdenum, other heavy metals, and dissolved solids. Brines, spent ion exchange resins, and chemicals used in beneficiation operations are also constituents of wastes generated during beneficiation.

The first subsection below describes several of the more important wastes (as defined under RCRA or otherwise) and nonwastes alike, since either can have important implications for environmental performance of a facility. The next subsection describes the major types of waste units and mine structures that are of most environmental concern during and after the active life of an operation.

1.5.1 Extraction and Beneficiation Wastes and Materials

1.5.1.1 Waste Rock or Overburden

According to the 1985 *Report to Congress: Wastes From the Extraction and Beneficiation of Metallic Ores, Phosphate Rock, Asbestos, Overburden from Uranium Mining, and Oil Shale*, the greatest quantity of waste generated as a result of the mining and beneficiation of uranium ore is in the form of overburden and waste rock. Generally, these materials are deposited in waste rock piles or dumps. Surface mining operations generate more waste per unit of crude ore extracted than underground operations. During the late 1970s, the largest open pit uranium mines produced an average of 40,000,000 metric tons of overburden annually. Underground mines produced an average of 2,000 metric tons of waste rock during the same time period. Characteristics of the waste rock were not specifically determined although limited data indicated that waste rock contained higher levels of arsenic, selenium, and vanadium than background levels (USEPA, 1983b Vol.2).

1.5.1.2 Mine Water

Mine water is generated when water collects in mine workings, both surface and underground, as a result of inflow from rain or surface water and of groundwater seepage. Surface water is generally controlled using engineering techniques to prevent water from flowing into the mine. During the life of the mine, water is

pumped out of the mine as necessary to keep the mine dry and allow access to the ore body for extraction. This water may be pumped from sumps within the mine pit or underground workings or may be withdrawn from the vicinity of mining activity through interceptor wells. Interceptor wells are used to remove groundwater, creating a cone of depression in the water table surrounding the mine; the result is dewatering of the mine. Mine water may be treated and discharged (subject to 40 CFR 440 Subpart C), or, if a mill is operating on-site, mine water can be pumped to the beneficiation circuit or to tailings impoundments.

The quantity and chemical composition of mine water generated at mines vary by site. The chemistry of mine water is dependent on the geochemistry of the ore body and surrounding area. The two principal concerns surrounding mine water associated with uranium mining are the potential for acid mine drainage and the presence of radionuclides.

Information on the potential for generation of acid mine drainage from uranium mine workings and waste rock was not available. While pyrite (an acid-forming mineral) is present in some uranium ore deposits, many uranium mines are located in arid climates. Low precipitation rates and the resultant lack of water may reduce the potential for generation of acid drainage (at least in the short term) from waste rock in both the Colorado Plateau and the Shirley Basin of Wyoming.

The presence of radionuclides in mine effluent has been documented and, in at least one case, uranium was recovered using ion exchange on effluent seeping from an inactive underground mine. The presence of elevated levels of radionuclides in alluvial aquifers in the Grants Mineral Belt, New Mexico, were attributed to authorized discharges from mines (discussed in the Environmental Effects section of this report) (Eadie and Kaufmann, 1977).

1.5.1.3 Tailings

Most wastes generated by conventional mills are disposed of in tailings impoundments.
Wastes are primarily disposed of in the form of a slurry composed of tailings, gangue (including dissolved base metals), spent beneficiation solutions, and process water bearing carbonate complexes (alkaline leaching) and sulfuric acid (acid leaching), sodium, manganese, and iron. The characteristics of this waste vary greatly, depending on the ore, the beneficiation procedure, and the source of the water (fresh or recycled). The liquid component is usually decanted and recirculated to the crushing/grinding or leaching circuit.

Tailings typically consist of two fractions, sands and slimes. The sand and slimes may be combined and deposited directly in the impoundment or may be distributed through a cyclone such that the sand fraction is directed toward the dam while the slimes are directed to the interior of the pond (Merritt, 1971).

The fate of radionuclides is of special interest in uranium mill tailings. Radium-226 and thorium-230 are the principal constituents of concern and are associated with the slime fraction of the tailings. Radon-222 (gas) is also a tailings constituent. The concentrations of radionuclides in the tails will vary depending on the leach

method used (thorium is more soluble in acid than alkaline leaches); typically, tailings will contain between 50 and 86 percent of the original radioactivity of the ores depending on the proportion of radon lost during the operation (Merritt, 1971). Other tailings constituents (including metals, sulfates, carbonates, nitrates, and organic solvents) would also be present in the tailings impoundment depending on the type of ore, beneficiation methods, and waste management techniques. (For updated information on specific hazardous constituents, see 60 *Federal Register* 2854, January 11, 1995, which is attached in Appendix C).

1.5.1.4 Bleed Solution

Bleed solutions are generated in both the extraction and restoration phases of *in situ* mining. There are three pathways that lead to the solution bleeds. During the extraction phase, a one percent bleed is typically maintained to develop the cone of depression within the mined aquifer (i.e., one percent less barren lixiviant is injected than the amount of pregnant solution withdrawn). The bleed is drawn from the circuit following the ion exchange columns and prior to the lixiviant being recharged for reinjection. Aalso, in the early phases of restoration, lixiviant injection is terminated; however, the solution removed by recovery wells is also sent through ion exchange to recover uranium remaining solubilized in the deposit. A bleed is maintained through this operation, again following the ion exchange step. In addition, as recovery of uraniferous components drops and ion exchange becomes uneconomical, solution (water) withdrawn from the mined aquifer through recovery wells is treated with reverse osmosis prior to being reinjected to the aquifer (see the discussion of Restoration above). A bleed is maintained through this point to insure that clean water is drawn into the aquifer being restored.

In each of the above cases, the bleed is usually pumped from the extraction/restoration circuit to lined settling ponds where barium chloride is added. Barium chloride reacts with radium to form a barium-radium-sulfate precipitate which is allowed to settle out of solution. When the radium levels reach acceptable levels (typically less than 30 mg/l), the water may be pumped to a holding (surge) pond, discharged to surface water through an NPDES-permitted outfall, land applied, or, may be stored in a storage pond for injection during the restoration phase.

1.5.1.5 Evaporation Pond Sludges

In situ bleed solutions and lixiviant leaching solutions constitute the major source of wastes directed to lined evaporation ponds. These solutions consist of barren lixiviant and usually have elevated levels of radium; other contaminants (metals, salts) are limited to what may have been solubilized by the lixiviant or contaminants in solutions used for beneficiation. Barium chloride is added to the evaporation ponds which, in the presence of radium, forms a barium-radium-sulfate precipitate. This precipitate forms the majority of the sludges in the settling/evaporation ponds at *in situ* mining operations. Alkali chlorides and carbonates are other likely constituents (USEPA, 1983b Vol. 2). These sludges are collected at the completion of mining (unless required sooner) and disposed of at an NRC-licensed disposal facility. The Agency does not have information regarding the specific chemical composition or radioactive level of these precipitants.

Evaporation pond sludges at conventional mills may also contain barium-radium-sulfate precipitates in addition to chemical wastes from the leaching and stripping circuits. These sludges may contain metals, sulfates, chlorides, lime, and amines depending on the leaching methods and waste disposal practices (Merritt, 1971).

1.5.1.6 Drilling Wastes

The number of wells involved in an *in situ* mining operation indicates that there may be significant quantities of wastes associated with drilling operations (drilling muds, cuttings, water). Drilling wastes (muds, cuttings, produced water) are typically directed into unlined pits adjacent to the wells. Following well completion, the pits and their contents are typically closed in-place. The majority of the cuttings generated in drilling operations are non-ore bearing and therefore contain little in the way of radioactive minerals (USEPA, 1983b Vol. 2).

1.5.1.7 Waste Ion Exchange Resins

Ion exchange resins have a limited life span and must occasionally be replaced. Resins consist of two portions, an organic structural component and (cationic or anionic) functional groups attached to the organic framework. The chemical composition of functional groups varies from strong acid groups to strong base groups. *In situ* operations typically dispose of spent resins with other so-called "contaminated waste" in labelled containers prior to disposal at an NRC-licensed disposal facility. Conventional mills would typically dispose of spent ion exchange resins in the tailings impoundment. The volume of spent ion exchange resins generated on an annual basis was not determined. At conventional mills, however, the contribution of spent resins to the volume of a tailings impoundment would be minimal compared to the volumes of tailings.

1.5.1.8 Reverse Osmosis Brines

The reverse osmosis process is used by *in situ* operations to treat effluent prior to final discharge and to treat groundwater during the restoration phase. Reverse osmosis wastes are typically high in salts (total dissolved solids) and may have concentrations of radionuclides that exceed NPDES discharge limits. These wastes are typically injected into deep disposal wells permitted under the UIC program (UIC permit requirements are discussed in the Current Regulatory Framework section of this report) (USEPA, 1983b Vol. 2). The quantities generated and more detailed characteristic data were not obtained.

1.5.1.9 Acid/Alkaline Leaching, Solvent Extraction, Stripping and Precipitation Circuit Wastes and Materials

Under normal operating procedures, solutions are recycled to the greatest extent possible to conserve water, chemicals, and uranium. Detailed discussions on the longevity and management of beneficiation solutions were not obtained. All wastes and materials generated during the beneficiation operation are likely to contain radionuclides in at least trace quantities as well as other metals dissolved from the ore.

In addition to radionuclides, solvent extraction solutions include phosphoric acids (cationic ion exchange), amines and ammonium salts (anionic ion exchange), and organic carriers such as kerosene or alcohol. Stripping solution could contain nitrates, chlorides, sulfates hydroxides or acids. Wastes from the ion exchange solution are dependant on the type of resins employed, however, chloride solutions are commonly used for elution. Constituents that could accumulate in the precipitation circuit are primarily anions - sulfates, chlorides and possibly, carbonates (Merritt, 1971; Twidwell et al., 1983). Again, information on quantities and characteristics were not obtained.

1.5.2 Waste and Materials Management

Wastes and nonwaste materials generated as a result of extraction and beneficiation of uranium ore are managed (treated, stored, or disposed) in discrete units. For the purposes of this report, these units are divided into six groups: (1) mine structures such as pits and underground workings; (2) overburden, waste rock, and ore; (3) tailings impoundments; (4) settling/evaporation ponds; (5) land application areas; and (6) deep disposal wells.

1.5.2.1 Overburden, Waste Rock, and Ore

Overburden and waste rock removed from the mine are stored or disposed of in unlined piles on site. Often constructed without liners, these waste dumps are generally unsaturated in the arid regions where most uranium mining occurs. Such dumps could possibly generate acid drainage if pyrites or other sulfide minerals and moisture are present in sufficient concentrations. Concentrations of radionuclides are likely to be similar to those in adjacent, undisturbed deposits although radon (gas) levels may be higher as a result of higher diffusion rates through unconsolidated piles as opposed to undisturbed bedrock. Topsoil may be segregated from overburden and waste rock and stored for later use in reclamation and revegetation.

Some operations store extracted ore in stockpiles until they are beneficiated as directed by the operator's mining, operating, or production plan. These piles may be located in or outside the pit. In some cases, low-grade ore may never be beneficiated and become waste at closure. Ore and sub-ore piles are typically unlined. States may or may not have required run-on/runoff controls for these piles; however, they are not required. Constituents of concern for waste rock and ore piles include low concentrations of radionuclides as well as sulfur-bearing minerals that, under certain conditions, may generate acid and, thus, leach metals.

1.5.2.2 Mine Pits and Underground Workings

In addition to wastes generated during active operations, when the mines close or stop production, pits and underground workings may be allowed to fill with water, since the need for dewatering is gone. (Mine water generated during the active life of a mine is usually not considered to be a waste; however, it is generally considered waste after mine closure.) Radionuclide concentrations are likely to be elevated in mine water (collected in abandoned pits or underground workings, and in discharges) and acid generation may be a problem, depending on local geochemistry. Abandoned underground mines and mine shafts may be

unprotected, and the surface above the mine may, with time, subside, though this is mostly a problem with historical mines. Deficiencies in mine shaft protection may be caused by the use of unsuitable materials, such as inadequate shaft cappings, or by unexpected occurrences that break capping seals, such as water surges in flooded mines (US DOI, Bureau of Mines 1983a).

1.5.2.3 Tailings Impoundments

The requirements for tailings impoundments at operational active mills changed with Title II of UMTRCA. Among other things, UMTRCA banned the use of mill tailings for off-site construction, the most significant pathway for human exposure to radionuclides (USEPA, 1983b Vol 2). Through UMTRCA, the NRC requirements for tailings ponds at active mills include impermeable liners to control the migration of liquids and soluble constituents, and adequate closure at the termination of milling operations. Prior to UMTRCA, impoundments were frequently unlined and reclamation (closure) requirements would have been dependant on State requirements. (For updated information, see 60 *Federal Register* 2854, January 11, 1995, which is attached in Appendix C).

Two general classifications of structures may be used to describe a tailings impoundment: water/slurry retention dams and raised embankments. The choice of impounding structure is influenced by the characteristics of the mill tailings, beneficiation effluents, and area geology and topography. The size of tailings impoundments varies between operations and may range up to hundreds of acres. No information was obtained on the number or sizes of evaporation ponds or on closure/reclamation practices.

1.5.2.4 Evaporation Ponds

Evaporation ponds are used by conventional milling operations to dispose of process water or other solutions that are unsuitable for discharge or undesirable for addition to the tailings impoundment. Wastes directed to evaporation ponds include barren leach, solvent exchange and ion exchange solutions. Bentonite or synthetic liners are typically installed to prevent the migration of fluids from the pond. Sludges removed from evaporation ponds are deposited in the tailings impoundment. No information was obtained on the number or sizes of evaporation ponds or on closure/reclamation practices.

1.5.2.5 Settling Ponds

Settling ponds are employed at *in situ* mining operations to remove radium from the bleed solution prior to discharge. Waste process water may also be directed to settling ponds after passing through an ion exchange or reverse osmosis circuit to remove the majority of contaminants. Barium chloride is added to the bleed solution to precipitate the radium, bringing the effluent within NPDES standards. The effluent can then be discharged via an NPDES permitted outfall or land applied. During restoration, settling pond effluent may be pumped to a storage reservoir and ultimately reinjected. Sludges removed from the settling ponds are containerized and shipped to NRC-licensed disposal facilities.

1.5.2.6 Land Application Areas

Land application is used as a method of eliminating the volume of water generated in the bleed solution during extraction and restoration phases of *in situ* mining. Land application discharges are permitted (in Wyoming) as a form of wastewater treatment and are required to meet NPDES discharge standards. The effluent is typically discharged to native grasslands used for grazing or hay production. Volumes of discharges were not determined.

1.5.2.7 Deep Disposal Wells

Since *in situ* mining operations usually do not operate a tailings impoundment, an alternative source for disposal of wastes is necessary. Deep disposal wells are often used to dispose of wastes that cannot be recycled, treated, and/or discharged. Brines generated by reverse osmosis treatment, laboratory wastes and other wastes are typically injected. Operation of these wells is regulated under the UIC program described in the Current Regulatory Framework section of this report. Volumes and characteristics of injected wastes were not determined.

1.6 ENVIRONMENTAL EFFECTS

1.6.1 Introduction

Uranium has been associated with mining wastes since the late 1890s when it was discarded as undesirable component in the mining of radium (and to a lesser extent, vanadium). Twelve mills operated on the Colorado Plateau for different periods from 1901 through the late 1980s. Initially, these mills beneficiated radium, although most if not all were also used for beneficiation of uranium as the industry developed (MINOBRAS, 1978).

Nearly any portion of waste management units at active mines may be a potential source of environmental contamination. Environmental effects resulting from uranium extraction and beneficiation are chiefly derived from two sources: mining activities, and radionuclides present in the wastes. Open pit mining activities may create environmental effects typical of surface disturbances: increased runoff as well as increased erosion by wind and water. Dewatering operations conducted by surface and underground mines may create groundwater depressions that may persist after mining ceases. Potential environmental effects from *in situ* operations are primarily groundwater-related. Since surface disturbance is not extensive, the impacts of surface operations associated with *in situ* mining (e.g. drilling wastes, ponds) are not well documented.

Mill tailings, and particularly the radionuclides contained within, appear to be a major source of environmental impact to air, soil, surface and groundwater. Findings in the *Report to Congress: Potential Health and Environmental Hazards of Uranium Mine Wastes* indicated that the most serious threat to human health was the use of uranium mill tailings in off-site construction. The Department of Energy, through Title I of UMTRCA, is conducting remedial activities on tailings generated by 24 uranium mills throughout the western U.S. (except for one site in New Jersey). UMTRCA's Title II licenses and places

stringent requirements on operations and closure at currently operating (and inactive) mills (USEPA, 1983a). For a discussion of UMTRCA, see the Current Regulatory Framework section of this report.

A discussion of the potential environmental effects associated with uranium mining is presented in the following sections. Specific examples from industry are included in this section, as appropriate. Actual release incidents are described in Appendix A of this report.

This section does not purport to be a comprehensive examination of environmental damages that can occur or that actually occur at mining operations. Rather, it is a brief overview of some of the potential problems that can occur under certain conditions. The extent and magnitude of contamination depends on highly variable site-specific factors that require a flexible approach to mitigation. EPA is aware that many of the potential problems can be, and generally are, substantially mitigated or avoided by proper engineering practices, environmental controls, and regulatory requirements.

1.6.2 Surface Water

1.6.2.1 Mine Dewatering

Surface and underground mines may be dewatered to allow extraction of ore. Dewatering can be accomplished in two ways: (1) pumping from groundwater interceptor wells to lower the water table and (2) pumping directly from the mine workings. At the end of a mine's active life, pumping typically is stopped and the pit or underground workings are allowed to fill with water. The mine water may be contaminated with radioactive constituents, metals, and suspended and dissolved solids.

Prior to being discharged, mine water from uranium mines is usually treated with a flocculent and barium chloride to reduce suspended solids concentrations and to coprecipitate radium. The chemical quality of mine waters differs from the receiving surface waters in several ways. For example, in the Grants Mineral Belt of New Mexico, mine dewatering effluents have been documented to contain elevated concentrations of gross alpha and beta particles; radionuclides radium-226 and lead-210; natural uranium; molybdenum; selenium; and dissolved solids, sulfate in particular. On occasion, arsenic, barium and vanadium are detected (Gallaher and Longmire, 1989). When mine water is discharged to surface waters, it can change the quality of the surface water. Elevated concentrations of metals and radionuclides, constituents typical of mine waters, have been detected in surface waters near uranium mines (EPA, 1983).

In arid climates, like New Mexico, the discharge of mine water to a receiving stream can completely change the hydrologic conditions of the receiving body. Typically, mine water is discharged to ephemeral streams in arid climates. The mine waters have, in some instances, transformed ephemeral streams to perennial streams. These newly created perennial streams often lose flow to subsurface alluvial material which recharges shallow alluvial aquifers. Studies have documented that infiltration of uranium mine dewatering effluents have been accompanied by a gradual change in the overall chemistry of the groundwater, and the groundwater now bears a greater resemblance to the mine dewatering effluent (Gallaher and Longmire, 1989).

The quality of mine water depends upon the dewatering method used. Water removed from wells adjacent to the mine usually is representative of natural groundwater quality, at least while dewatering continues. Mine water removed from the mine, however, can be high in radionuclides, metals, and dissolved solids (EPA, 1984). Practices such as recycling mine water to the mill helps reduce the impacts of mine water to surface water bodies.

1.6.3 Groundwater

Potential and documented effects on groundwater from uranium mining activities vary with the type of activity being conducted. Operation of open pit and underground mines potentially influence groundwater through dewatering operations and through approved discharges as discussed in the surface water section above. Tailings impoundments associated with conventional mills have the potential to leak; while some of the liquid constituents of the tailings are recycled or evaporated, unlined tailings ponds may allow liquids to seep into the ground, eventually reaching groundwater. This is also true for evaporation and radium settling ponds, although some States require liners in all wastewater ponds.

In situ operations inject lixiviant into what is termed the production zone, normally a sandstone aquifer. The potential impacts of these operations result from the increased solubility of uraniferous and other compounds, which facilitates migration of these species into neighboring aquifers. As a result, complete restoration of mined aquifers is not necessarily a simple task.

Dewatering operations at open pit and underground mines may impact local aquifers through drawdowns in the direct vicinity of the mine with (presumably) little lasting effect. However, depending on the transmissivity of the aquifer, the size of the dewatering operation, and the number of mines actively conducting dewatering, impacts to aquifers may be significant. Mining activity from 1970 through 1984 near the Everest Minerals' Highland Uranium Project reportedly withdrew 39,000 acre-feet of water. Although the extent of the drawdown was not stated, a 1991 Wyoming Department of Environmental Quality document reported that the potentiometric surface within the area was "recovering" (WDEQ, 1991).

It should be noted that groundwater impacted or potentially impacted by mining activities is not necessarily suited for domestic use prior to mining. For example, aquifers containing uranium ores in both Wyoming and New Mexico have been documented as having elevated levels of uranium and other radionuclides prior to the initiation of mining activities (WDEQ, 1991; Eadie and Kaufmann, 1977).

Dewatering activities in the Grants Mineral Belt, as discussed in the previous section, has impacted both surface water and alluvial aquifers. Streams receiving mine effluent had higher than baseline concentrations of uranium, radium, lead, selenium, and molybdenum. Studies completed as recently as 1986 indicate that the shallow aquifers underlying these streams had begun to chemically resemble mine water; concentrations of those constituents that may migrate (uranium, selenium, molybdenum) were higher than in "natural waters" (Gallaher and Longmire, 1989). The extent of recovery of both surface and shallow groundwater in the

Grants Mineral Belt, following the decline of uranium mining activities in the early 1980s, was not determined.

Mill sites covered under Title I of UMTRCA have been investigated to determine the extent of migration of tailings constituents. Migration of uranium and other tailings constituents occurs through leaching (percolation of precipitation) and erosion. Migration caused at least local contamination of groundwater at all of the 24 sites investigated. The following groundwater quality parameters at these sites were most frequently exceeded: uranium, molybdenum, manganese, nitrate, sulfate, and gross alpha activity. Additionally, arsenic, iron, selenium, radium and total solids exceeded drinking water maximum Contaminant limits (MCLs) at some sites (USEPA, 1987). The degree of migration is related to numerous factors including the chemistry of the tailings material; the permeability of the impoundment and liner (if present); the amount of precipitation; the nature of the underlying soils; and the proximity to both surface and groundwater. (For updated information, see 60 *Federal Register* 2854, January 11, 1995, which is attached in Appendix C).

Environmental effects associated with early *in situ* leaching operations occurred as a result of lixiviant selection. Early lixiviants included acid solutions and ammonium carbonates. Restoration of aquifers leached with acid lixiviants proved difficult as pH levels were difficult to raise after being dropped. Aquifers leached with ammonium lixiviants were also difficult to restore as the ammonium ions readily attached to clay particles within the production zone and were difficult to remove (Bureau of Mines, 1981b).

Extraction and restoration techniques have evolved and improved since *in situ* techniques were first employed. Carbon dioxide and oxygen are commonly used as the lixiviant in current *in situ* operations; recovery of the lixiviant itself, may not be a serious problem. However, restoration must remove or otherwise neutralize the oxidant in order to restore chemical stability within the aquifer. Recovery of the lixiviant and solubilized constituents at the end of the extraction operation can be complicated if the lixiviant migrates to an area that has poor hydraulic connections to the rest of the production zone. Lixiviant in these hydraulic "dead ends" may continue to solubilize enough constituents to preclude attainment of baseline parameters (Osiensky and Williams, 1990). This type of effect is typically limited to specific wells or portions of the production zone rather than entire production zones.

Although carbon dioxide and oxygen do not constitute contaminants of an aquifer, they function to oxidize and solubilize uranium (and other) constituents of the production zone. Once solubilized, the potential exists for migration of these constituents out of the production zone. Migration of solubilized minerals or lixiviant out of the production zone is termed an excursion. The severity of an excursion is dependant on the constituents involved (all solubilized constituents do not necessarily migrate), the use class of the affected aquifer, and the extent of the excursion. Detecting excursions may be complicated by the fact that constituents that have been solubilized may migrate out of the production zone and become reduced or precipitate prior to reaching a monitoring well. For this reason, selection of adequate parameters for use as upper control limits (UCLs) is critical (NRC, 1986).

In 1986, the NRC conducted an analysis of excursions at *in situ* mines in Wyoming and Texas. The percentage of excursions reported for individual wells compared to all operational wells was not discerned. The frequency of excursions was also not determined although the duration may range from a period of days to more that two years (in one case). The study found that the incidence of vertical excursions can be reduced by fully investigating the integrity of the aquifer prior to initiating extraction. Additionally, the study indicated that once excursions occur, horizontal excursions are more readily controlled than vertical excursions (NRC, 1986).

1.6.4 Air

1.6.4.1 Radon

Underground uranium mines produce exhaust, which typically has Radon-222 in measurable concentrations. Radon-222 is present in the exhaust because it emanates from the ore. The concentration of Radon-222 in mine exhaust varies depending upon ventilation rate, mine volume, mine age, grade of exposed ore, size of active working areas, moisture content and porosity of rock, barometric pressure, and mining practices. A previous EPA study indicates that higher Radon-222 emission rates occur at older mines, probably because there are larger surface areas of exposed ore and subore. By properly capping the exhaust vents and sealing the shaft and mine entrances with bulkheads, radon emission rates from inactive or closed underground mines can be dramatically reduced (EPA, 1983a).

Aboveground sources of radon-222 at both underground and surface extraction and beneficiation operations include exhalation from ore, waste rock, overburden (at surface mines only), and tailings. The amount of radon that emanates from these materials into the surrounding atmosphere can depend upon, among other things, the exposed surface area of the units in which the materials are located; the grade of material; the control mechanisms used; and, in the case of tailings, the method of deposition (EPA, 1983).

Radon also escapes from drill holes. When the development drill penetrates the ore body, the ore and sub-ore formations in the drill hole become exposed to air. Consequently, the radon emanates from the ore into the drill hole and can escape into the atmosphere (EPA, 1983a).

1.6.4.2 Fugitive Dust

A primary source of air contamination at mine sites are fugitive dust emissions from mine pits and underground workings, overburden, mine rock dumps, ore, sub-ore, and haul roads. Tailings may also be a potential source of fugitive dust when particulates are transported by wind. Dust emissions vary depending upon moisture content, amount of fines, number and types of equipment operating, and climate. The movement of large haul trucks can be a source of dust at most uranium mines. To minimize fugitive dust, haul roads are frequently sprinkled with water during dry periods or dust suppressants are applied. During the active life of the mine, water may be applied to these piles to control dust and prevent entrainment. After

mine closure, revegetation or other stabilizing methods may be used to control dust. The potential contaminants are heavy metals and other toxics (EPA, 1983).

1.6.4.3 Soils

The migration of radionuclides from mining or beneficiation operations into the soil can cause an increase in radioactivity of soils. It was found that radium-226 and, to a lesser extent, thorium-232 can adsorb into the structure of clay particles. These entities can also be desorbed by low concentration salt solutions (USBOM, 1984). Any metals that are present in waste rock, sub-ore, or tailings can be leached to the surrounding soil.

Environmental effects of uranium mining activities on soils includes those derived from surface disturbances. The most extensive soil disturbances are created by surface mines although surface facilities constructed for underground or *in situ* mining operations also impact soil, including a loss of vegetation cover. Loss of vegetation cover typically results in increased erosion rates unless measures are taken to stabilize topsoil and divert surface runoff from disturbed areas.

1.7 CURRENT REGULATORY FRAMEWORK

1.7.1 Introduction

Uranium mining activities must meet the requirements of both Federal and state regulations. The first part of this chapter addresses both the primary statutes that give Federal agencies the authority to regulate these activities and the regulations themselves. The latter portion of the chapter presents the regulatory programs of Texas and Wyoming to serve as examples of how State regulatory programs apply to uranium extraction and beneficiation.

The statutes (and associated regulations) that this chapter examines include: the Clean Water Act (CWA), as amended (33 USC 1251 et seq); the Clean Air Act (CAA), as amended (42 USC 7401 et seq); The Safe Drinking Water Act (SDWA), as amended (42 USC 300 (f) et seq); and the Atomic Energy Act (AEA) (42 USC 2021 et seq), as amended by the Uranium Mill Tailings Radiation Control Act (UMTRCA) (72 USC 7901 et seq). The primary Federal agencies responsible for implementing the aforementioned statutes include: the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the Department of Energy (DOE). The paragraphs below introduce each of the major statutes, which are described in more detail in subsequent sections.

The CAA gives EPA the authority to regulate emissions of both "conventional" pollutants, like PM_{10} (particulate matter less than 10 microns) and hazardous pollutants, such as radon. Both of these air pollutants are emitted by uranium extraction and beneficiation activities.

The CWA gives EPA the authority to impose effluent limits, via permits, on point-source discharges, including those from during uranium extraction and beneficiation operations, to waters of the U.S. It also

gives EPA the authority to regulate, through permits, storm water discharges from both inactive and active mine sites.

EPA established an Underground Injection Control (UIC) program under the authority of the Safe Drinking Water Act. Through this program, EPA established a permit system to ensure underground sources of drinking water are protected from the injection of process fluids and liquid wastes, including those produced during uranium extraction and beneficiation, into the subsurface via wells.

Under UMTRCA, EPA has the responsibility to establish standards for exposure of the public to radioactive materials originating from mill tailings and for cleanup and control standards for inactive uranium tailings sites and associated vicinity areas. It also gave EPA a mandate to establish standards for managing uranium tailings and wastes at active sites. Also under UMTRCA, DOE's role is to actually clean up and control inactive uranium tailings piles to comply with EPA standards.

UMTRCA requires the Nuclear Regulatory Council (NRC) to concur with remedies DOE selects for cleaning up and controlling inactive sites. Under UMTRCA, the NRC is also responsible for licensing active uranium mills and licensing inactive uranium tailings sites that have undergone remediation. Although the NRC has promulgated radiation protection standards that regulate active and inactive uranium milling sites, the NRC has no regulatory authority over uranium mines, except the aboveground activities of solution mines. The sections below more fully explore the regulatory roles of each of the aforementioned agencies.

The authority of State agencies to regulate uranium extraction and beneficiation activities comes from two sources, Federally delegated programs and State statutory authority. The Federal programs applicable to uranium extraction and beneficiation activities that can be delegated to the States include: the UIC program, the NPDES program, and NRC licensing and radiation protection standards. In order for a State to be able to administer any or all of these Federal programs, the State must have requirements that are at least as stringent as the respective Federal programs.

UMTRCA Title I Sites

Salt Lake City, UT
Green River, UT
Mexican Hat, UT
Durango, CO
Grand Junction, CO
Rifle, CO (two sites)
Naturita, CO
Maybell, CO
Slick Rock, CO (two sites)
Shiprock, NM
Ambrosia Lake, NM
Riverton, WY
Converse County, WY
Lakeview, OR
Falls City, TX
Tuba City, AZ
Monument Valley, AZ
Lowman, ID
Cannonsburg, PA
Edgemont, SD
Bowman/Belfield, SD

1.7.2 Federal Regulatory Program

1.7.2.1 The Uranium Millings Tailings Remediation Control Act

The U.S. Government began to purchase uranium for defense purposes in the early 1940s. Since that time, large quantities of tailings have been generated by the uranium milling industry. In many cases, these tailings have been dispersed from impoundments and piles by natural forces and by humans for construction use in or around buildings or for roads. UMTRCA, which in 1978 amended the AEA, established two programs to protect the public health, safety and the environment from uranium mill tailings. Title I of UMTRCA addresses 22 Congressionally

designated sites (to which DOE added two more) that are now inactive (e.g., all milling has stopped and the site is not licensed by the NRC). A list of these sites can be found in the box below. Title II of UMTRCA addresses active sites (those with NRC or Agreement State licenses) (48 FR 45926).

Risks Posed by Uranium Mill Tailings

Uranium occurs in various minerals as one of three isotopes: U-234, U-235, and the most abundant of the isotopes, U-238. Yellowcake is a generic term used to describe the yellow powder generated as the end product of uranium beneficiation. The purity of yellowcake typically ranges from 60 to 75 percent U_3O_8.[1]

Historically, conventional uranium mining consisted of extracting uranium bearing rock, then crushing, grinding, and froth flotation to produce a uranium concentrate yellowcake. This milling process generated large volumes of tailings which were disposed of in tailings impoundments. Radium-226, thorium-230, and radon-222 (gas) are the radionuclides present in uranium mill tailings that are of principle concern to human health and the environment. In *American Mining Congress v. Thomas* (AMC I), the court recognized the dangers to human health and the environment from uranium mill tailings when it stated that:

> [r]adium decays to produce radon. Radon is an inert gas, some of which escapes from the tailings particles into the atmosphere. Airborne radon degrades into a series of short half-life decay products that are hazardous if inhaled. If the radon gas does not escape the mill tailings piles, its decay products remain in the piles and produce gamma radiation, which may be harmful to people and animals living near the mill tailings piles. Uranium mill tailings also contain potentially dangerous nonradioactive materials such as arsenic and selenium. These toxic and radioactive materials may be ingested with food or water.[2]

Uranium has primarily been mined in the western United States; Arizona, Colorado, New Mexico, South Dakota, Texas, Utah, Washington and Wyoming. A total of 14 uranium mines were operational in 1991; six underground mines, two open pits, and six in-situ facilities. Uranium was also produced to a limited extent as a byproduct of phosphoric acid production at two sites in Florida and one in Louisiana.[3] Both Florida sites no longer produce uranium but are still operating as producers of phosphoric acid.

Regulatory Structure

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[1] Merritt, R.C. 1971. *The Extractive Metallurgy of Uranium*. Colorado School of Mines, Golden, CO.

[2] American Mining Congress v. Thomas (AMC I), 772 F.2d 617, 621 (10th Cir. 1985), cert. denied, 476 U.S. 1158 (1986). See also 48 Fed. Reg. 590, 592 (1983). See generally Environmental Protection Agency, Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites 3-68 (1982).

[3] Domestic Uranium Mining and Milling Industry 1992, Viability Assessment. U.S. Department of Energy, Energy Information Administration, 1993. DOE/EIA-0477(92), Distribution Category UC-98, Washington, DC.

A complex set of federal and state regulations are applicable to uranium mining and processing. These include the Atomic Energy Act (AEA)[4], as amended by the Uranium Mill Tailings Radiation Control Act (UMTRCA)[5]; the Clean Air Act (CAA)[6]; the Clean Water Act (CWA)[7]; and the Safe Drinking Water Act (SDWA)[8].

The primary federal agencies responsible for implementing these statutes include: the Nuclear Regulatory Commission (NRC) the Environmental Protection Agency (EPA) and the Department of Energy (DOE).

The Uranium Millings Tailings Remediation Control Act

In many cases, uranium mill tailings have been dispersed from impoundments and piles by natural forces and by humans for construction use in or around buildings or for roads. UMTRCA established two programs to protect the public health, safety and the environment from uranium mill tailings. Title I of UMTRCA addresses 24 inactive sites. An inactive site means that all milling has stopped and the site is not licensed by the NRC. Title II of UMTRCA addresses active sites that are required to have a license from NRC or an Agreement State.[9]

Title I of UMTRCA[10]

Residual radioactive material is determined by the Secretary of Energy to be radioactive and can be either:

(1) Waste in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores; or
(2) Other waste at a processing site which relates to such processing, including any residual stock of unprocessed ores or low-grade materials.

This term is used only with respect to materials at sites subject to remediation under Title I of UMTRCA.

Title I defines tailings at inactive uranium milling sites as residual radioactive material. It requires the cleanup of offsite tailings and the long-term control of tailings piles. DOE was charged with remediating these designated sites, with the full cooperation and participation of the states, to achieve compliance with standards prescribed by EPA. EPA has promulgated final health and environmental standards to govern stabilization, control, and clean up of residual radioactive materials (primarily mill tailings) at inactive uranium processing sites.[11] The DOE must meet these standards when remediating Title I sites.

[4] 42 U.S.C. § 2021 et seq

[5] 72 U.S.C. § 7901 et seq

[6] 42 U.S.C. § 7401 et seq

[7] 33 U.S.C. § 1251 et seq

[8] 42 U.S.C. § 300 (f) et seq

[9] A state can apply for and obtain permission from the NRC to become an Agreement State under AEA § 274(a), 42 U.S.C. § 2021(a). Otherwise, NRC exclusively regulates source, special nuclear, and byproduct material. As part of obtaining Agreement status, a state must demonstrate that its statutes and regulations conform to NRC requirements. 42 U.S.C. § 2021(d)(2).

[10] 42 U.S.C. § 7918.

[11] 40 C.F.R. 192 (1992).

EPA promulgated standards for two types of remedial actions: control and cleanup. Control places tailings in a situation that will minimize their long-term risk to humans. Cleanup reduces the potential health risks resulting from dispersed tailings. All remedial actions must be selected and performed with the concurrence of the NRC. Upon completion of the remedial action at the 24 designated sites, the NRC must issue a license to ensure that public health and the environment are protected. The license may require DOE to conduct monitoring, maintenance, or any other actions the NRC deems necessary.[12]

The Uranium Mill Tailings Remedial Action Amendments Act of 1988 provides an extension of the UMTRCA Title I deadline for the DOE to finish remediating the 24 designated sites. It allowed DOE until Sept 30, 1994 (previously 1990) to perform remedial actions at designated sites. The authority to perform groundwater restoration was extended without limitation.

The court in *AMC I* upheld most of EPA's standards except for the groundwater provisions of Title I regulations.[13] EPA is currently issuing new groundwater standards as a result of *AMC I*.[14] The previous standards for Title I sites were in the form of qualitative groundwater guidance in which DOE chooses the constituent concentration levels that groundwater must meet. When *AMC I* remanded EPA's standards, it instructed EPA "to treat these toxic chemicals that pose a groundwater risk as it did in the active mill site regulations."[15] In 1987, NRC promulgated final rules for groundwater protection at uranium mill tailings sites that conform to provisions of EPA's standards for groundwater protection at 40 C.F.R. § 192(d) and (e).[16] UMTRCA required agencies to use the available proposed standards until final ones were promulgated.[17]

In 1995, EPA issued final regulations to correct and prevent contamination of groundwater beneath and in the vicinity of inactive uranium processing sites by uranium tailings.[18] The regulations apply to tailings at 24 locations that qualify for remedial action. They provide that tailings must be stabilized and controlled in a manner that permanently eliminates or minimizes contamination of groundwater beneath stabilized tailings, so as to protect human health and the environment. They also provide for cleanup of contamination that occurred before the tailings are stabilized. The rule also establishes groundwater protection standards that include a list of specific hazardous constituents relevant to each waste management area, a concentration limit for each hazardous constituent, the point of compliance, and the compliance period.

EPA promulgated final standards for the control of residual radioactive material from non-operational uranium processing sites designated in Title I of UMTRCA in Subpart A of 40 C.F.R. § 192. The purpose of

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[12] 55 Fed. Reg. 45,591 (1990).

[13] American Mining Congress v. Thomas, 772 F.2d 617 (10th Cir. 1985), cert. denied, 476 U.S. 1158 (1986). Title I regulations are found in 40 C.F.R. 192.20(a)(2)-(3).

[14] 60 Fed. Reg. 2854 (1995).

[15] AMC I, 772 F.2d 617, 640 (10th Cir. 1985).

[16] 52 Fed. Reg. 43,553 (1987).

[17] See AMC I at 623. See also 55 Fed. Reg. 45,591 (1990).

[18] 60 Fed. Reg. 2854 (1995).

Subpart A is to provide for long-term stabilization and isolation in order to inhibit misuse and spreading of residual radioactive materials, control releases of radon to air, and protect water. These standards require that the remediation:

- be designed to be effective for up to one thousand years to the extent reasonably achievable, but at a minimum for 200 years,
- provide reasonable assurance that releases of radon-222 from residual radioactive material to the atmosphere will not exceed an average release rate of 20 Pci/m^2/s,
- provide reasonable assurance that releases of radon-222 from residual radioactive material will not increase the annual average concentration of radon-222 in air by more than one-half picocurie per liter.

Under Subpart B of 40 C.F.R. § 192, EPA promulgated final standards for the cleanup of land and buildings contaminated with residual radioactive materials at the 24 designated inactive uranium processing sites. EPA requires that remedial actions be conducted to provide reasonable assurance that, as a result of residual radioactive materials from any designated processing site:[19]

- The concentration of radium-226 in land, averaged over any area of 100 square meters shall not exceed the background level by more than:
  - 5 picocuries per gram (Pci/g), averaged over the first 15 cm of soil below the surface.
  - 15 Pci/g averaged over 15 cm thick layers of soil more than 15 cm below the surface.
- In any occupied or habitable building:
  - The objective of the remedial action shall be, and reasonable effort shall be made to achieve, an annual average radon decay product concentration (including background) not to exceed 0.02 WL. Regardless, the radon decay product concentration, including background shall not exceed 0.03 WL.
  - The level of gamma radiation shall not exceed the background level by more than 20 microroentgens per hour.

WL (working level) is:
"Any combination of short-lived radon decay products in one liter of air that will result in the ultimate emission of alpha particles with a total energy of 130 billion electron volts." (40 CFR 192)

Subpart C of 40 C.F.R. § 192 allows DOE, with NRC concurrence, to apply supplemental standards in lieu of the standards in Subparts A and B. Before using these supplemental standards, certain conditions must be present; for example, the remedial actions required to satisfy Subpart A or B pose a clear risk of injury to workers or to members of the public.

Title II of UMTRCA[20]

[19] 40 C.F.R. § 192(b) (1992).

[20] 42 U.S.C. § 2022.

Title II of UMTRCA applies to currently operating uranium mill tailings facilities licensed by the NRC or an Agreement State. Title II regulates uranium byproduct materials such as mill tailings at operating sites. The Title II program contains requirements for a final disposal of tailings, the control of effluents into groundwater, and radon emissions during and after milling operations. UMTRCA required EPA to establish standards for operating sites in a manner consistent with standards established under Subtitle C of the Solid Waste Disposal Act, as amended.[21] However, the tailings as a substance are exempt from EPA's RCRA Subtitle C regulations.[22]

The standard setting requirements are divided into two parts. The first part applies to the management of tailings during the active life of the pile and during the subsequent closure period, which begins after cessation of milling operations but prior to completion of final disposal. The second part specifies standards for after the piles are closed, which govern the design of disposal systems.[23] The site must be closed in a manner that meets applicable NRC standards before the NRC or Agreement State terminates the operating license and issues a long-term care license.[24] The NRC requires a detailed Long-Term Surveillance Plan (LTSP) from DOE or an appropriate State which addresses ownership (whether Federal or State), disposal site conditions, the surveillance program, required follow-up inspections, and how and when emergency repairs and, if necessary planned maintenance, will be accomplished.[25]

In 1983, EPA proposed general environmental standards for uranium and thorium mill tailings sites licensed by NRC or one of its Agreement States.[26] The NRC published amendments to 10 C.F.R. § 40 to conform its rules to EPA's general standards in 40 C.F.R. § 192, as it affected matters other than ground water protection.[27]

EPA promulgated final rules in Subpart D of 40 C.F.R. § 192 to establish standards for the management of uranium byproduct materials at Title II sites, pursuant to § 84 of the AEA, as amended. Industry petitioners challenged these rules in *American Mining Congress v. Thomas*

> Byproduct material means the tailings or wastes produced by the extraction or concentration of uranium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by such solution extraction operations do not constitute "byproduct material" (40 CFR 192).

[21] 42 U.S.C. §§ 6901-6992k.

[22] There is no permit required by EPA for the disposal of byproduct material. 42 U.S.C. § 2022(b)(2). Additionally, uranium tailings are exempt from RCRA Subtitle C regulations (hazardous wastes) by 40 C.F.R. § 261.4(b)(7) (1992).

[23] 58 Fed. Reg. 32,174 (1993).

[24] 55 Fed. Reg. 45,591 (1990).

[25] Id.

[26] 48 Fed. Reg. 19,584 (1983). Final standards were published in 48 Fed. Reg. 45926 (1983) and codified in 40 C.F.R. § 192(D) and (E).

[27] 50 Fed. Reg. 41,852 (1985).

(AMC II).[28] The *AMC II* court found that EPA need not make a finding of a "significant risk" prior to promulgating regulations for mill tailings; that EPA may issue standards to apply within the boundaries of the mill sites; that the standards do not unlawfully compel specific engineering and design methods by the implementing agencies; and that EPA properly considered cost and benefit factors in establishing these standards.[29]

Uranium byproduct materials include the tailings or wastes produced by the extraction or concentration of uranium. The final standards address both uranium ore processing operations and closure and post-closure for uranium byproduct management facilities. The uranium ore processing operation standards require:

- impoundments containing uranium byproduct material such as tailings to meet design criteria established by EPA for owners and operators of hazardous waste treatment, storage and disposal (TSD) facilities[30]

- managing uranium byproduct materials to conform to:

  - a combined radium-226 and radium-228 standard of 5 Pci/l,

  - a gross alpha-particle activity (excluding radon and uranium) standard of 15 Pci/l for groundwater,

  - the groundwater protection standards[31] and the monitoring requirements[32] that were established for owners and operators of hazardous waste TSD facilities,

  - the Environmental Radiation Protection Standards for Nuclear Power Operations[33], and

  - the Ore Mining and Dressing Point Source Category: Effluent Limitations Guidelines and New Source Performance Standards, Subpart C, Uranium, Radium, and Vanadium Ores Subcategory.[34]

Uranium byproduct management facilities must meet the following closure and post-closure requirements:

[28] American Mining Congress v. Thomas (AMC II), 772 F.2d 640 (10th Cir. 1985) 16 Envtl. L. Rep. 20,069.

[29] Id.

[30] 40 C.F.R. § 264.221 (1992).

[31] 40 C.F.R. § 264.92 (1992).

[32] 40 C.F.R. § 264.98 (1992).

[33] 40 C.F.R. § 190 (1992).

[34] 40 C.F.R. § 440 (1992).

- closure and post-closure requirements for nonradiological hazards, which EPA promulgated for hazardous waste treatment storage and disposal facilities,[35]

- the disposal areas must be designed to provide reasonable assurance of effective control of radiological hazards for at least 200 years, and

- the disposal areas must be designed to limit releases of radon-222 from uranium byproduct materials to the atmosphere so as not to exceed an average release rate of 20 Pci/m^2/s (the same standard as for Title I sites). This requirement, however, is not applicable to any portion of a disposal site that contains a concentration of radium-226 that, as a result of uranium byproduct material, does not exceed the background level by more than:

  - 5 Pci/g, averaged over the first 15 cm below the surface

  - 15 Pci/g averaged over 15 cm thick layers more than 15 cm below the surface.

1.7.2.2 Nuclear Regulatory Commission

The NRC regulates active uranium milling and inactive uranium mill tailings disposal sites through licenses. It does not regulate the actual mining of uranium, except the above ground activities associated with solution mining. The NRC establishes its procedures and criteria for the issuance of licenses to receive title to, receive, possess, use, transfer, or deliver source and byproduct materials.[36] The authority for issuing these rules comes from the AEA, Title II of the Energy Reorganization Act of 1974, and Titles I and II of UMTRCA.

Source material is:

- Uranium or thorium, or any combination thereof, in any physical or chemical form, or

- Ores which contain by weight one twentieth of one percent (0.05%) or more of:
  - uranium
  - thorium, or
  - any combination thereof.

Source material does not include special nuclear material, for example plutonium or uranium 233 (10 CFR 40).

In *Quivira Mining Company v. NRC (Quivira Mining)*, the court held that NRC can issue regulations under UMTRCA that establish standards to follow in licensing and relicensing uranium mills and tailings sites.[37] The *Quivira Mining* court also held that although NRC performed no new cost-benefit studies in promulgating criteria for its rules, it reasonably relied on the cost-benefit analysis performed by the EPA when it issued its active site regulations.[38]

In a similar case addressing NRC's implementing criteria from the 1987 amendments to UMTRCA, *American Mining Congress v. NRC (AMC III)* held that the NRC properly considered the costs and benefits of its 1987 amendments when it conformed the amendments to the EPA's UMTRCA regulations concerning public health and safety that had already assessed costs and benefits.[39] The *AMC III* court held that since Congress has not stated whether the

[35] 40 C.F.R. § 264.111 (1992).

[36] 10 C.F.R. § 40 (1992).

[37] Quivira Mining Company v. NRC, 866 F.2d 1246 (10th Cir. 1989), 19 Envtl. L. Rep. 20,778.

[38] Id.

[39] American Mining Congress v. NRC (AMC III) 902 F.2d 781 (10th Cir. 1990) 20 Envtl. L. Rep. 21,054.

NRC must independently assess the costs and benefits of its regulations and the NRC is required to conform to EPA's health and safety regulations, NRC's interpretation of the UMTRCA is permissible and avoids replicating EPA's properly conducted cost-benefit analysis.[40] The *AMC III* court also held that EPA acted permissibly under the UMTRCA when it promulgated regulations that imposed RCRA requirements on uranium mill tailings.[41]

Remediated Nonoperating Uranium Mill Tailings Sites

The NRC has issued general licenses for Title I and Title II UMTRCA sites which have undergone remediation. Title I UMTRCA sites, the 24 designated inactive sites, are not subject to any licensing requirements during DOE's remediation, but Title II sites, the active sites, are subject to licensing requirements. The general licenses are for custody and long-term care of:

- Residual radioactive material at uranium mill tailings disposal sites remediated under Title I of UMTRCA
- Byproduct material at uranium or thorium mill tailings disposal sites regulated under Title II of UMTRCA.

These general licenses become effective when the NRC accepts a site's Long-Term Surveillance Plan (LTSP), from either the DOE or Agreement State. There is no termination of these general licenses. The LTSP must contain procedures for establishing groundwater monitoring, groundwater protection standards, inspections, and maintenance measures.

Operating Mill Tailings Sites

Operating mills and mill tailings sites must have site-specific NRC licenses for possessing and using

Highlights of NRC's Appendix A Requirements:

- Permanently isolate tailings such that active maintenance is not necessary,
- Comply with EPA's groundwater protection standards in 40 CFR 192, Subpart D,
- Conduct monitoring, including groundwater monitoring,
- Reduce all airborne effluent releases as low as reasonable achievable, by means of emission controls on mills and controlling dust from tailings piles,
- Establish financial surety to carry out decontamination and decommissioning of the mill and site, and for reclamation of tailings or waste disposal areas,
- Mills must pay a minimum of $250,000 (1978 dollars) to US Treasury or appropriate State agency, prior to license termination, for long-term surveillance costs, and
- Title to the byproduct material licensed in this part and land used for the disposal of this material must be transferred to the US or to the State (at its option).

[40] Id.

[41] Id.

source or byproduct material.[42] The NRC requires the license applicant to file an application for this license at least nine months prior to commencing construction of a plant or facility in which the activity will be conducted.[43] Further, the NRC has determined that the issuance of a license to possess and use source material for uranium milling is a major federal action which significantly affects the environment.[44] Therefore, pursuant to the National Environmental Policy Act, an Environmental Impact Statement must be prepared and submitted with the license application.

The license application must contain a proposed decommissioning funding plan or a certification of financial assurance for decommissioning.[45] Each decommissioning funding plan must contain a cost estimate for decommissioning and a description of the method of financial assurance.[46] Each licensee must keep records of information important to the safe and effective decommissioning of the facility which includes records of spills involving contamination.[47]

An application for a site-specific license must contain proposed written specifications relating to milling operations and the final disposal of the byproduct material to achieve the requirements that the NRC set forth in Appendix A of 10 C.F.R. § 40. Appendix A establishes technical, financial, ownership and long-term site surveillance criteria relating to siting the operation, decontamination, decommissioning, and reclamation of mills and tailings.

Radiation Protection Standards

Pursuant to the AEA and the Energy Reorganization Act of 1974, the NRC established standards for protection against radiation hazards resulting from Title I and Title II activities licensed by the NRC.[48] The regulations establish standards for permissible doses, and levels and concentrations of radiation for restricted and unrestricted areas.[49] They also establish precautionary procedures to be implemented (e.g. personnel monitoring, caution signs, procedures for handling packages, instruction of personnel and storage and control of licensed materials in unrestricted areas). Waste disposal criteria are also established. For example, NRC requires tailings and associated waste to be disposed of by transfer to an authorized recipient or by applying for NRC approval of proposed procedures to dispose of licensed material.[50] The regulations provide for criteria for disposal by release into sanitary sewage systems and other methods.[51] They also provide

[42] 10 C.F.R. § 40 (1992).

[43] Id.

[44] 10 C.F.R. § 51 (1992).

[45] Id.

[46] Id.

[47] Id.

[48] 10 C.F.R. § 20 (1992).

[49] Id.

[50] Id.

[51] Id.

requirements for records, reports and notification on radiation exposure of individuals for whom personnel monitoring is required; for disposal of licensed materials; for theft or loss of licensed materials; and for notification of incidents involving source material.[52]

Uranium Mill Tailings Sites Not Addressed Under UMTRCA

UMTRCA was enacted to provide remediation and protection from uranium tailings produced as a result of government contracts but not private contracts.[53] The 24 Title I sites have a special status because of their government contract relationship and are explicitly provided funding for remediation under UMTRCA. However, there are 12 private sites being addressed under Superfund that owe their problems to uranium mill tailings and other radioactive constituents.[54]

Because of the intrinsic hazard of many mining wastes, EPA relies primarily on the existing authorities of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to require removal and remediation at sites where mining wastes pose a hazard to human health or the environment.[55] Without this Superfund safety net, persons suffering environmental damages from mine sites would have to rely on common-law remedies such as trespass, nuisance, and negligence.

This Superfund safety net was dealt a near fatal blow in the district court decision of *Iron Mountain* where the mining industry argued that the Bevill Amendment expanded the exclusion to include CERCLA liability.[56] The Bevill Amendment exempts uranium mill tailings from EPA's RCRA Subtitle C regulations.[57] The *Iron Mountain* court addressed whether Congress intended for the Bevill exclusion to also protect mining wastes from CERCLA liability. The *Iron Mountain* court held that "[t]he plain meaning of [CERCLA] § 101(14) suggests that only wastes not excluded by the Bevill Amendment or by some other exclusion may be regulated by CERCLA."[58] *Iron Mountain* held that "even if mining wastes are covered by CERCLA, certain wastes are excluded from coverage by reference to the Bevill Amendment in § 101(14)(C)."[59] The *Iron Mountain* court specifically rejected *Eagle-Picher* which held that an excluded mining waste may be subject to CERCLA liability if its components otherwise qualify as a hazardous substance due to its toxicity or other characteristics.[60]

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[52] Id.

[53] See Hecla Mining Co. v. U.S., 909 F.2d 1371 (10th Cir. 1990). 21 Envtl. L. Rep. 20,256.

[54] Mining Waste Sites on the NPL, Executive Summary, Preliminary Draft, 1992. Environmental Protection Agency, Office of Solid Waste. (Document available from the author.)

[55] 42 U.S.C. §§ 9601-9626 (1988).

[56] United States v. Iron Mountain Mines, Inc., 812 F. Supp. 1528, (E.D. Cal. 1992) reaff'd, recons. granted, summ. judgment denied, United States v. Iron Mountain Mines, 1993 U.S. Dist. LEXIS 1665, (E.D. Cal. 1993).

[57] 40 C.F.R. 261.4(b)(7) (1992).

[58] Iron Mountain at 1540.

[59] Iron Mountain at 1540.

[60] Eagle-Picher Industries v. EPA, 759 F.2d 922 (D.C. Cir. 1985).

In an unrelated case addressing the same issue, the Ninth Circuit in *Louisiana-Pacific* implicitly overruled *Iron Mountain* with respect to CERCLA coverage of Bevill exempt mining waste.[61] *Louisiana-Pacific* held that the Bevill exclusion only provides limited protection from CERCLA liability and that hazardous constituents released from mining wastes can be regulated under CERCLA.[62]

Summary of Major Court Actions Applicable to Uranium Mining

The four major cases interpreting UMTRCA are *AMC I, AMC II, Quivira Mining*, and *AMC III*. *AMC I* addressed EPA's UMTRCA inactive site regulations under Title I and for the most part upheld EPA's standards. *AMC II* upheld EPA's standards at active Title II sites. The decisions in *AMC I* and *AMC II* affirm Congress's strong interest in the expeditious control of threats to human health and the environment at uranium mill tailings disposal sites.[63]

Quivira Mining addressed and upheld NRC's implementing criteria. *AMC III* addressed and upheld amendment to NRC's implementing criteria. The decisions in *Quivira Mining* and *AMC III* set forth the scope of the cost benefit analysis used by EPA and NRC and concluded that it was proper for NRC to rely on earlier cost benefit analysis developed by EPA.[64]

The practical effect of *Louisiana-Pacific* is that private uranium mining activities (non-UMTRCA sites) are subject to Superfund liability, regardless of management practices and other environmental exemptions. The net result is that private uranium mine owners and operators are subject to Superfund liability just like most other industries. The Superfund safety net for uranium and other radioactive mining wastes remains intact.

1.7.2.3 Department of Energy

Under the authority of the AEA, as amended, DOE has promulgated regulations for leasing public lands controlled by DOE for uranium exploration and mining (10 CFR 760). (Some, but not all, public lands with known uranium deposits were withdrawn by DOE from other land management agencies; details surrounding the withdrawal of these lands were not obtained). Only citizens of the U.S. or U.S. corporations are eligible lessees. DOE issues leases through competitive bidding. DOE may, if it so chooses, require periodic submissions of plans for controlling environmental impacts. The lessee will be required to conduct operations to minimize environmental effects, to comply with all applicable State and Federal statutes and regulations, and to rehabilitate affected areas.

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[61] Louisiana-Pacific Corp. v. ASARCO, Inc., 6 F.3d 1332 (9th Cir. 1993), amended 13 F.3d 1378 (1994). It should be noted that Superfund is not the only safety net. When Iron Mountain held that mining wastes were exempt from CERCLA, EPA issued a RCRA § 7003 imminent hazard order to address the wastes under 42 U.S.C. § 6973. See Iron Mountain Cleanup Ordered Under RCRA After Court Decides Mining Wastes Exempt, 24 Env't Rep. (BNA) 184 (May 28, 1993).

[62] "It is clear from the plain language and structure of section 9601 that the specific exception for slag in subsection (C) applies only to that subsection and that slag is regulated by CERCLA to the extent that it falls under any other subsection of section 9601(14)." Louisiana-Pacific Corp. v. ASARCO, Inc., 6 F.3d 1332, 1339 (9th Cir. 1993), amended 13 F.3d 1378 (1994).

[63] 58 Fed. Reg. 32,174, 32,179 (1993).

[64] Id.

DOE is also responsible for remediating UMTRCA Title I sites to meet EPA standards, as described above. Any remedy DOE selects to undertake pursuant to the UMTRCA must have NRC approval prior to beginning remediation activities. As previously mentioned, DOE is responsible for the 24 Title II sites.

1.7.3 Clean Air Act

The three major components of the Clean Air Act program relevant to uranium extraction and beneficiation operations are the National Ambient Air Quality Standards (NAAQS), which regulate six criteria pollutants; the New Source Performance Standards, which regulate newly operating or new expansions of major sources of air pollutants; and the National Emission Standards for Hazardous Air Pollutants (NESHAPS), which regulate specific toxic pollutants emitted by specific industries.

Under the CAA (42 USC §7409, Section 109) EPA established national primary and secondary air quality standards for six "criteria" pollutants. These are known as the National Ambient Air Quality Standards (NAAQSs). The NAAQSs are maximum acceptable concentration limits for six air pollutants, one of which is suspended particulate matter of less than 10 microns in diameter. To attain the air quality goals set by the CAA, States and local authorities have the responsibility of ensuring their regions are in compliance with the NAAQSs. In addition, states may promulgate more stringent ambient air quality standards. Although fugitive dust control is not an explicit requirement of the Act, most States require fugitive dust suppression measures as part of their State Implementation Plans (SIPs) to achieve the NAAQS for particulate matter. Fugitive dust is common at uranium mining operations: it arises from mine pits, overburden, mine rock dumps, ore, sub-ore, and haul roads.

New Source Performance Standards (NSPSs), authorized under CAA §111, also have been promulgated for particulate emissions from all new or expanded uranium extraction activities (40 CFR 60, Subpart LL). However, uranium beneficiation activities and all underground processing facilities are exempt from the NSPSs. Also, NSPS particulate emission concentration standards only apply to stack emissions. The NSPSs require operations to contain stack-emitted particulate matter in excess of 0.005 grams per dry standard cubic meter (dscm). In addition, stack emissions must not exhibit greater than seven percent opacity, unless the stack emissions are discharged from an affected facility using a wet scrubbing emission control device. Also, on or after 60 days following the achievement of the maximum production rate (but no later than 180 days after initial startup), operations must limit all fugitive dust emissions to 10 percent opacity.

Standards have been established for radionuclide emissions from various sources, including uranium extraction and beneficiation activities, to the ambient air (40 CFR 61) under the authority contained in the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) portion of the CAA. EPA regulations that apply to uranium extraction and beneficiation activities are outlined below:

- Subpart B sets standards for active underground uranium mines. The standards in this subpart apply to an owner or operator of an underground uranium mine that has mined, will mine or is designed to mine over 100,000 tons of ore during the life of the mine, or has or will have an annual ore production rate greater than 10,000 tons, unless it can be demonstrated to EPA that the mine will not exceed 100,000 tons during the life of the mine. The regulation sets an emission standard for radon from the mine not to exceed 10 mrem/y for any member of the public. Reporting requirements are also specified in the regulation.

- Subpart H sets standards for facilities owned or operated by DOE, excluding inactive facilities regulated by Titles I and II of UMTRCA, which emit any radionuclide other than radon-222 and radon-220 into the air. Emissions of radionuclides from these facilities to the ambient air shall

not exceed those amounts which would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr.

- Subpart I sets standards for NRC-licensed facilities and to facilities owned or operated by any Federal agency other than the DOE (none were identified), except it does not apply to any Title I UMTRCA facilities that have undergone remediation as provided for in 40 CFR Part 192. Emission standards of radionuclides released from regulated facilities to the ambient air shall not exceed amounts which would cause any member of the public to receive in any year an effective dose equivalent of 3 mrem/yr.

- Subpart T sets standards for radon emissions from the disposal of uranium mill tailings. The regulation applies to the owners and operators for all sites that are used for the disposal of tailings that are listed in Title I of the Uranium Mill Tailings Control Act of 1978 or regulated under Title II of the same Act. Radon-222 emissions to the ambient air from uranium mill tailings units that are no longer operational shall not exceed 20 $pCi/m^2/s$.

- Subpart W sets emission standards for radon emissions from mill tailings at operational mills. It applies to owners or operators of facilities licensed to manage uranium byproduct materials from uranium mills and their associated tailings. Radon-222 emissions to the ambient air from regulated facilities shall not exceed 20 pCi/m2-s. Tailings impoundments built after Dec. 15, 1989 must be designed, constructed and operated to meet either phased disposal in lined tailings impoundments that are not greater than 40 acres, or continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time. Tailings disposal must be in accordance with 40 CFR 192.32(a).

EPA received several petitions for reconsideration of Subpart T because of concern that it overlapped with UMTRCA requirements for the management of uranium byproduct materials (Subpart D of 40 CFR Part 192). As a result the EPA, NRC, and Agreement States signed a Memorandum of Understanding (MOU) in October of 1991 that outlines the steps each will take to eliminate regulatory redundancy and to ensure uranium mill tailings are closed as expeditiously as practicable. On June 8, 1993, EPA proposed amending UMTRCA regulations contained in 40 CFR Part 192, Subpart D (58 FR 32174). These proposed regulations include a requirement for installing a permanent radon barrier designed to achieve the 20 pCi/m2-s radon emission standard, a compliance schedule for meeting the 20 pCi/m2-s radon emission standard, and a monitoring requirement to ensure tailings impoundment designs are effective at achieving the aforementioned standard. In the preamble to this proposed rule, EPA stated its intentions to eventually rescind Subpart T of 40 CFR 61 (NESHAPs), once it has been assured that the amended UMTRCA standards are as protective of public health with an ample margin of safety, as are the NESHAPS rules. NRC and the Agreement Sates agreed to amend the licenses of all sites whose milling operations have ceased and whose tailings piles remain partially or totally uncovered. The amended license would require the mill operator to establish a tailings closure plan.

1.7.4 Clean Water Act

Under section 402 of the CWA (33 USC §1342), all point-source discharges of pollutants to waters of the United States must be permitted under the National Pollutant Discharge Elimination System (NPDES). A

point source is defined as any discrete conveyance, natural or man-made, including pipes, ditches, and channels. NPDES permits are issued by EPA or delegated States.

Effluent limits imposed on an NPDES permittee are either technology-based or water-quality-based. National technology-based effluent guideline limitations have been established for discharges from uranium mines and mills under the Ore Mining and Dressing Point-Source Category (40 CFR Part 440, Subpart C). These regulations provide effluent limitations based upon best practicable control technology (BPT) and best achievable technology (BAT) for uranium mills and open-pit and underground uranium mines, including mines using *in situ* leach methods. Discharges from regulated operations must meet best available technology/best practicable technology (BAT/BPT) standards for zinc, arsenic, ammonia, dissolved radium 226, total radium 226, uranium, total suspended solids (TSS), chemical oxygen demand (COD), and pH. The specific effluent standards for these contaminants are shown in Table 1

Table 1-1. Effluent Limitation Guidelines for Discharges from Mines and Mills in the "Uranium, Radium, and Vanadium Ores Subcategory"

(milligrams per liter, except as noted)

Effluent characteristic	Mine drainage				Mill discharges		
	BPT limits		BAT limits		BPT limits		BAT limits
	One-day max	30-day average	One-day max	30-day average	One-day max	30-day average	
TSS	30.	20.	N/A		30.	20.	N/A
COD	200.	100.	200	100	N/A	500.	
As	N/A		N/A		1.0	0.5	
Zn	1.0	0.5	1.0	0.5	1.0	0.5	
Ra-226 (dissolved) (pCi/L)	10.	3.	10.0	3.0	10.	3.	
Ra-226 (total) (pCi/L)	30.	10.	30.0	10.0	30.	10.	
U	4.	2.	4.0	2.0	N/A		
pH (s.u.)	6.0 - 9.0		6.0 - 9.0		6.0 - 9.0		

New Source Performance Standards			
Effluent characteristic	Mine drainage		Mill discharges
	One-day maximum	30-day average	
TSS	30.	20.	No discharges of process wastewater allowed, except: when net precipitation exceeds annual evaporation, the difference may be discharged subject to BPT limits for mine drainage.
COD	200.	100.	
Zn	1.0	0.5	
Ra-226 (dissolved) (pCi/L)	10.	3.	
Ra-226 (total) (pCi/L)	30.	10.	
U	4.	2.	
pH (s.u.)	6.0 - 9.0		

N/A Not applicable (no standards promulgated)

NOTE: Limitations apply to discharges from open-pit or underground mines from which uranium, radium, and vanadium ores are produced; and to mills using the acid leach, alkaline leach, or combined acid and alkaline leach process for the extraction of uranium, radium, and vanadium. BPT and NSPS mine drainage limitations do not apply to *in situ* operations; BAT mine drainage and all mill discharge limitations do apply to such facilities. In addition, overflows from facilities designed/operated/maintained to contain or treat flows from the 10-year/24-hour storm event may qualify for "storm exemption."

SOURCE: 40 CFR 440 Subpart C: 440.32 (BPT), 440.33 (BAT), 440.34 (NSPS)

. EPA has also promulgated effluent guidelines for new uranium mines and mills, known as New Source Performance Standards (NSPSs). New source performance standards for mines are also listed in Table 1. New mills using acid leach, alkaline leach, or combined acid and alkaline leach process for uranium extraction or mines and mill using *in-situ* leach methods are not allowed to discharge process wastewater, unless annual precipitation exceeds annual evaporation.

The permit writers must also ensure that the NPDES permit will protect water quality. Permit writers must also determine whether technology-based effluent limitations i.e., BPT, BAT, and/or NSPS) are adequate to ensure that applicable water quality standards are met. Where technology-based limits are not sufficiently stringent, water-quality-based effluent limitations must be developed. As a result, a NPDES permit may include technology-based effluent limitations for some pollutants and water-quality-based effluent limitations for other pollutants. Individual states are required to adopt water quality criteria at least as stringent as Federal levels. The application of these criteria is based on the designated use of a specific receiving water (drinking water supply, aquatic life, and/or recreational use). Also, each State has been required to develop instream water quality standards to protect the designated uses of receiving waters.

Contaminated storm water runoff from some mining operations has been documented as causing water quality degradation. In the past, point source storm water discharges have received limited emphasis under the NPDES program. However, EPA recently promulgated regulations (55 FR 47990; November 16, 1990) that specifically address point-source discharges of storm water from industrial facilities, including active and inactive/abandoned mine sites. These regulations require NPDES permits for all point source discharges of contaminated storm water from mine sites. The implementation strategy calls for discharges to be covered in individual (facility-specific) or general (State or EPA Region-specific) NPDES permits. Some of the States authorized to implement the NPDES program (e.g. Colorado, Wyoming) have developed general permits for storm water discharges from mining facilities. For States not NPDES-authorized (e.g. Texas, Arizona), EPA is developing a general permit. EPA is also developing a separate general permit for storm water discharges from inactive/abandoned mines on Federal lands.

Some discharges from mine sites do not meet the definition of a "point source discharge." These discharges are nonpoint source discharges. Under Section 319 of the CWA, States are required to prepare nonpoint-source assessment reports and to develop programs to address nonpoint sources on a watershed-by-watershed basis. Each State must report to EPA annually on program implementation and resulting water quality improvements.

1.7.5 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was enacted in 1974 and amended in 1986. It protects the quality of drinking water by establishing standards for drinking water quality and treatment and distribution systems, and by regulating the injection of waste and non-waste materials into disposal or other injection wells. The SDWA's most direct impact on the uranium industry is through the Underground Injection Control (UIC) Program, which aims to protect underground sources of drinking water.

EPA is responsible for implementing (or overseeing the implementation of) the UIC program. EPA regulations can be found in 40 CFR Parts 144-146. Upon EPA approval, States can be delegated the responsibility for implementing all or part of the UIC program in their jurisdiction.

EPA's UIC regulations protect underground sources of drinking water (USDWs) by prohibiting the direct injection or migration of foreign fluids into these aquifers. An underground source of drinking water is defined as any aquifer or its portion that supplies a public water system or contains fewer than 10,000 mg/l total dissolved solids (TDS). An aquifer may be exempted from UIC regulation if it is shown to be completely isolated with no possible future uses. In general, Federal regulations prohibit any underground injection unless authorized by permit or by rule. In addition, no owner/operator of a well may construct, operate, maintain, convert, plug, or abandon an injection well in a manner which allows the movement of contaminated fluid into underground sources of drinking water.

The program establishes requirements for five injection well categories. Regulations vary according to the class of well. These categories are outlined below.

Class I: Injection wells for hazardous, industrial, non-hazardous, and municipal wastewater disposal below the lower most formation, within 1/4 mile of the wellbore, containing an underground source of groundwater.

Class II: Injection wells for fluids related to oil and gas production such as salt water disposal wells, enhanced oil recovery wells and hydrocarbon storage wells.

Class III: Injection wells related to mineral extraction such as *in situ* production of uranium, only for ore bodies which have not been conventionally mined.

Class IV: Disposal of radioactive or hazardous waste into or above a formation which contains an underground source of drinking water within 1/4 mile. Section 3020(a) of RCRA prohibits the construction and operation of Class IV wells.

Class V: Injection wells not included in the other classes. This includes solution mining of conventional mines, such as stope leaching and low-level radioactive waste wells.

Classes I, III and V are potentially applicable to the uranium extraction and beneficiation industry. The Federal requirements for these wells are summarized in the subsections that follow.

1.7.5.1 Class I Nonhazardous Wells

Area of Review and Corrective Action Plan

Applicants for permits to inject into Class I wells must identify the locations of all known wells within the injection wells "area of review" that penetrate the injection zone. The "area of review" is the area surrounding an injection well described in accordance with listed criteria, or in the case of an area permit, is the project area plus a circumscribing area (either one-quarter mile or calculated according to criteria in the regulations).

For wells in the area of review that are improperly sealed, completed, or abandoned, the applicant must also submit a corrective action plan. The purpose of this is to ensure that pre-existing wells do not provide a conduit between the injection zone and underground sources of drinking water. An approved plan must consist of steps or modifications as necessary to prevent movement of fluid into underground sources of drinking water.

EPA (or the State) may require as a permit condition that injection pressure be limited so that pressure in the injection zone does not exceed hydrostatic pressure at the site of any improperly completed or abandoned well within the area of review. This limitation can be part of a compliance schedule and may last until all other required corrective action has been taken.

The regulations list various factors upon which EPA (or the State) may base its decision that a corrective action plan is inadequate. They include (1) the nature and volume of injected fluid; (2) the nature of native fluids or byproducts of injection; (3) the potentially affected population; and (4) abandonment procedures in effect at the time the well was abandoned. Each plan, for an existing well, must include a compliance schedule requiring corrective action to be completed as soon as possible. No new injection well may be used for injection until all required corrective action has been taken.

Mechanical Integrity Testing

Submission of an application for EPA approval of a State UIC program must include a program description, including an explanation of how the State will implement mechanical integrity requirements required under the regulations.

A well must meet the following mechanical integrity requirements. First, there can be no significant leak in the casing, tubing, or packer. One of the following methods must be used to determine that there are no impermissible leaks: (1) monitoring the annulus pressure; (2) pressure test with liquid or gas; or (3) a method authorized by the State or EPA other than the above, with the written approval of the Administrator. Second, there may be no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the well bore. There must be no significant fluid movement as determined by: (1) the results of a temperature or noise log; or (2) a method authorized by the State with the written approval of the Administrator or by EPA.

When conducting and evaluating these tests, the owner or operator and the EPA (or the State) must apply methods and standards generally acceptable in the industry. In reporting the results of integrity testing to EPA (or the State), the owner or operator must include a description of the test(s) and the methods used. In making an evaluation, EPA (or the State) will review monitoring and other test data submitted since the previous evaluation.

Technical Criteria and Standards

Among the technical criteria that apply to UIC programs to regulate Class I nonhazardous injection wells are the following: (1) construction requirements, including that wells be sited so that they inject into a formation beneath the lowermost formation containing an underground source of drinking water within one quarter mile of the well bore, and that wells be cased and cemented to prevent movement of fluids into underground sources of drinking water; (2) operating requirements, including that injection between the outermost casing protective of underground sources of drinking water and the well bore is prohibited; and (3) monitoring requirements, including that analysis be conducted of injected fluids with sufficient frequency to yield representative data of their characteristics.

1.7.5.2 Class III Wells

Area of Review and Corrective Action Plan

Requirements with respect to the establishment of an area of review and the submission of a corrective action plan described above under Class I nonhazardous wells also apply to Class III wells. Additional requirements apply to Class III wells: when EPA (or the State) is considering the appropriate corrective action, EPA (or the State) must consider the overall effect of the project on the hydraulic gradient in potentially affected underground sources of drinking water. If the decision is made that corrective action is not necessary, the required monitoring program must be designed to verify the validity of such a determination.

Mechanical Integrity Testing

The same requirements that apply to Class I nonhazardous wells apply to Class III. However, there is one difference with respect to methods that may be used to determine the absence of significant fluid movement. Acceptable methods for such purposes include: (1) where the nature of the casing precludes the use of the logging techniques prescribed in the regulations, cementing records may be used to demonstrate the presence of adequate cement to prevent such migration; (2) where EPA (or the State) elects to rely on cementing records to demonstrate the absence of significant fluid movement, the monitoring program required by regulations shall be designed to verify such an absence; and (3) as finalized in January 1992, EPA allows the use of the water-brine interface mechanical integrity test for salt solution mining. (57 *Federal Register* 1109, January 10, 1992).

Technical Criteria and Standards

Technical criteria applicable to Class III injection wells include (1) construction requirements, including that wells must be cased and cemented to prevent migration of fluids into or between underground sources of drinking water and that casing and cementing used for newly drilled wells must be designed to last the life of the well. Among the factors which must be considered in determining casing and cementing requirements are depth to injection zone, injection pressure, and type and grade of cement; (2) operating requirements, including that except during well stimulation, injection pressure at the wellhead must be calculated to assure that the pressure in the injection zone during injection does not initiate new fractures or propagate existing ones; and (3) monitoring requirements, including monitoring of the nature of injected fluids at time intervals

sufficiently frequent to yield data representative of their characteristics; and (4) reporting requirements, including quarterly reporting to the EPA (or the State) on required monitoring and reporting on results of mechanical integrity testing.

1.7.5.3 Class V Wells

In general, Federal regulations state that for Class V wells, injection is authorized by EPA until additional requirements under future regulations are promulgated. This means that such injection operations are authorized by *rule*, so no Federal permit is required. EPA has not yet promulgated regulations governing this class of wells.

It should be noted that individual States with approved Class V UIC programs may have their own technical requirements which apply to Class V wells in those States. (See discussion above on General State UIC Program Requirements). Some States with approved UIC programs may require permits, while other such States may authorize injection by rule.

A general provision of the UIC regulations that applies to Class V wells, is that no injection may be conducted in a manner that allows the movement of contaminated fluid into underground sources of drinking water.

Regulations require that within one year of the effective date of the UIC program in a particular State, the owners and operators of Class V wells in the State notify the State of these wells and submit required inventory information, including (1) facility name and location; (2) nature and type of injection wells; (3) operating status of such wells.

For EPA-administered UIC programs only, additional information must be submitted by owners and operators of certain types of Class V wells (in addition to other well classes). Among the types of Class V wells for which additional data may be requested by EPA are brine return flow wells. Data required to be submitted may include (1) a listing of all wells, including location of wells; (2) dates of completion of such wells; (3) identification and depth of the formation into which each well is injecting; (4) casing and cementing record, tubing size, and depth of packer; (5) average and maximum injection pressure at the wellhead; and date of the last mechanical integrity test, if any.

Under the UIC regulations, each State, in turn, is required to submit a report and recommendations to EPA, within three years of the approval of the State UIC program, concerning Class V wells. The report must contain data on (1) construction features of Class V wells in the State and the nature and volume of injected fluids; (2) an assessment of the contamination potential of such wells, using hydrogeological data available to the State; (3) an assessment of available corrective alternatives and their environmental and economic consequences; and recommendations for regulatory approaches and remedial actions where appropriate.

1.7.6 Selected State Regulatory Requirements

This section addresses applicable laws, regulations and permits that apply to the uranium extraction and beneficiation industry in Texas and Wyoming since these States contain the vast majority of operating facilities. The section on State regulation is intended to provide an example of State regulatory programs. It is not intended to be a comprehensive summary of regulatory programs in these or other uranium mining States. Wyoming is authorized by EPA to administer NPDES and the UIC program but is not authorized by the NRC for implementation of a AEA/UMTRCA program. Texas is not an EPA-delegated State for NPDES permitting but has been delegated responsibility for the UIC program under SDWA and is also authorized by NRC to implement the AEA/UMTRCA program. Therefore, EPA writes NPDES discharge permits for uranium extraction and beneficiation in Texas for discharges to surface waters and the NRC issues permits for uranium milling operations in Wyoming.

1.7.6.1 Texas

Uranium extraction and beneficiation regulation in Texas is in a state of transition. Until recently, the Texas Water Commission's UIC program had jurisdiction over injection wells, and the Texas Department of Health's Bureau of Radiation Control handled all radiation and radioactivity at uranium mines and mills, regardless of media (soil, air, or water). In March of 1992, the State legislature passed Senate Bill 2, which gave jurisdiction of disposal of radioactive waste at *in-situ* mines to the Texas Water Commission. The same legislation created a new agency, the Texas Natural Resources Conservation Commission (NRCC) (to become effective on Sept 1, 1993). The entire Texas Air Control Board, the entire Texas Water Commission (TWC), and parts of the Texas Department of Health's Bureau of Radiation Control will be moved to the NRCC. Further, there are new bills currently in the State legislature that could move all of the uranium extraction and beneficiation regulatory functions, including licensing and inspections, to the NRCC.

Water Commission

The Texas Water Commission regulates some aspects of *in situ* uranium mining pursuant to the Texas Water Quality Act, Chapters 26 and 27 of the Texas Water Code. The TWC does not address surface water discharges associated with uranium extraction and beneficiation because Texas is not a NPDES-authorized state. The Commission is the State authority administering the EPA-delegated UIC program. Under the UIC program, the Commission has been responsible for the permitting of non-radiological contaminants in injection fluids. Recently, however, the Commission has also become responsible for administering NRC's authority over disposal of radioactive waste at *in situ* mines, via injection wells. This authority stems from Texas becoming an NRC Agreement State in the early 1960's. Previously, the Department of Health administered NRC's radiological contaminant requirements at *in situ* mines, but the authority was transferred to the TWC in an effort to minimize the number of permits needed by uranium solution mines (Kohler, 1993). A Memorandum of Understanding (MOU) between the two agencies establishes responsibilities for each of the program elements (Kohler, 1993). The Commission issues site-specific permits for solution mining, which includes UIC and NRC requirements, and also issues subsequent production area authorizations under the site-specific permit (TDWR, 1984). Some of the NRC and UIC (Class II wells) solution mining permit requirements include:

- Restoration procedures such as plugging of wells and restoration of ground cover
- Liners for all wastewater ponds
- Leakage detection, repair procedures, and freeboard limits for all ponds
- Controlled access to the ponds to prevent entrance by wildlife and unauthorized persons
- Runoff and spill control measures
- Preventive maintenance such as inspection for ponds, pipelines, dikes, trenches, and storage areas
- Disposal of all radioactive wastes pursuant to Department of Health requirements
- Disposal of non-radioactive solid and semi-solid wastes at an authorized waste disposal site in accordance with the Texas Water Commission rules
- Use of non-ammonia leaching solution at production areas
- Sampling of monitoring wells every 3 months
- Proof of mechanical integrity of all injection wells
- Financial assurance, usually in the form of a bond, for proper plugging and abandonment of wells, for any surface contaminant cleanup and restoration, including groundwater remediation to levels that would allow unrestricted use
- Aquifer restoration to pre-mining conditions once mining has ceased.

Department of Health

Texas is a NRC-Agreement State, and the Department of Health's Bureau of Radiation Control (BRC), in conjunction with the TWC, is responsible for administering the NRC radiation regulatory program for uranium extraction and beneficiation (see above). Texas has incorporated the NRC regulations pertaining to uranium extraction and beneficiation into Texas' Regulations for Control of Radiation (Haygood, 1993).

Previously, the BRC licensed (byproduct material) and conducted inspections at *in situ* mining facilities. As noted above, both of these responsibilities, however, have been assumed by the TWC in an effort to minimize the number of licenses (and permits) required from the industry (Haygood, 1993). The BRC, however, is still responsible for licensing uranium mills. Additionally, the BRC also implements the NESHAPs provisions for radon at uranium *in situ* mines and uranium mills. The BRC has no authority over uranium surface mines.

Railroad Commission (TRC)

The TRC regulates uranium surface mining, pursuant to the Texas Uranium Surface Mining and Reclamation Act. It has jurisdiction over private lands, while the General Land Office has jurisdiction over State lands (through a letter of agreement, the Commission actually regulates operations on State lands under the General Land Office authority). As part of this responsibility, the TRC issues bonds to ensure reclamation will be completed after mining has ceased (EPA, 1984). The TRC also regulates the exploration phase of *in-situ* uranium mining. Once production of wells begins, however, the Water Commission has regulatory jurisdiction. The TRC has promulgated its regulations in Rules of the Surface Mining and Reclamation Division (EPA, 1984).

General Land Office

The General Land Office issues prospecting permits and mining leases on State lands. The General Land Office has authority to regulate uranium mining on State lands, but does not exercise its authority because it has turned it over to the Railroad Commission in a letter of agreement between the two agencies. It requires a plan of operations as part of the mining lease application and may specify certain reclamation requirements for obtaining a lease. Usually, however, the General Land Office leases simply incorporate by reference the Railroad Commission's mining requirements (Farr, 1993).

Air Control Board

The Board is responsible for regulating non-radioactive air emissions, and must ensure that Texas complies with National standards. The Board regulates fugitive dust from "non-agricultural operations," which includes uranium extraction and beneficiation, and particulate matter emitted from stacks (Betrick Hameron, 1993). The Board's standards parallel those set by EPA (see above). NESHAPs standards for radon emissions from uranium extraction and beneficiation are implemented by the BRC, as noted above.

1.7.6.2 Wyoming

Most of the permits required by uranium mining and beneficiation operations in Wyoming must be obtained through the Wyoming Department of Environmental Quality (WDEQ). The WDEQ consists of four divisions: land quality, water quality, air quality and solid waste. Permits for impoundments and reservoirs are issued by the State Engineer's Office (SEO); the SEO also handles issues involving water rights. Wyoming is not a NRC delegated state, so, uranium milling and *in situ* operators must apply to the NRC for a Source Materials License.

Department of Environmental Quality

Land Quality Division (LQD). The LQD is the lead agency in permitting mining operations and is the sole authority for issuing mining permits. The LQD and WQD jointly issue Groundwater Pollution Control permits for *in situ* operations. Groundwater monitoring data are submitted to and reviewed by the LQD. The LQD is responsible for bonding provisions and annual inspections. In addition, the LQD distributes

guidelines addressing numerous permit-related topics including *In Situ* Mining, Hydrology, Soils and Overburden, and Vegetation. Land Quality Division Mining Permit Requirements include:

- Baseline Groundwater Quality Survey - for the permit area and each mining unit (UCLs are determined at this time)
- Hydrogeologic Characterization
- Surface Water Baseline (quality and quantity)
- Geological Assessment
- Detailed Mineral Extraction and Reclamation Plan.
- Bonding (for the cost of reclaiming affected land or ground water disturbed by mining)
- Vegetation survey (including Threatened and Endangered Species)
- Soils Assessment
- Wildlife Inventory.

Water Quality Division (WQD). Since Wyoming has been delegated NPDES and UIC programs, the WQD issues all permits for surface water discharges (i.e., NPDES) and underground injection (injection/production wells and disposal wells). The operation of injection and production wells are also covered under the LQD/WQD Groundwater Pollution Control permits. Wastewater Land Application Facility permits are required by *in situ* operators who dispose of excess process water through land application.

State Engineer's Office

The SEO requires that all dams and impounding structures be certified by a professional engineer. The office is also the lead agency for impacts on water rights.

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APPENDIX A

NPL SUMMARIES RELATED TO URANIUM EXTRACTION AND BENEFICIATION

Appendix A
NPL Summaries Related to Uranium Extraction and Beneficiation

This Appendix includes summaries of Superfund National Priorities List (NPL) sites related to extraction and beneficiation of uranium. The original summaries were prepared by EPA in 1991. Excerpts from these summaries are included in this profile as case study examples of select mining operations. The summaries provide a brief description of the operation, but focus on site-specific environmental effects and, in several cases, provide a brief summary of EPA actions at the site. The NPL examples illustrate some of the problems associated with uranium mining. As stated in the introduction, uranium processing wastes are not addressed in this profile. Although there are uranium processing-related sites on the NPL, they have not been discusses in this Appendix. At some sites discussed, however, both tailings and processing wastes contributed to the environmental hazards that resulted in their listing on the NPL.

Homestake Mill; Grants, New Mexico

Operating History

The Homestake Mill Superfund Site is located in Cibola County, New Mexico, approximately 5.5 miles north of Milan, New Mexico. The site consists of an uranium processing mill and two tailings embankments at an elevation of approximately 6,600 feet. The mill began operating in 1958, and was originally licensed by the Atomic Energy Commission. The Mill has a nominal design capacity of 3,400 tons per day (tpd). The site was placed on the NPL in September 1983. In June 1990 the Mill stopped operating and went on "standby status."

When operating, the Mill employed an alkaline leach-caustic precipitation process for extracting and concentrating uranium oxide (yellow cake) from ores that historically averaged from 0.05 to 0.30 percent U_3O_8, to produce yellowcake. Tailings from the process are composed of uranium-depleted fine and coarse sand and slimes.

Two separate embankments have been used to dispose of tailings generated at the mill. The most recently used embankment consists of two impoundments, and covers approximately 175 acres with tailings that total 17 million cubic yards (21 million tons) and measure 90 to 100 feet high. The tailing embankment is constructed of coarse tailing material, and at least 60 acres were covered by water. The second embankment, which has not been in use since 1962, covers approximately 45 acres, measures 25 feet high, and contains 1.225 million tons of tailings. More than 95 percent of the top of this embankment is covered with at least 6 inches of soil.

Tailings were slurried from the Mill to the embankments. The tailings were deposited on (and within) the embankment by means of wet cyclones, which separate the material into coarse and fine splits. The tailing piles have been stabilized with solid materials such as erosion control blankets and used tires, wetting the piles with water, and chemical-stabilization agents that form a crust on the surface to reduce water and wind erosion.

An injection and collection effort has resulted in a decrease in the groundwater contaminant plume, which no longer extends past the facility boundary.

Environmental Damages and Risks

The EPA evaluated risks to public health from exposure to the levels of radon found during the study. Lung cancer lifetime risks per year for the 17 residents of the 8 houses [with more than 4 pCi/l average annual indoor radon concentrations] range from 0.000031 to 0.00059 and center around 1 in 10,000 per year of residency for all age groups. The evaluation indicates that this is not considered a significant risk, as the models used are very conservative. Further, the mill site is not believed to be the main source of the radon contamination.

Lincoln Park Site; Canon City, Colorado

Operating History

Uranium milling began at the Cotter site in 1958. The first mill operated until 1979 using an alkali process. An acid leach mill process began in 1979, but has been inactive since 1986. The site covers approximately 1.4 square miles in south central Colorado and consists of two inactive mills, a partially reclaimed tailings pond disposal area, and an inactive tailings pond disposal area.

During the milling process, molybdenum and vanadium were recovered as by-products during uranium concentrate production. During the period of alkali milling (prior to 1979), 10 ponds were used for storage of process liquid and fresh water, for the disposal of tailings, and for storage of fresh water. These ponds are unlined except for Pond 2 (lined in 1972); Pond 3 (lined in 1981); and Pond 10 (lined in 1976).

In December 1979, when the acid milling process began, a double-lined impoundment was installed with drains above the synthetic membrane and below the clay layer and synthetic membrane. Tailings from this acid leach process and water collected from ground-water interceptors are stored in this impoundment. It consists of two sections: (1) a 91-acre primary impoundment for the storage of acid leach mill wastes; and (2) a 44-acre secondary impoundment. During the period between April 1981 to August 1983, the contents of Ponds 1, 2, 4, 5, 6, and 8 (2.2 million cubic yards of tailings) were moved to a double-lined secondary impoundment. Ponds 9 and 10 were removed in 1978 during construction of the secondary impoundment.

Reagents used in the milling process included sulfuric acid, ammonia, ammonium sulfate, kerosene, tertiary amines, sodium and calcium salts, potassium permanganate, zinc sulfate, and organic flocculents.

The Mill occasionally processed custom ores such as waste raffinate from other mills and precipitates or slags from other processes. In one instance, Polychlorinated Biphenyl (PCB)-contaminated ore was processed, which contaminated some of the plant areas. Trichloroethylene was used to extract the PCBs from the contaminated soils. This issue was being investigated by EPA at the time the Remedial Investigation was prepared in 1986.

A catalyst plant on the Mill site was operated briefly in 1978 and 1979 to recover metal values from spent catalyst material. Spent sulfuric acid catalyst material is currently stockpiled north of the old Mill.

Sources of contamination include the uranium ore stockpile, tailings, and raffinate; contaminated soils and groundwater; leaks from the old tailings ponds; and suspected leaks from the new impoundment area. Contaminants include radium, nickel, molybdenum, cobalt, copper, arsenic, zinc, lead, and cadmium. The Cotter site is located south and almost adjacent to the semirural area of Lincoln Park and 3.5 miles south of Canon City. The site is located in a topographic bowl known as "Wolf Park Basin." Offsite ground-water contamination from the Cotter site was first noted in the Lincoln Park area in 1968. Prior to a 1988 State-ordered clean-up, a number of residences used water from wells on their property, either in addition to their

Canon City tap water or as their sole supply. Homes in the impacted area are presently supplied with Canon City water. Most land around the Mill is used for grazing livestock and wildlife habitat.

Environmental Damages and Risks

The AEC was the regulatory agency responsible for oversight of the facility from 1958 to 1968. Between 1959 and 1966, the site was cited 18 times for failing to track radioactive releases. The State of Colorado Department of Health assumed regulatory oversight in 1968 and cited Cotter Corporation 82 times for various violations under the Nuclear Regulatory Commission regulatory process between 1968 and 1984. Among the state citations were exceedance of "As Low As Reasonably Achievable" particulate emissions, discharge and releases from tailings discharge pipes, and poor recordkeeping on control of off-site surface-water contamination.

Contaminated groundwater at the site is transported downgradient into the Lincoln Park area. Ground-water contamination was first noted in Lincoln Park in 1968. Concentrations of molybdenum in Lincoln Park groundwater were in the range of 24 to 60 mg/l (compared to a background level of about 0.005 mg/l). These levels were described as injurious to cattle and unsuitable for irrigation of crops used for cattle feed. A contaminant plume of uranium and molybdenum extends from the Cotter site (in the shallow pathway along the Sand Creek drainage) into Lincoln Park and eventually to the Arkansas River. Concentrations of molybdenum and uranium at the Mill site from 1981 to 1984 ranged up to 231 and 116 mg/l, respectively, in Lincoln Park. Concentrations in Lincoln Park ranged up to 0.92 and 13.2 mg/l. Maximum concentrations in Lincoln Park of lead and selenium, as well as gross alpha and beta, exceeded Maximum Contaminant Levels for drinking water.

Wind transport of contaminants has been observed since 1958. Emissions of radionuclides and hazardous metals have been measured through air and soil sampling. Offsite soil concentrations of metals are at (or above) a level of concern for agriculture use, cattle grazing, and wildlife. In particular, soil concentrations were above critical values for molybdenum, cobalt, nickel, arsenic, copper, zinc, and cadmium. In general, it was found that contamination decreased with distance from the Cotter site. Contaminated offsite soils are, in turn, entrained in surface flow, and contaminants are transported in the intermittent streams to the Arkansas River.

Offsite vegetation samples were also shown to be contaminated, with levels exceeding levels toxic to plants and/or animals of molybdenum, zinc, and cadmium.

Uravan Uranium Mill; Uravan, Colorado

Site Overview

The Uravan Uranium mill complex is located approximately 90 miles southwest of Grand Junction along State Highway 141 in Montrose County, Colorado. The mill was built at Club Mesa, west of the San Miguel River canyon.

Standard Chemical Company began operating the Uravan Mill facility in 1915 to recover uranium, vanadium, and radium from mined ores. Ore was received at the Uravan Mill from approximately 60 different underground mines in the Uravan mineral belt, most of which were within 35 to 40 miles of the mill. Union Carbide bought the facility from Standard Chemical through the U.S. Vanadium Company in 1936 and continued to process uranium and radium at the site. While in operation, the mill processed approximately 1,000 tons of ore per day.

Stockpiled ore was crushed, ground, and then beneficiated onsite. Beneficiation at the mill included hot, strong acid leaching in a two-stage circuit followed by the recovery of pregnant solutions in thickeners. Uranium was recovered from the pregnant solution and separated from vanadium by column ion exchange, with the final yellowcake product precipitated with ammonia. The uranium yellowcake and crude vanadium precipitate was then further processed at another Union Carbide facility in Rifle, Colorado.

Plant tailings from the thickener circuit were pumped into tailings piles which, by late 1984, covered over 80 acres and contained approximately 10 million tons of tailings. The tailings have a low pH and are contaminated with both metals and radionuclides.

Raffinate, a liquid or crystallized waste of primarily hydrated ammonium sulphate from the milling and extraction process, contains ammonium-aluminum salts, dissolved ore elements, and spent processing reagent. These wastes contain hydrated ammonium sulfate, uranium, vanadium, iron, sodium, radium, calcium, silver, silicon, potassium, sulfate, carbon, mercury, lead, molybdenum, manganese, zinc, cobalt, copper, chromium, and nickel. The liquid form of this waste was stored in evaporating ponds, while the crystallized waste was stored in onsite repositories. The river ponds along the San Miguel River are below the level of the potential maximum flood. Analyses of liquid and solid components of Uravan wastes show high levels of many metals.

The principal waste management areas onsite and in associated areas are:

- Atkinson Creek Crystal Disposal Area - Unlined storage pit along the San Miguel River containing 200,000 cubic yards of raffinate crystals.

- Club Ranch Ponds - Six unlined ponds covering 32 acres located along the San Miguel River that contain 30 million gallons of liquid raffinate and 560,000 cubic yards of raffinate crystals.

- River Ponds - Seven unlined ponds constructed in old tailings piles containing 200,000 cubic yards of neutralized mill sludge and contaminated soils. The seven ponds are located along both sides of the San Miguel River. These were used as holding areas for liquid waste collected in the mill area before they were discharged into the San Miguel River.

- Tailings Piles - About 10 million tons of mill tailings contained in three piles (at two sites) that are located on the Club Mesa, 400 feet above and west of the mill site.

- Club Mesa Area - Disposal area on Club Mesa consisting of two clay-lined sludge storage areas, storage ponds, raffinate spray evaporation area, and associated contaminated soils; contains 250,000 cubic yards of raffinate crystals, 150,000 cubic yards of neutralized sludge, 40,000 cubic yards of contaminated pond material, and 44,000 cubic yards of contaminated soil.

- Plant Areas - Two plant locations with surficial contamination including containment structures, ore stockpile area, equipment and auxiliary wastes, and heap leach sites containing 15,000 tons of ore.

- Town and Adjacent Areas - Several small communities and three larger population centers located along the San Miguel River are within 50 miles of the site. Old tailings and contaminated soil have been found in these areas.

Mining, milling, and waste disposal activities have resulted in:

- Wind and surface-water dispersal of the tailings materials and the uncontrolled release of radon from the Tailings Piles

- Seepage of contaminated liquids into soils and groundwater from several areas in the mill complex and waste disposal areas

- Concentrations of large quantities of wastes in locations that pose a risk to public health and the environment, based on considerations of the potential for release of hazardous materials to the environment.

Environmental Damages And Risks

Initial interest in the site was prompted by the State of Colorado's belief that contamination (resulting from poor waste management practices at the Uravan facility) was impacting the State's natural resources.

Several small communities (Nucla, Naturita, Vancorum, Redvale, Norwood, Placerville, Saw Pit, Paradox, Bedrock, Gateway, Olathe, Whitewater, Glade Park, Monticello, and Moab) and three larger population centers (Grand Junction, Delta, and Montrose) are within 50 miles of the site. The total area population is thought to be around 3,000 people, down from 5,500 in 1960. (According to EPA, residents of Uravan were advised to move away in 1985 due to the high levels of radioactivity measured in the area. By 1986, only 50 permanent residents remained. In 1988, after all permanent residents had relocated, all company homes and buildings in Uravan were demolished.) No drinking water is drawn from the San Miguel River downstream of the facility site, although water is drawn to irrigate local hay fields.

Without remediation, the potential risk to human health as a result of the site contamination is thought to be moderate. This is because of the modest size of the population actually residing in the risk area. It was concluded that even if the facility experienced a large release of contaminants into the environment, based on present population, very few people would be affected. Radiological and nonradiological contaminants in the tailings area represent the source or origin of the greatest potential human health hazard associated with the Uravan Mill.

Potential radiological environmental hazards arise from the radioactivity released during the milling of natural uranium and are primarily associated with the natural decay of uranium 238, the parent isotope, and its radioactive daughters present in the ore. In the tailings pile specifically, the decay and ingrowth of the short-lived radon gas and its daughters represent major contributions to the potential radiological hazard associated with the Uravan Mill. As of 1986, radiation sources associated with the tailings piles constituted over 50 percent of the total airborne radioactivity released from the Uravan uranium milling operation. This was expected to increase to 90 percent of the total airborne radioactivity released from the mill, which permanently closed in 1991. The longer the operational or active open surface lifetime, the greater the potential hazard of the tailings pile radiation source due to potential releases. However, according to EPA, nearly all tailings piles have been capped, and are not as large a source of airborne radioactivity.

Both forage and vegetables in the site area are consumed by wildlife and livestock. These contaminants will bioaccumulate as a result of consumption by either animals or humans that are primary or secondary consumers. The high dispersion of contaminants in the area is attributed to wind transport of contaminated particles.

Monticello Mill Site; San Juan County, Utah

Operating History

The Monticello Mill Tailings site is an abandoned uranium/vanadium mill occupying 78 acres in, and adjacent to, the City of Monticello, San Juan County, Utah. The tailings and residual ore remaining at the site have contaminated soils, groundwater, and surface water in Montezuma Creek, which flows through the Mill site. An additional 300 acres of peripheral properties (properties adjacent to the Mill site and a 3.3-mile reach of Montezuma Creek between the Town of Monticello and Vega Creek) have been contaminated by airborne particles from tailings and water-transported tailings and ore from leftover piles.

The Monticello Mill site began operation as a vanadium ore-buying station in the 1940's. As ore production increased, a vanadium mill was constructed with government funding. The Mill began vanadium production in 1942 and uranium-vanadium sludge production in 1943 for the Manhattan Engineer District. The mill was closed in February 1944; it was reopened in 1945 and produced uranium-vanadium sludge until 1946. A salt-roast process was used to convert vanadium minerals to soluble form. After pyrite was added to react with some of the calcium (in the excess lime in the ore) to form calcium sulfate, the hot ore was quenched in sodium carbonate to dissolve most vanadium and precipitate out calcium carbonate. Remaining sands, after successive washings, were transferred to tailings ponds. The addition of sulfuric acid to the "pregnant liquor" (i.e, the vanadium-bearing solution) induced the precipitation of vanadium pentoxide. The precipitate was washed to remove sodium chloride and sodium sulfate, and the wash water was discharged to the creek.

In 1948, the Atomic Energy Commission (AEC) bought the Monticello Mill site from the War Assets Administration and operated a uranium mill at the site until January 1960. Numerous uranium milling processes were used during this period to accommodate the wide variety of ore types received at the mill. Up to 1955, processes included raw ore carbonate leach, low-temperature roast/hot carbonate leach, and salt roast/hot carbonate leach; acid leach-resin-in-pulp (RIP) and raw ore carbonate leach from 1955 to 1958; and a carbonate pressure leach RIP process from August 1958 until closure of the mill in 1960. The ore-buying station remained open until March 31, 1962. Other than parts of the land transferred to the U.S. Bureau of Land Management, since 1949 the site has remained under the control of the AEC and its successor agencies [first the U.S. Energy Research and Development Administration and, more recently, the U.S. Department of Energy (DOE)].

Four tailings impoundments were constructed at the Monticello Mill site. Two tailings impoundments, the Vanadium Pile and the Carbonate Pile, received waste material prior to the 1955 installation of the acid leach RIP plant. The Carbonate Pile received tailings from the AEC salt roast/hot carbonate leach milling process. It is not known which of the several milling processes in use prior to acid leach-RIP produced the tailings in the Vanadium Pile. The Vanadium Pile and the Carbonate Pile may have been used simultaneously. The Acid Tailings Pile received waste in 1955 and 1956 from the operation of both the acid leach-RIP and carbonate-leach plants. Tailings from the acid leach process were combined with carbonate plant tailings and calcium hydroxide for neutralization and then pumped to the Acid Pile (where a portion of pond overflow was recycled through the leach circuit). The remaining overflow was discharged to Montezuma Creek. To reduce discharges to Montezuma Creek, the Acid Pile was constructed with a 6-inch liner of compacted bentonite to prevent seepage; tailings-pond effluent was partially recycled. A fourth tailings impoundment, referred to as the East Pile, was constructed to increase capacity. It received tailings from 1956 to 1960.

During the Mill's period of operation, the tailings impoundments were moist. However, within a year of shutdown, the surfaces dried out and tailings sand began to migrate as sand dunes. In addition, water erosion "became a problem."

AEC began stabilizing the piles in the summer of 1961 by grading, adding 8 to 12 inches of fill, adding topsoil, and planting native grasses. Concurrent with the tailings-pile stabilization, the Mill facilities were dismantled. Equipment was sold, burned, or buried onsite in trenches excavated near the Carbonate Pile (and covered with tailings).

During the summer of 1965, contaminated surface soil was removed from peripheral properties previously used for ore storage. This soil may have been used as fill material to partially bury the mill foundations. Following a radiation survey of the South Stockpile Area and Ore-buying Station in 1972, contaminated soil was removed from these areas in May 1974 and August 1975. Nearly 15,000 cubic yards of contaminated soil, which was placed on top of the East Pile, was graded, contoured, and reseeded. Mill foundations were demolished and bulldozed into adjacent pits.

The Monticello Mill site was accepted into the Surplus Facilities Management Program in 1980 and the Monticello Remedial Action Project was established to restore the government-owned Mill site to safe levels of radioactivity; to dispose of (or contain) the tailings in an environmentally safe manner; and to perform remedial actions at offsite (vicinity) properties that had been contaminated by radioactive material from mill operations. Site characterization activities commenced in 1981.

According to EPA, approximately 1.8 million cubic yards of tailings and contaminated soil are located in the tailings-impoundment area on the east side of the mill. An additional 100,000 cubic yards of contaminated materials have been identified in the Mill area. The tailings and contaminated soils contain elevated levels of both radioactive and nonradioactive contaminants of concern. These constituents are products of the uranium 238-decay cycle (including radium 226) arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, vanadium, and zinc.

As of 1990, the population within 1.5 miles of the site was estimated at 1,900. The population is concentrated north and west of the Monticello Mill site. The Mill site is located in a controlled land zoning district that permits a mix of agricultural, residential, commercial, and industrial use. The average annual precipitation in the Monticello area is 18.3 inches. Prevailing annual winds are generally from the south, west-southwest, and northwest.

Environmental Damages and Risks

Radiological Contamination

The Public Health Assessment identified radon gas and gamma radiation as the major radiologic contaminants of concern. Adverse health effects arise from the inhalation of radon gas (a decay product of the radium 226 found in the tailings), as the lungs are exposed to the full radiation dose of the radon daughters. In contrast, gamma radiation creates adverse health effects as a result of full-body exposure.

Five potential exposure pathways were identified and considered for quantitative analysis:
(1) inhalation and ingestion of airborne radioactive particulates; (2) ingestion of contaminated foods (plant and animal) produced in areas contaminated by wind-blown tailings; (3) ingestion of surface water contaminated by tailings; (4) inhalation of radon and radon daughters; and (5) direct exposure to gamma radiation emitted from the tailings.

The first two pathways were concluded to present insignificant exposure to humans since radiologic analysis of air particulate samples typically yielded levels below detection. The third pathway (ingestion of contaminated surface water) was not considered a "probable pathway" because: (1) elevated radium concentrations have not yet been detected in Montezuma Creek; and (2) although elevated concentrations of uranium have been detected in the Creek, the uranium dose rate is low at low concentrations and it has a very long half-life (because of this, uranium exposure was examined under nonradiological risks).

Two pathways remained: (1) inhalation of radon and radon daughters; and (2) direct exposure to gamma radiation emitted from the tailings. The cancer risk associated with inhalation of radon and radon daughters

from the Mill site and peripheral properties was estimated to be 0.0038 excess annual cancer incidences to the Monticello population. Cancer risks from whole-body gama radiation exposure were an estimated 0.02 excess annual cancer incidences for the Monticello population. (The Radiological Risk Assessment was performed on a population basis prior to later EPA guidance on performing radiological risk assessments on an individual basis).

Nonradiological Contamination

The following nonradioactive elements were selected as "highest risk" or indicator contaminants at the Mill site or peripheral properties: arsenic, copper, lead, molybdenum, selenium, uranium, vanadium, and zinc. Noncarcinogenic health effects can arise from acute and chronic exposures to all eight elements; only arsenic was considered to be a human carcinogen.

Four potential exposure pathways were identified based on the population and activity patterns in the vicinity of the Mill site: (1) resuspended dust inhalation; (2) soil ingestion; (3) vegetable ingestion; and (4) beef ingestion. The first pathway was excluded from further quantitative analysis because particulate concentrations were at background levels or below, and the Remedial Investigation determined that lead concentrations were well below NAAQS. The second pathway was also excluded because current and expected future access to the site (it is currently fenced) is, and will be, very limited. The vegetable and animal ingestion pathways were retained for quantitative analysis, since the pathways are considered to be indirect exposure routes resulting from contaminated surface water used to irrigate fields and water livestock.

A human "dose" (intake) was calculated for each indicator metal and pathway (vegetable and beef ingestion) for both adults and children based on the average and maximum concentrations of indicator metals found in soils. Each "dose" was compared to an EPA- developed reference dose for chronic (long-term) exposure to each metal. This comparison revealed that no reference doses were exceeded based on average metal concentrations; and therefore, the calculated doses are not likely to be associated with health risks. However, when maximum metal concentrations were used, uranium, copper (including the vegetable pathway), and zinc (the beef pathway, including or excluding the vegetable pathway) "doses" for children were exceeded. It was concluded, however, that it was unlikely that individuals would receive chronic exposure to these maximum concentrations (because the site is uninhabited and because of past land-use patterns). Thus, there was "no apparent health risk".

Arsenic is the only Mill site contaminant of concern that was considered a carcinogen by EPA. Cancer risk due to ingested arsenic (via the vegetable pathway) was calculated using soil concentrations. At maximum soil concentrations, the excess lifetime cancer risk is 2.7×10^{-5}; and it is 7.0×10^{-6} for average soil concentrations. Calculated cancer risk due to ingested arsenic (via the beef pathway) was calculated using soil concentrations. At maximum soil concentrations, the cancer risk is 2.0×10^{-5}; and it is 2.0×10^{-6} for average soil concentrations. It was concluded that "arsenic may pose a public health impact under the existing conditions at the site".

United Nuclear Corporation, Churchrock Site; Gallup, New Mexico

Operating History

The United Nuclear Corporation (UNC) Churchrock Site is an inactive uranium mill and tailings-disposal site located in an isolated area of McKinley County, 15 miles northeast of Gallup, New Mexico. The Mill was operational from 1977 to 1982. The Mill, designed to process 4,000 tons of ore per day, used the conventional acid-leach solvent-extraction method to extract uranium. The ore processed at the site (average ore grade 0.12 percent uranium oxide) came from UNC's Northeast Churchrock and Old Churchrock mines

as well as the nearby Kerr-McGee Quivera mine. The waste tailings were pumped to a 100-acre tailings-disposal area. According to radioactive materials license records, between 3.4 and 3.6 million tons of acidic tailings were disposed of at the site.

UNC's tailings-disposal area is located directly east of Pipeline Canyon. The tailings-disposal area was subdivided by cross-dikes into cells identified as the South Cell, Central Cell, and North Cell areas. Two soil-borrow pits are in the Central Cell area. In July 1979, the dam on the South Cell breached, releasing approximately 93 million gallons of tailings and pond water to the Rio Puerco River. The dam was repaired and clean-up actions were taken.

In October 1979, the New Mexico Environmental Improvement Division (NMEID) ordered UNC to implement a discharge plan to control contaminated tailings seepage which was responsible for ground-water contamination. Ground-water pumping and evaporation was initiated in 1981. From 1979 to 1982, UNC neutralized tailings with ammonia and/or lime. In May 1982, UNC announced that it was going to temporarily close the Churchrock Uranium Mill due to depressed uranium market conditions. The market did not recover, and UNC closed the facility. In 1987, UNC submitted a closure plan to NRC to decommission the Mill. In 1983, EPA designated the Churchrock site an NPL Site and initiated a Remedial Investigation effort.

Environmental Damages And Risks

Arsenic, cadmium, lead, molybdenum, cobalt, manganese, chromium, and radionuclides (including uranium and thorium) are the constituents of concern at the site. Although no people reside within the site boundary, adjacent land includes the Navajo Indian Reservation to the north and land to the east and south held in trust for the Navajo Tribe and administered by the Bureau of Indian Affairs. Ten wells are located in slightly over a 3-mile radius of the site; the closest is 12,000 feet northeast of the site. Four of these wells are operational, and are used for both livestock and domestic purposes. Land use is primarily grazing for sheep, cattle, and horses. Contaminants in the Alluvial Aquifer and/or deeper aquifers at concentrations exceeding clean-up standards include aluminum, arsenic, cadmium, cobalt, manganese, molybdenum, nickel, selenium, nitrate, Total Dissolved Solids (TDS), radium 226 and radium 228, and gross alpha.

A Risk Assessment, based on ingestion of groundwater contaminated at 1985 levels, estimated excess lifetime cancer risks for arsenic and radionuclides (the only carcinogens among the contaminants). The excess lifetime cancer risk from arsenic ingestion was estimated as 1×10^{-1} (based on a maximum arsenic concentration) to 1.2×10^{-3} (average concentrations).

For radionuclides, the excess cancer risks was estimated to be 1.8×10^{-1} to 6.5×10^{-5}. In addition, estimated daily intakes of cadmium, manganese, and nickel were estimated to exceed health-based standards for noncarcinogens. These estimates were all based on a "future-use scenario," in which it was assumed that wells would be constructed for domestic use in each of the clean-up target areas. However, EPA has found no current exposure from ground-water ingestion from currently operating domestic and livestock wells within 4 miles of the site.

APPENDIX B

ACRONYM LIST

Acronym List

AMD	acid mine drainage
BAT/BPJ	best available technology/best professional judgment
BLM	Bureau of Land Management
BMP	best management practice
BPJ	best professional judgment
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIP	carbon-in-pulp
CWA	Clean Water Act
FLPMA	Federal Land Policy and Management Act
FS	Forest Service
GPM	gallons per minute
FWS	Fish and Wildlife Service
HRS	Hazard Ranking System
ICSs	individual control strategies
IM	instruction memorandum
kg	kilogram
MCL	maximum contaminant level
mg/l	milligrams per liter
MSHA	Mine Safety and Health Administration
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NMEID	New Mexico Environmental Improvement Division
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NSPSs	new source performance standards
NTIS	National Technical Information Service
oz/t	troy ounces per ton
ppm	parts per million
PSD	prevention of significant deterioration
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation and feasibility study
RIP	resin-in-pulp
ROD	record of decision
SIPs	State implementation plans
TSCA	Toxic Substance Control Act
TDS	total dissolved solids
TSS	total suspended solids
UCL	upper control limit
USC	United States Code
US DOI	United States Department of the Interior
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UMTRCA	Uranium Mill Tailings Remediation Control Act

APPENDIX C

GROUNDWATER STANDARDS FOR REMEDIAL ACTIONS AT INACTIVE URANIUM PROCESSING SITES (60 *FEDERAL REGISTER* 2854, JANUARY 11, 1995)

FEDERAL REGISTER
Vol. 60, No. 7

Rules and Regulations

ENVIRONMENTAL PROTECTION AGENCY (EPA)

40 CFR Part 192

[FRL-3510-1]
RIN 2060-AC03

Groundwater Standards for Remedial Actions at Inactive Uranium Processing Sites

Part IV

60 FR 2854

DATE: Wednesday, January 11, 1995

ACTION: Final rule.

To view the next page, type .np* TRANSMIT.
To view a specific page, transmit p* and the page number, e.g. p*1

SUMMARY: The Environmental Protection Agency is issuing In 1994, EPA issued final regulations to correct and prevent contamination of groundwater beneath and in the vicinity of
inactive uranium processing sites by uranium tailings. EPA first issued regulations (40 CFR part 192, subparts A, B, and C) for cleanup and disposal of tailings from these sites on January 5, 1983. These new regulations replace existing provisions at 40 CFR 192.20(a)(2) and (3) that were remanded by the U.S. Court of Appeals for the Tenth Circuit on September 3, 1985. They are promulgated pursuant to Section 275 of the Atomic Energy Act, as amended by Section 206 of the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604).

The regulations apply to tailings at the 24 locations that qualify for remedial action under Title I of Public Law 95-604. They provide that tailings must be stabilized and controlled in a manner that permanently eliminates or minimizes contamination of groundwater beneath stabilized tailings, so as to protect human health and the environment. They also provide for cleanup of contamination that occurred before the tailings are stabilized.

EFFECTIVE DATE: February 10, 1995.

ADDRESSES: Background Documents. A report ("Groundwater Protection Standards for Inactive Uranium Tailings Sites, Background Information for Final Rule," EPA 520/1-88-023) has been prepared in support of these regulations. Another report ("Groundwater Protection Standards for Inactive Uranium Tailings Sites, Response to Comments," EPA 520/1-88-055) contains the detailed responses of the Environmental Protection Agency to comments on the standard by the reviewing public. Single copies of these documents may be obtained from the Program Management Office (6601J), Office of Radiation and Indoor Air, U.S.

Environmental Protection Agency, Washington, DC 20460; (202) 233-9354.

Docket. Docket Number R-87-01 contains the rulemaking record. The docket is available for public inspection between 8 a.m.-4 p.m., weekdays, at EPA's Central Docket Section (LE-131), Room M-1500, 401 M Street SW., Washington, DC 20460. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Allan C.B. Richardson, Criteria and Standards Division (6602J), Office of Radiation and Indoor Air, U.S. Environmental Protection Agency, Washington, DC 20460; telephone (202) 233-9213.

SUPPLEMENTARY INFORMATION:

I. Introduction

On November 8, 1978, Congress enacted the Uranium Mill Tailings Radiation Control Act of 1978 (henceforth called "UMTRCA"). In UMTRCA, Congress found that uranium mill tailings "* * * may pose a potential and significant radiation health hazard to the public, and * * * that every reasonable effort should be made to provide for stabilization, disposal, and control in a safe and environmentally sound manner of such tailings in order to prevent or minimize radon diffusion into the environment and to prevent or minimize other environmental hazards from such tailings." The Act directs the Administrator of the Environmental Protection Agency (EPA) to set "* * * standards of general application for the protection of the public health, safety, and the environment * * *" to govern this process of stabilization, disposal, and control.

UMTRCA directs the Department of Energy (DOE) to conduct such remedial actions at the inactive uranium processing sites as will insure compliance with the standards established by EPA. This remedial action is to be selected and performed with the concurrence of the Nuclear Regulatory Commission (NRC). Upon completion of the remedial action program, the depository sites will remain in the custody of the Federal government under an NRC license.

The standards apply to residual radioactive material at the 24 processing sites designated, as provided in the Act, by DOE. Residual radioactive material is defined as any wastes which DOE determine to be radioactive, either in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores, or in other forms which relate to such processing, such as sludges and captured contaminated water from these sites. (Additional wastes that do not meet this definition may be subject to regulation as hazardous waste under the Solid Waste Disposal Act (SWDA) as amended by the Resource Conservation and Recovery Act of 1976 (RCRA).)

Standards are required for two types of remedial actions: disposal and cleanup of residual radioactive material. Disposal is here used to mean the operation that places tailings in a permanent condition which will minimize risk of harmful effects to the health of people and harm to the environment. Cleanup is the operation that eliminates, or reduces to acceptable levels, the potential health and environmental consequences of tailings or their constituents that have been dispersed from tailings piles or disposal areas by natural forces or by human activity, through removal of residual radioactive materials from land, buildings, and groundwater.

On January 5, 1983, EPA promulgated final standards for the disposal and cleanup of the inactive mill tailings sites under UMTRCA (48 FR 590). These standards were challenged in the Tenth Circuit Court of Appeals by several parties (Case Nos. 83-1014, 83-1041, 83-1206, and 83-1300). On September 3, 1985, the court dismissed all challenges except one: it set aside the groundwater provisions of the regulations at 40 CFR 192.20(a)(2) and (3) and remanded them to EPA "* * * to treat these toxic chemicals that pose a groundwater risk as it did in the active mill site regulations." On September 24, 1987, EPA proposed new standards to replace those remanded. A public hearing was held in Durango, Colorado, on October 29, 1987. In response to requests from several commenters at the public hearing and a later request by the American Mining Congress, the public record for comments on the proposed standard was not closed until January 29, 1988. With this notice, EPA is establishing final standards to replace those set aside.

II. Summary of Background Information

Beginning in the 1940's, the U.S. Government purchased large quantities of uranium for defense purposes. As a result, large piles of tailings were created by the uranium milling industry. Tailings piles pose a hazard to public health and the environment because they contain radioactive and toxic constituents which emanate radon to the atmosphere and may leach into groundwater. Tailings, which are a sand-like material, have also been removed from tailings piles in the past for use in construction and for soil [*2855] conditioning. These uses are inappropriate, because the radioactive and toxic constituents of tailings may elevate indoor radon levels, expose people to gamma radiation, and leach into ground and surface waters.

Most of the mills are now inactive and many of the sites were abandoned. These abandoned sites are being remediated under Title I of UMTRCA. Congress designated 22 specific inactive sites in Title I of UMTRCA, and the DOE subsequently added two more. Most remaining uranium mill tailings sites are regulated by the NRC or States and will be reclamated under Title II of UMTRCA. (DOE also owns one inactive site at Monticello, Utah, that is not included under UMTRCA). The Title I sites are located in the West, predominantly in arid areas, except for a single site at Canonsburg, Pennsylvania. Before disposal operations began, tailings piles at the inactive sites ranged in area from 5 to 150 acres and in height from only a few feet to as much as 230 feet. The amount at each site ranges from residual contamination to 2.7 million tons of tailings. The 24 designated Title I sites combined contain about 26 million tons of tailings covering a total of about 1000 acres.

Under the provisions of Title I of UMTRCA, the DOE is responsible for the disposal of tailings at these sites, which will then be licensed to DOE by NRC for long term surveillance and maintenance, following NRC approval of the remediation. In addition, tailings that were dispersed from the piles by natural forces or that have been removed for use in or around buildings or on land are being retrieved and replaced on the tailings piles prior to their disposal.

UMTRCA, as originally enacted, required that DOE complete all these remedial actions within 7 years of the effective date of EPA's standards, that is, by March 5, 1990. At the end of 1993 disposal actions had been completed at ten sites: Canonsburg, Pennsylvania, one of two sites in areas of high precipitation (Falls City, Texas is the other); Shiprock, New Mexico; Salt Lake City, Utah; Lakeview, Oregon; Green River, Utah; Spook and Riverton, Wyoming; Lowman,

Idaho; Tuba City, Arizona; and Durango, Colorado. Disposal actions were well advanced at eight other sites: Rifle (two piles), Grand Junction, and Gunnison, Colorado; Monument Valley, Arizona; Mexican Hat, Utah; Falls City, Texas; and Ambrosia Lake, New Mexico. The remaining sites are in the advanced stages of planning and should be under construction within the next two years. In view of the rate of progress with remedial work, Congress in 1988 extended the completion date for disposal and most cleanup activities until September 30, 1994, and provided further "* * * that the authority of the Secretary to perform groundwater restoration activities under this title is without limitation." (Uranium Mill Tailings Remedial Action Amendments Act of 1988, P.L. 100-616, November 5, 1988; 42 U.S.C. 7916). Section 1031 of the Energy Policy Act of 1992 further extended the completion date for UMTRCA surface stabilization (disposal) activities to September 30, 1996.

The most important hazardous constituent of uranium mill tailings is radium, which is radioactive. Other potentially hazardous substances in tailings piles include arsenic, molybdenum, selenium, uranium, and, usually in lesser amounts, a variety of other toxic substances. The concentrations of these materials in tailings vary from pile to pile, ranging from 2 to more than 100 times local background soil concentrations. A variety of organics is also known to have been used at these sites.

Exposure to radioactive and toxic substances may cause cancer and other diseases, as well as genetic damage and teratogenic effects. Tailings pose a risk to health because: (1) Radium in tailings decays into radon, a gaseous radioactive element which is easily transported in air and the radioactive decay products of which may lodge in the lungs; (2) individuals may be directly exposed to gamma radiation from the radioactivity in tailings; and (3) radioactive and toxic substances from tailings may leach into water and then be ingested with food or water, or inhaled following aeration. It is the last of these hazards that is primarily addressed here. (Although radon from radium in groundwater is unlikely to pose a substantial hazard at these locations, these standards also address that potential hazard.) The other hazards are covered by existing provisions of 40 CFR part 192.

EPA's technical analysis was based on detailed reports for 14 of the 24 inactive uranium mill tailings sites that had been developed by late 1988 for the Department of Energy by its contractors. Preliminary data for the balance of the sites were also examined. Those data showed that the volumes of contaminated water in aquifers at the 24 sites range from a few tens of millions of gallons to 4 billion gallons. In a few instances mill effluent was apparently the sole source of this groundwater. Each of the 14 sites examined in detail had at least some groundwater contamination beneath and/or beyond the site. In some cases the groundwater upgradient of the pile already exceeded EPA drinking water standards for one or more contaminants due to mineralization sources or due to anthropogenic sources other than the uranium milling activities, thus making it unsuitable for use as drinking water without treatment and, in some extreme cases, for most other purposes before it was contaminated by effluent from the mill. Some contaminants from the tailings piles are moving offsite quickly and others are moving slowly. The time for natural flushing of the contaminated portions of these aquifers was estimated to vary from a couple of years to many hundreds of years. Active restoration was estimated to take from less than 5 years at most sites to approximately 50 years at one site.

DOE currently estimates that there is approximately 4.7 billion gallons of contaminated water, but this estimate does not include all sites. One site, Lowman, Idaho, shows no sign of contamination related to the processing activities, while the site with the largest amount of contamination, Monument Valley, Arizona, has an estimated 0.75 billion gallons of contaminated water. The DOE estimate does not include those sites where current assessments indicate that supplemental standards should be applied, because contamination at these sites has been hard to quantify.

Contaminants that have been identified in the groundwater downgradient from a majority of the sites include uranium, sulfate, iron, manganese, nitrate, chloride, molybdenum, selenium, and total dissolved solids. Radium, arsenic, fluoride, sulfide, chromium, cadmium, vanadium, lead, and copper have also been found in the groundwater at one or more sites.

UMTRCA requires that the standards established under Title I provide protection that is consistent, to the maximum extent practicable, with the requirements of RCRA. In this regard, regulations established by EPA for hazardous waste disposal sites under RCRA provide for the specification of a groundwater protection standard for each waste management area in the facility permit (see 40 CFR part 264, subpart F). The groundwater protection standard includes a list of specific hazardous constituents relevant to each waste management area, a concentration limit for each hazardous constituent, the point of compliance, and the compliance period. The subpart F regulations specify that the concentration limits may be set at [*2856] general numerical limits (maximum concentration limits (MCLs)) for some hazardous constituents or at their background level in groundwater unless alternate concentration limits (ACLs) are requested and approved. ACLs may be requested based upon data which would support a determination that, if the ACL is satisfied, the constituent would not present a current or potential threat to human health and the environment. This standard incorporates many of these provisions into the regulations for the Title I sites.

III. Changes and Clarifications in Response to Comments

These final standards modify and clarify some of the provisions of the proposed standards as a result of information and views submitted during the comment period and at the public hearing. EPA received many comments on the proposed standards. Twenty-three letters were received and eight individuals testified at the public hearing. Comments were submitted from private citizens, public interest groups, members of the scientific community, and representatives of industry and of State and Federal agencies. EPA has carefully reviewed and considered these comments in preparing its detailed Response to Comments and the final Background Information Document and in developing the final standards. EPA's responses to major comments are summarized below.

Uranium Concentration Limit

Several commenters pointed out that the Agency used inappropriate dose conversion values (nonstochastic) for uranium and radium (instead of the more appropriate stochastic values) in developing the proposed concentration limit for uranium. These comments were correct. We have reevaluated the risks associated with ingestion of uranium, using current risk factors for radiocarcinogenicity of uranium, and have also considered the chemical toxicity of uranium. We have concluded that the level proposed, 30 pCi/liter, provides

an adequate margin of safety against both carcinogenic and toxic effects of uranium, and that the level should be expressed in terms of the concentration of radioactivity, because it is related to the principal health risk, and can accommodate different levels of radioactive disequilibrium between uranium-234 and uranium-238.

EPA's Office of Groundwater and Drinking Water has also examined these factors, and, on July 18, 1991, proposed the MCL for uranium in drinking water be set at a chemical concentration comparable to the limit on radioactivity promulgated in this regulation. Should the MCL for drinking water, as finally promulgated, provide a level of health protection different from that provided by the limit in this regulation, EPA will reconsider the limit at that time. On the basis of the above considerations, the limit for uranium has been established at 30 pCi/liter for this regulation.

Molybdenum Concentration Limit

Several reviewers objected to the proposed inclusion of a limit on molybdenum. They pointed out that EPA has not established a drinking water standard for this element. While this is true, the drinking water regulations also make provision for health advisories in the case of contaminants that are problems only in special situations. Molybdenum in the vicinity of uranium mill tailings is such a special case. Uranium mill tailings often contain high concentrations of molybdenum that can leach into groundwater in concentrations that may cause toxic effects in humans and cattle. This rule therefore continues to contain a limit on the concentration of molybdenum in groundwater. The value chosen remains the same as that proposed, as discussed in Section IV below.

Other Groundwater Limits

These groundwater limits incorporate MCLs issued under the Safe Drinking Water Act (SDWA) (42 USC 300f, et seq.) and in effect for sites regulated under RCRA from the time these limits were proposed on September 24, 1987, to the present. However, on January 30, 1991, EPA issued new MCLs for some of the inorganic constituents included in the present limits, and proposed new drinking water standards for radioactive constituents were published on July 18, 1991 (56 FR 3526 and 33050). Following publication of final drinking water standards for radioactive constituents, EPA will consider whether the benefits and costs implied by differences between these limits and the new drinking water standards warrant proposing to incorporate the new values into both the Title I and the Title II limits for groundwater.

Application of These Regulations to Vicinity Properties

Several commenters questioned the wisdom of applying these regulations to vicinity properties. (Vicinity properties are real properties or improvements in the vicinity of a tailings pile that are determined by DOE, in consultation with the NRC, to be contaminated with residual radioactive materials.) They indicated that if the portion of the proposed rule requiring detailed assessment and monitoring were applied to all vicinity properties, it would greatly expand the cost of the program without providing additional benefits. Since only a few vicinity properties contain sufficient tailings to constitute a significant threat of groundwater contamination, we have concluded that detailed assessment and monitoring, followed by identification of listed constituents and groundwater standards, is not required at all vicinity properties. It is

necessary only at those vicinity properties with a significant potential for groundwater contamination, as determined by the DOE (with the concurrence of NRC) using factors such as those in EPA's RCRA Facility Assessment Guidance document. It should be noted that this modification applies to the requirement for detailed assessment and monitoring only; the standards for cleanup of groundwater contamination are not changed. In addition, we note that the minimal quantities of residual radioactive materials left behind at vicinity properties after compliance with subpart B do not constitute disposal sites under subpart A.

Application of State Regulations to These Sites

Some commenters expressed the view that these regulations should require consistency with State laws and regulations. EPA's regulations for licensed mill tailings sites under Title II of this Act do not contain such a provision. (Although NRC Agreement States may, under the Atomic Energy Act, adopt standards which "* * * are equivalent to the extent practicable or more stringent * * *," they have not done so under UMTRCA.) We have decided that decisions regarding consistency with State laws and regulations should be made by DOE in consultation with the States, as provided by Section 103 of the Act. In making these decisions in cases where an approved Wellhead Protection Area, under the Safe Drinking Water Act, is associated with the site, however, DOE must comply with the provisions of that program, unless an exemption is granted by the President of the United States. In addition, contamination on the site that is not covered by UMTRCA (because it is not related to the processing operation) may be covered by Federal or State RCRA programs.

Application of Institutional Controls During an Extended Remedial Period

Several comments were received concerning the effectiveness, reliability, [*2857] and enforceability of institutional controls to be applied during a remedial period that has been extended to take advantage of natural flushing. EPA recognizes that some institutional controls, such as advisories or signs, although desirable as secondary measures, are not appropriate as primary measures for preventing human exposure to contaminated water. For this reason, the regulations permit institutional controls to be used in place of remediation only when DOE is able to ensure their effectiveness will be maintained during their use. The standards require that institutional controls "* * * effectively protect public health and the environment and satisfy beneficial uses of groundwater * * *" during their period of application. In this regard, we note that tribal, state, and local governments can also play a key role in assuring the effectiveness of institutional controls. In some cases this may be effected through changes in tribal, state, or local laws to ensure the enforceability of institutional controls by the administrative or judicial branches of government entities. One State indicated that some institutional controls, such as deed restrictions, should not be viewed as restrictions since they do not empower any agency to prohibit access to contaminated water. However, judicial enforcement of deed restrictions can be as effective as administrative enforcement of other institutional controls by a government agency. Therefore, deed restrictions are an acceptable institutional control if they are enforceable by a court with jurisdiction over the site at which they are used, and if the implementing agency will take appropriate steps to assure their effective application.

Some commenters expressed the view that, if institutional controls are used, this use must be restricted to the 7-year period for remediation authorized in

Section 112(a) of UMTRCA. EPA believes that it is not possible to achieve cleanup of groundwater at all of the sites within 7 years, no matter what reclamation scheme is employed. It is therefore necessary to consider time frames other than that originally contemplated in UMTRCA for completion of remedial actions. Congress, in granting an extension of the authorization in Section 112(a) of UMTRCA for disposal and cleanup actions from March 5, 1990 to September 30, 1994, provided further "* * * that the authority of the Secretary to perform groundwater restoration activities under this title is without limitation." (Uranium Mill Tailings Remedial Action Amendments Act of 1988 (42 U.S.C. 7916)). In addition, under Section 104(f)(2) of the Act (42 U.S.C. 7919(f)(2)), the NRC may require maintenance of corrective and institutional measures that are already in place at the time authorization under Section 112(a) expires, without time limitation.

The provisions for use of natural flushing when appropriate institutional controls are in place are consistent with existing regulations under Title II, although they are not explicit in those regulations. In cases where groundwater contamination is detected, the Title II regulations specify when corrective actions must begin, but do not specify a time when corrective actions must be completed. These provisions under Title I provide additional guidance on the length of time over which institutional control may reasonably be relied upon, and further guidance on the kinds of institutional provisions that would be appropriate at any uranium tailings site. In addition, use of institutional controls is not limited to extended remedial periods. Interim institutional controls may also be used to protect public health or the environment, when DOE finds them necessary and appropriate, prior to commencing active remedial action, during active remedial action, or during implementation of other compliance strategies.

Other comments addressed a variety of matters, including the monitoring of institutional controls, the relationship between long-term maintenance responsibilities and the 100-year limit on use of institutional controls, types of institutional controls, longer or shorter extended remedial periods, and the legality of institutional controls under UMTRCA. These matters are addressed in the Response to Comments, published separately as a background document.

Point of Compliance

Several commenters objected to the definition of the point of compliance in the disposal standards (subpart A), and suggested that it be defined at some finite distance from the edge of the remediated tailings instead of at the downgradient edge of the pile, as in regulations established under RCRA. They indicated that the remediated tailings may seep a minor amount of contamination, which may cause the standards to be exceeded at the proposed point of compliance, under conditions where there would be no detriment to human health or the environment at small distances away. This difficulty can be solved, as proposed, by moving the point of compliance or, alternatively, by granting an ACL if it can be shown that such levels of contamination will not impair human health or damage the environment. We have concluded the latter is more in keeping with the regulations established under RCRA. The standards provide that DOE may request an ACL under such circumstances and NRC may approve such a request if contamination of groundwater will not endanger human health or degrade the environment. It is our view that this requirement would usually be satisfied at any site where the minor seepage noted above is not projected to extend beyond a few hundred meters from the waste management area and will not

extend outside the site boundary. This could occur under a variety of circumstances where important roles are played by attenuation, dilution, or by vapor transport in unsaturated zones.

Under the cleanup standard (subpart B), the DOE is required to characterize the extent of contamination from the site and clean it up wherever it exceeds the standards. This characterization and confirmation of cleanup will be carried out through the monitoring program established under @ 192.12(c)(3). Although the DOE is not required to clean up preexisting contamination that is located beneath a remediated tailings pile, they are required to consider this contamination when developing their plan(s) for remedial action and will have to clean up any contamination that will migrate from beneath the pile and exceed the concentration limits established in accordance with @ 192.02(c)(3).

Alternate Concentration Limits

Several reviewers commented that EPA should not, for a variety of reasons, delegate the responsibility for approving ACLs to the NRC. Others stated that the standards were so strict that ACLs would be needed at every site. EPA considered a number of approaches to the provision for granting ACLs. These included deleting the ACL provision, establishing (by regulation) generic criteria for ACLs to be implemented by NRC, providing for some form of EPA review or oversight of ACL implementation, and (as in the proposed regulation) providing for no EPA role in setting ACLs at individual sites.

EPA has decided not to delete the ACL provision because it is clearly needed, if for no other reason than to deal with the possibilities of unavoidable minor projected seepage over the extremely long-term design life (1000 years) of the disposal required, in most cases, by these standards, and of [*2858] cleanup situations involving pollutants for which no MCLs exist. Establishment of a complete set of regulations specifying generic criteria for granting ACLs presents difficulties for rulemaking, since ACL determinations often involve complex judgments that are not amenable to being reduced to simple regulatory requirements. In this regard we note that such regulations do not yet exist in final form for sites directly regulated under RCRA. However, the Agency has issued interim final Alternate Concentration Limit Guidance (OSWER Directive 9481.00; EPA/SW-87-017), and has proposed several relevant rules, e.g., under 40 CFR parts 264, 265, 270, and 271, for Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities (55 FR 30798; July 27, 1990). In addition, the NRC proposed a draft Technical Position on Alternate Concentration Limits for Uranium Mills at Title II sites on March 21, 1994 (59 FR 13345). EPA has reviewed the NRC draft Technical position, and we find that it is consistent, in general, with EPA's own guidance and proposed rules. The NRC draft position does not, however, specify an upper limit on risks to humans from carcinogens. We have reconsidered the issue of EPA review or oversight of ACLs at Title I sites in light of this review, and concluded that, in the interests of assuring that public health is adequately protected while at the same time minimizing the regulatory burden on DOE, the best course of action is to specify that upper limit in this regulation and assign the responsibility for making determinations for ACLs at individual sites to NRC. Accordingly, in this rule, in the implementing guidance contained in subpart C, @ 192.20(a)(2), we now specify that the criterion for known or suspected carcinogens contained in the above-referenced RCRA documents should be applied in granting ACLs. That criterion specifies that ACLs should be established at levels which represent an excess lifetime risk, at a point of exposure, no greater than 10 supra -4 to

10 supra -6 to an average individual.

EPA is required by UMTRCA (Section 206) to be consistent, to the maximum extent practicable, with RCRA. For this reason, relevant portions of the RCRA regulations have been incorporated. For example, these regulations provide for the use of ACLs when it can be shown that the criteria specified in @ 192.02(c)(3)(ii) are satisfied. It remains the view of the Agency that, as at the Title II sites, an ACL is appropriate if the NRC has determined that these criteria are satisfied when the otherwise applicable standard will be met within the site boundary (or at a distance of 500 meters, if this is closer). It is clear that ACLs will usually be appropriate to accommodate the controlled minor seepage anticipated from properly designed tailings disposal within such distances, when public use is not possible.

Cost

Greater consideration of cost and cost-benefit analysis was requested by several commenters. In 1983, Congress amended UMTRCA to provide that when establishing standards the Administrator should consider, among other factors, the economic costs of compliance. We have considered these costs in two ways. First, we compared them to the benefit, expressed in terms of the value of the product-processed uranium ore-which has led to contamination of groundwater at these sites. We estimate the present value of the processed uranium ore from these sites as approximately 3.9 billion dollars (1989 dollars). The estimated cost of compliance is approximately 5.5% of this value, and we judge this to be a not unreasonable incremental cost for the remediation of contamination from the operations which produced this uranium. As a second way of considering the economic costs of compliance, we examined the cost of alternative ways to supply the resources for future use represented by these groundwaters. As noted earlier, water is a scarce resource in the Western States where this cleanup would occur. When other resources have been exhausted, the only remaining alternative to cleaning up groundwater in the vicinity of these sites is to replace this water by transporting water from the nearest alternative source. Our analysis of the costs of doing this indicates that it is significantly more costly to supply water from alternative sources than it would be to clean up the groundwater at these sites. We have concluded, therefore, that this final rule involves a reasonable relationship between the overall costs and benefits of compliance.

The RCRA subpart F regulations do not include cost as a consideration for the degree of cleanup of groundwater, and these regulations also do not provide for site-specific standards based on site-specific costs. Nonetheless, it is clearly desirable and appropriate to apply the most cost-effective remedies available to meet these standards at each site, and we anticipate that DOE will make such choices in choosing the remedies it applies to satisfy these standards. Further, once the basic criteria for establishing ACLs set forth in @ 192.02(c)(3)(ii)(B) have been satisfied, if a higher level of protection is reasonably achievable, this should be carried out. However, we do not believe it is appropriate to apply detailed cost/benefit balancing judgments to justify lesser levels of protection for ground water. The benefits of cleaning up groundwater are often not quantifiable and may not become known for many years; therefore, site-specific cost-benefit analyses are difficult to apply in such situations. Moreover, Congress provided no authority that protection of ground water at each site should be limited by cost/benefit considerations, even after reconsidering the question in the 1984 amendments.

Some reviewers raised the issue of additional costs arising from use of these standards in other applications, such as CERCLA cleanups. We recognize that there may be costs associated with using these standards as precedents for other waste cleanup projects. However, the reasonableness of incurring such costs should be assessed when it is possible to do so with complete information, that is, at the time of application of these standards as precedents for situations other than the one for which they were developed.

Natural Restoration

The use of natural restoration of an aquifer was discussed by several reviewers. Some felt that it was a viable and desirable alternative, because it is easy and inexpensive to apply, for groundwaters that are not expected to be used for drinking or other purposes during the cleanup period. Others felt that it should be prohibited because it required a reliance on institutional controls and would circumvent active cleanup of groundwater. EPA believes that the use of natural restoration can be a viable alternative in situations where water use and ecological considerations are not affected, and cleanup will occur within a reasonable time. We have concluded that institutional controls, when enforced by government entities, or that otherwise have a high degree of permanence, can be relied on for periods of time up to 100 years, and that adequate safeguards are provided through NRC oversight of the implementation of these standards to prevent this alternative from being used to circumvent active cleanup of water that will be used by nearby populations.

Commenters suggested that natural restoration was not adequate to restore water quality at these sites. DOE has indicated that they expect that natural restoration may be all that is necessary at up to eight sites and could be used [*2859] in conjunction with active remedial measures at several other sites. Natural restoration is most valuable when the contaminated aquifer discharges into a surface water body that will not be adversely affected by the contamination.

Pile and Liner Design

The design of the remediated pile and the use of a liner was of concern to several commenters, and recommendations were given for suitable designs. These commenters feared that water would continually infiltrate the remediated piles and contaminate groundwater.

These EPA standards would not be satisfied by designs which allow contamination that would adversely affect human health or the environment. Further, current engineering designs for covers incorporate a number of features that control infiltration to extremely low levels. These may include an erosion barrier (with vegetation, where feasible) to transpire moisture and reduce infiltration; rock filters and drains to drain and laterally disperse any episodic infiltration; very low permeability infiltration barriers to intercept residual infiltration; and finally, the thick radon barrier, which further inhibits infiltration. The combined effect of these features is to reduce the overall hydrological transmission of covers to levels on the order of one part in a billion, with a resulting high probability that there will be no saturated zone of leachate in or below the tailings. EPA expects DOE to use such state-of-the-art designs wherever it is appropriate to do so because of the proximity of groundwater.

Under the provisions of UMTRCA, the detailed design of the pile and its cover is the responsibility of DOE, and confirmation of the viability of the design to satisfy EPA's standards is the responsibility of NRC. EPA's responsibility is to promulgate the standards to which the disposal must conform. It would be inconsistent with the division of responsibilities set forth in UMTRCA to specify actual designs for the piles in these regulations. In this connection, the requirement to provide a liner when tailings are moved to a new location in a wet state is properly seen as a generic management requirement. Any liner for this purpose would only serve a useful purpose for the relatively short time over which the moisture content of the pile adjusts to its long-term equilibrium value, after which the cover design would determine the groundwater protection capability of the disposal.

Restricted List of Constituents

Commenters were overwhelmingly opposed to a restricted list of radioactive or toxic constituents and recommended that the entire list of constituents be relied upon. It is the Agency's experience that, under RCRA, no changes in this list have been requested based on the criteria provided in @ 264.93(b). These criteria allow for hazardous constituents to be excluded based on a determination that the constituent does not pose a substantial present or potential hazard to human health or the environment. Therefore, that portion of the RCRA standards which specify conditions for the exclusion of constituents from the RCRA list of hazardous constituents has been excluded as unnecessary.

However, a short list of compounds has been developed by EPA for use in monitoring groundwater under RCRA. This rule incorporates that list of constituents (Appendix IX of part 264) in place of the complete list in Appendix I for the monitoring programs required at @@ 192.02(c)(1), 192.03, and 192.12(c)(1). However, the rule still requires that all hazardous constituents listed in Appendix I be considered when corrective action is necessary.

IV. Summary of the Final Standard

These final standards consist of three parts: a first part governing protection against future groundwater contamination from tailings piles after disposal; a second part that applies to the cleanup of contamination that occurred before disposal of the tailings piles; and a third part that provides guidance on implementation and specifies conditions under which supplemental standards may be applied.

A. The Groundwater Standard for Disposal

The standard for protection of groundwater after disposal (subpart A) is divided into two parts that separately address actions to be carried out during periods of time designated as the disposal and post-disposal periods. The disposal and post-disposal periods are defined in a manner analogous to the closure and post-closure periods, respectively, in RCRA regulations. However, there are some differences regarding their duration and the timing of any corrective actions that may become necessary due to failure of disposal systems to perform as designed. (Because there are no mineral processing activities currently at these inactive sites, standards are not needed for an operational period.) The disposal period, for the purpose of this regulation, is defined as that period of time beginning on the effective date of the original Title I part 192 standard for the inactive sites (March 7, 1983) and ending with completion

of all actions related to disposal except post-disposal monitoring and any corrective actions that might become needed as a result of failure of completed disposal. The post-disposal period begins with completion of disposal actions and ends after an appropriate period for the monitoring of groundwater to confirm the adequacy of the disposal. The groundwater standard governing the actions to be carried out during the disposal period incorporates relevant requirements from subpart F of part 264 of this chapter (@@ 264.92-264.95). The standard for the post-disposal period reflects relevant requirements of @ 264.111 of this Chapter. The disposal standard also includes provisions for monitoring and any necessary corrective action during both disposal and post-disposal periods. These provisions are essentially the same as those governing the licensed (Title II) uranium mill tailings sites (40 CFR 192, subparts D and E; see also the Federal Register notices for those standards published on April 29, 1983 and on October 7, 1983). Several additional constituents are regulated, however, in these final Title I regulations.

These regulations do not change existing requirements at Title I sites for the period of time disposal must be designed to comply with the standards, and therefore remain identical to the requirements for licensed (Title II) sites in this respect. The Agency also recently promulgated final regulations for spent nuclear fuel, and high level and transuranic radioactive wastes (40 CFR part 191; 58 FR 66398, December 20, 1993). Those standards specify a different design period for compliance (10,000 years versus 1000 years) for two principle reasons: (1) The level of radioactivity, and therefore the level of health risk, in the wastes addressed under 40 CFR part 191 is many orders of magnitude greater than those addressed here. (The radioactivity of tailings is typically 0.4 to 1.0 nCi/g, 40 CFR part 191 wastes are always greater than 100 nCi/g, and are typically far higher.) (2) The volume of uranium mill tailings is far greater than the waste volumes addressed under 40 CFR part 191. The containment that would be required to meet a 10,000 year requirement is simply not feasible for the volumes of tailings involved (the option of underground disposal was addressed and rejected in the original [*2860] rulemakings for the Title I and Title II sites).

These regulations require installation of monitoring systems upgradient of the point of compliance (i.e., in the uppermost aquifer upgradient of the edge of the tailings disposal site) or at some other point adequate to determine background levels of any listed constituents that occur naturally at the site. The disposal should be designed to control, to the extent reasonably achievable for 1000 years and, in any case, for at least 200 years, all listed constituents identified in residual radioactive materials at the site to levels for each constituent derived in accordance with @ 192.02(c)(3). Accordingly, the elements of the groundwater protection standard to be specified for each disposal site include a list of relevant constituents, the concentration limits for each such constituent, and the compliance point.

These standards provide for consideration of ACLs if the disposal cannot reasonably be designed to assure conformance to background levels (or those in Table 1) over the required term. ACLs can be granted provided that, after considering practicable corrective actions, a determination can be made that it satisfies the values given by implementing the conditions for ACLs under @ 192.02(c)(3)(ii).

The standards for Title II sites require use of a liner under new tailings piles or lateral extensions of existing piles. These standards for remedial

action at the inactive Title I sites do not contain a similar provision. EPA assumes that the inactive piles will not need to be enlarged. Several, however, will be relocated. However, unlike tailings at the Title II sites, which generally may contain large amounts of process water, the inactive tailings contain little or no free water. Such tailings, if properly located and stabilized with a cover adequate to ensure an unsaturated zone, are not likely to require a liner in order to protect groundwater.

However, a liner would be needed for an initial drying-out period to meet these groundwater standards if a situation arose where the tailings initially contained water above the level of specific retention. For example, tailings to which water was added to facilitate their removal to a new site (i.e., through slurrying), or for compaction during disposal. (It is anticipated that piles will never be moved to areas of high precipitation or situated within a zone of water table fluctuation.) Section 192.20(a)(3) requires the remedial plan to address how any such excess water in tailings would be dealt with. In such circumstances it will normally be necessary to use a liner or equivalent to assure that groundwater will not be contaminated while the moisture level in the tailings adjusts to its long-term equilibrium value. Currently, however, DOE plans do not include slurrying any tailings to move them to new locations. Further, for all but two sites, of which one has already been closed (Canonsburg) and at the other (Falls City) disposal actions are well advanced, the tailings are located in arid areas where annual precipitation is low.

Disposal designs which prevent migration of listed constituents in the groundwater for only a short period of time would not provide appropriate protection. Such approaches simply defer adverse groundwater effects. Therefore, measures which only modify the gradient in an aquifer or create barriers (e.g., slurry walls) would not of themselves provide an adequate disposal.

Section 192.02(d) requires that a site be closed in a manner that minimizes further maintenance. Depending on the physical properties of the sites, candidate disposal systems, and the effects of natural processes over time, measures required to satisfy these standards will vary from site to site. Actual site data, computational models, and prevalent expert judgment may be used in deciding that proposed measures will satisfy the standards. Under the provisions of Section 108(a) of UMTRCA, the adequacy of these judgments is determined by the NRC.

For the post-disposal period, a groundwater monitoring plan is required to be developed and implemented. The plan will require monitoring for a period of time deemed sufficient to verify, with reasonable assurance, the adequacy of the disposal to achieve its design objectives for containment of listed constituents. EPA expects this period of time to be comparable, in most cases, to that required under @ 264.117 of Title 40 for waste sites regulated under RCRA (i.e., a few decades). However, there may be situations where longer or shorter periods are appropriate. Installation and commencement of the monitoring required under @ 192.03 will satisfy this EPA standard, for the purposes of licensing of the site by the NRC.

With regard to this monitoring, UMTRCA provides that, after remediation is completed and custody is transferred to a Federal agency, NRC may require that the Federal agency having custody of each remediated tailings site "* * * undertake such monitoring, maintenance, and emergency measures * * *and other actions as [NRC] deems necessary to comply with [EPA's standards]" (UMTRCA,

Section 104(f)(2)). Although it is not intended that routine monitoring be carried out as a requirement for conformance to these standards for the 200- to 1000-year period over which the disposal is designed to be effective, NRC may require more extensive monitoring to comply with EPA's standards, as NRC deems necessary under @ 104(f)(2) of the Act.

During the post-disposal period, if listed constituents from a disposal site are detected in excess of the groundwater standards, these regulations require a corrective action program designed to bring the disposal and the groundwater into compliance with the provisions of @ 192.02(c)(3) and subpart B, respectively. In designing such a corrective action program, the implementing agencies may consider all of the provisions available under subparts A, B, and C. A modification of the monitoring program sufficient to demonstrate that the corrective measures will be successful is also required. In designing future corrective action programs, the implementing agencies may also wish to consider the guidance provided by new regulations now being developed for the RCRA program that will be proposed as subpart S to Title 40. However, the requirements of Part 192 will still govern regulatory determinations of acceptability.

Additional Regulated Constituents

For the purpose of this regulation only, the Agency is regulating, in addition to the hazardous constituents referenced by @ 264.93, molybdenum, nitrate, combined radium-226 and radium-228, and combined uranium-234 and uranium-238. Molybdenum, radium, and uranium were addressed by the Title II standards because these radioactive and/or toxic constituents are found in high concentrations at many mill tailings sites. These regulations add numerical limits for these constituents. Nitrate was added because it had been identified in concentrations far in excess of drinking water standards in groundwater at a number of the inactive sites.

The concentration limit for molybdenum in groundwater from uranium tailings is set at 0.1 milligram per liter. This is the value of the provisional Adjusted Acceptable Daily Intake (AADI) for drinking water developed by EPA under the Safe Drinking Water Act (50 FR 46958). The Agency has established neither a maximum concentration limit goal [*2861] (MCLG) nor a maximum concentration limit (MCL) for molybdenum because it occurs only infrequently in water. According to the most recent relevant report of the National Academy of Sciences (Drinking Water and Health, 1980, Vol. III), molybdenum from drinking water, except for highly contaminated sources, is not likely to constitute a significant portion of the total human intake of this element. However, as noted above, uranium tailings are often a highly concentrated source of molybdenum, and it is therefore appropriate to include a standard for molybdenum in this rule. In addition to the hazard to humans, our analysis of toxic substances in tailings in the Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (EPA 520/4-82-013-1) found that, for ruminants, molybdenum in concentrations greater than 0.05 ppm in drinking water would lead to chronic toxicity. This concentration included a safety factor of 10; the standard provides for a safety factor of 5, which we consider adequately protective for ruminants.

The standard for combined uranium-234 and uranium-238 due to contamination from uranium tailings is 30 pCi per liter. The level of health risk associated with this standard is equivalent to the level proposed as the MCL for uranium

in drinking water by EPA (56 FR 33050, July 18, 1991). The standard promulgated here applies to remedial actions for uranium tailings only. When the Agency has established a final MCL for isotopes of uranium in drinking water, we will consider whether this standard needs to be reviewed.

The limit for nitrate (as nitrogen) is 10 mg per liter. This is the value of the drinking water standard for nitrate.

B. The Cleanup Standard

With the exception of the point of compliance provision, the standard (subpart B) for cleanup of contaminated groundwater contains the same basic provisions as the standard for disposal in subpart A. In addition, it provides for the establishment of supplemental standards under certain conditions, and for use of institutional control to permit passive restoration through natural flushing when no public water system is involved.

Although the standards specify a single point of compliance for conformance to the groundwater standards for disposal, this does not suffice for the cleanup of groundwater that has been contaminated before final disposal. Instead, in this case compliance must be achieved anywhere contamination above the levels established by these standards is found or is projected to be found in groundwater outside the disposal area and its cover. The standards require DOE to establish a monitoring program adequate to determine the extent of contamination (@ 192.12(c)(1)) in groundwater around each processing site. The possible presence of any of the inorganic or organic hazardous constituents identified in tailings or used in the processing operation should be assessed. The plan for remedial action referenced under @ 192.20(b)(4) should document the extent of contamination, the rate and direction of movement of contaminants, and consider future movement of the plume. The cleanup standards normally require restoration of all contaminated groundwater to the levels provided for under @ 192.02(c)(3). These levels are either background concentrations, the levels specified in Table 1 in the rule, or ACLs. In cases where the groundwater is not classified as of limited use, any ACL should be determined under the assumption that the groundwater may be used for drinking purposes. In certain circumstances, however, supplemental standards set at levels that would be achieved by remedial actions that come as close to meeting the otherwise applicable standards as is reasonably achievable under the circumstances may be appropriate. Such supplemental standards and ACLs are distinct regulatory provisions and may be considered independently. The regulations provide that supplemental standards may be granted if:

. Groundwater at the site is of limited use (@ 192.11(e)) in the absence of contamination from residual radioactive materials; or

. Complete restoration would cause more environmental harm than it would prevent; or

. Complete restoration is technically impracticable from an engineering perspective.

The use of supplemental standards for limited use groundwater applies the groundwater classification system proposed in EPA's 1984 Groundwater Protection Strategy. As proposed for use in these standards (52 FR 36003, September 24, 1987), Class III encompasses groundwaters that are not a current or potential

source of drinking water because of widespread, ambient contamination caused by natural or human-induced conditions, or cannot provide enough water to meet the needs of an average household. These standards adopt the proposed definition of limited use groundwater. However, for the purpose of qualifying for supplemental standards, human-induced conditions exclude contributions from residual radioactive materials.

Water which meets the definition of limited use groundwater may, nevertheless, reasonably be or be projected to be useful for domestic, agricultural, or industrial purposes. For example, in some locations higher quality water may be scarce or absent. Therefore, @ 192.22(d) requires the implementing agencies to remove any additional contamination that has been contributed by residual radioactive materials to the extent that is necessary to preserve existing or reasonably projected beneficial uses in areas of limited water supplies. At a minimum, at sites with limited use groundwater, the supplemental standards require such management of contamination due to tailings as is required to assure protection of human health and the environment from that contamination. For example, if the additional contamination from the tailings would cause an adverse effect on drinkable groundwater that has a significant interconnection with limited use groundwater over which the tailings reside, then the additional contamination from the tailings will have to be abated.

Supplemental standards are also appropriate in certain other cases similar to those addressed in Section 121(d)(4) of the Superfund Amendments and Reauthorization Act of 1986 (SARA). SARA recognizes that cleanup of contamination could sometimes cause environmental harm disproportionate to the effects it would alleviate. For example, if fragile ecosystems would be impaired by any reasonable restoration process (or by carrying a restoration process to extreme lengths to remove small amounts of residual contamination), then it might be prudent not to completely restore groundwater quality. Such a situation might occur, for example, if the quantity of water that would be lost during remediation is a significant fraction of that available in an aquifer that recharges very slowly. Decisions regarding tradeoffs of environmental damage can only be based on characteristics peculiar to the specific location of the site. We do not yet know whether such situations exist in the UMTRCA program, but EPA believes that use of supplemental standards should be possible in such situations, after thorough investigation and consideration of all reasonable restoration alternatives. [*2862]

Based on currently available information, we are not aware that at least substantial restoration of groundwater quality is technically impracticable from an engineering perspective at any of the designated sites. However, our information is incomplete. For example, there may not be enough water available in a very small aquifer to carry out remediation and retain the groundwater resource, or, in other cases, some contaminants may not be removable without destroying the aquifer. EPA believes that DOE should not be required to institute active measures that would completely restore groundwater at these sites if such restoration is technically impracticable from an engineering perspective, and if, at a minimum, protection of human health and the environment is assured. Consistent with the provisions of SARA for remediation of waste sites generally, the standards therefore permit supplemental standards in such situations at levels achievable by site-specific alternate remedial actions. A finding of technical impracticability from an engineering perspective requires careful and extensive documentation, including an analysis of the

degree to which remediation is practicable. It should be noted that the phrase "technically impracticable from an engineering perspective" means that the remedial action cannot reasonably be put into practice; it does not mean a conclusion derived from the balancing of costs and benefits. In addition to documentation of technical matters related to cleanup technology, DOE should also include a detailed assessment of such site-specific matters as transmissivity of the geologic formation, aquifer recharge and storage, contaminant properties (e.g., withdrawal and treatability potential), and the extent of contamination.

Finally, for aquifers where compliance with the groundwater standards can be projected to occur naturally within a period of less than 100 years, and where the groundwater is not now used for a public water system and is not now projected to be so used within this period, this rule permits extension of the remedial period to that time, provided institutional control and an adequate verification plan which assures satisfaction of beneficial uses is established and maintained throughout this extended remedial period.

Active restoration should be carefully considered when evaluating the use of such passive restoration. The provision to permit reliance on natural restoration is based on the judgment that sole reliance on active cleanup may not always be warranted under these standards promulgated pursuant to UMTRCA. This may be the case for situations where active cleansing to completely achieve the standards is impracticable, environmentally damaging, or excessively costly, if groundwater can reach the levels required by the standards through natural flushing within an acceptable period of time. This mechanism may be considered where groundwater concentration limits can be met through partial (or complete) reliance on natural processes and no use of the water as a source for a public water system exists or is projected. Any institutional control that may be required to effectively protect public health and the environment and assure that beneficial uses that the water could have satisfied are provided for in the interim must be verified for effectiveness and modified as necessary. Alternate standards are not required where final cleanup is to be accomplished through natural flushing, since those established under @ 192.02(c)(3) must be met at the end of the remedial period.

The regulations establish a time limit on such extension of the remedial period to limit reliance on extended use of institutional controls to manage public access to contaminated groundwater. Following the precedent established by our rule for high-level radioactive wastes (40 CFR 191.14(a)), use of institutional controls is permitted for this purpose only when they will be needed for periods of less than 100 years.

The effectiveness of institutional controls must be verified and maintained over the entire period of time that they are in use. Examples of acceptable measures include use restrictions enforceable by the administrative or judicial branches of government entities, and measures with a high degree of permanence, such as Federal or State ownership of the land containing the contaminated water. In some instances, a combination of institutional controls may be needed to provide adequate protection, such as providing an alternate source of water for drinking or other beneficial uses and restricting inappropriate use of contaminated groundwater. However, institutional control provisions are not intended to require DOE to provide water for uses that the groundwater would not have been available or suitable for in the absence of contamination from residual radioactive materials. Institutional controls that are not adequate

by themselves include such measures as health advisories, signs, posts, admonitions, or any other measure that requires the voluntary cooperation of private parties. However, such measures may be used to complement other enforceable institutional controls.

Restoration of groundwater may be carried out by removal, wherein the contaminated water is removed from the aquifer, treated, and either disposed of, used, or re-injected into the aquifer, and in situ , through the addition of chemical or biological agents to fix, reduce, or eliminate the contamination in place. Appropriate restoration will depend on characteristics of specific sites and may involve use of a combination of methods. Water can be removed from an aquifer by pumping it out through wells or by collecting the water from intercept trenches. Slurry walls can sometimes be put in place to contain contamination and prevent further migration of contaminants, so that the volume of contaminated water that must be treated is reduced. The background information document contains a more extensive discussion of candidate restoration methods.

Previously EPA reviewed preliminary information for all 24 sites and detailed information for 14 to make a preliminary assessment of the extent of the potential applicability of supplemental standards and the use of passive remediation. Approximately two-thirds of the sites appear to be located over potable (or otherwise useful) groundwater and the balance over limited use groundwaters. DOE, based on more recent information, feels that up to ten sites are candidates for supplemental standards, and that the rate at which natural flushing is occurring at up to eight of the sites permits consideration of passive remediation under institutional control as the sole remedial method. Some sites exhibit conditions that could be amenable to a combination of strategies. Further, EPA is not able to predict the applicability of provisions regarding technical impracticability or excess environmental harm, since this requires detailed analysis of specific sites, but anticipates that wide application is unlikely. It is emphasized that the above assessment is not based on final results for the vast majority of these sites, and is, therefore, subject to change.

RCRA regulations, for hazardous waste disposal units regulated by EPA, provide that acceptable concentrations of constituents in groundwater (including ACLs) are determined by the Regional Administrator (or an authorized State). EPA's regulations under Title II of UMTRCA provide that the NRC, which regulates active sites, replace the EPA Regional Administrator for the above functions when any [*2863] contamination permitted by an ACL will remain on the licensed site or within 500 meters of the disposal area, whichever is closer. Because Section 108(a) of UMTRCA requires the Commission's concurrence with DOE's selection and performance of remedial actions to conform to EPA's standards, this rule makes the same provision for administration by the NRC of those functions for Title I as it did in the case of the Title II standards, and also provides for NRC concurrence on supplemental standards.

V. Implementation

UMTRCA requires the Secretary of Energy to select and perform the remedial actions needed to implement these standards, with the full participation of any State that shares the cost. The NRC must concur with these actions and, when appropriate, the Secretary of Energy must also consult with affected Indian tribes and the Secretary of the Interior.

The cost of remedial actions is being borne by the Federal Government and the States as prescribed by UMTRCA. The clean-up of groundwater is a large-scale undertaking for which there is relatively little long-term experience. Groundwater conditions at the inactive processing sites vary greatly, and, as noted above, engineering experience with some of the required remedial actions is limited. Although preliminary engineering assessments have been performed, specific engineering requirements and detailed costs to meet the groundwater standards at each site have yet to be determined. We believe that costs averaging about 10-15 million (1993) dollars for each of the approximately fourteen tailings sites at which remedial action may be required are most likely.

The benefits from the cleanup of this groundwater are difficult to quantify. In some instances, groundwater that is contaminated by tailings is now in use and will be restored. Future uses that will be preserved by cleanup are difficult to project. In the areas where the tailings were processed, groundwater is an important resource due to the arid condition of the land. However, much of the contamination at these sites occurs in shallow alluvial aquifers. At some of these sites such aquifers have limited use because of their generally poor quality and the availability of better quality water from deeper aquifers.

Implementation of the disposal standard for protection of groundwater will require a judgment that the method chosen provides a reasonable expectation that the provisions of the standard will be met, to the extent reasonably achievable, for up to 1000 years and, in any case, for at least 200 years. This judgment will necessarily be based on site-specific analyses of the properties of the sites, candidate disposal systems, and the potential effects of natural processes over time. Therefore, the measures required to satisfy the standard will vary from site to site. Actual site data, computational models, and expert judgment will be the major tools in deciding that a proposed disposal system will satisfy the standard.

The purpose of the groundwater cleanup standard is to provide the maximum reasonable protection of public health and the environment. Costs incurred by remedial actions should be directed toward this purpose. We intend the standards to be implemented using verification procedures whose cost and technical requirements are reasonable. Procedures that provide a reasonable assurance of compliance with the standards will be adequate. Measurements to assess existing contamination and to determine compliance with the cleanup standards should be performed with 1 reasonable survey and sampling procedures designed to minimize the cost of verification.

The explanations regarding implementation of these regulations in @@ 192.20(a)(2) and (3) have been revised to remove those provisions that the Court remanded and to reflect these new requirements.

These standards are not expected to affect the disposal work DOE has already performed on tailings. On the basis of consultations with DOE and NRC, we expect, in general, that a pile designed to comply with the disposal standards proposed on September 24, 1987, will also comply with these disposal standards for the control of groundwater contamination. DOE will have to determine, with the concurrence of the NRC, what additional work may be needed to comply with the groundwater cleanup requirements. However, any such cleanup work should not adversely affect the control systems for tailings piles that have already been

or are currently being installed.

However, at three sites (Canonsburg, PA; Shiprock, NM; and Salt Lake City, UT) the disposal design was based on standards remanded in part on September 3, 1985. We have considered these sites separately, based on information supplied by DOE, and reached the tentative conclusion that modification of the existing disposal cells is not warranted at any of them. Final determinations will be made by DOE, with the concurrence of NRC.

The disposal site at Canonsburg, PA, is located above the banks of Chartiers Creek. Contamination that might seep from the encapsulated tailings will reach the surface within the site boundary, and is then diluted by water in the creek to insignificant levels. Under these circumstances, this site qualifies for an ACL under @ 192.02(c)(3)(ii), and modification of the existing disposal cell is not warranted.

The site at Shiprock, NM, which is located above the floodplain of the San Juan River, is over an aquifer that may not be useful as a source of water for drinking or other beneficial purpose because of its quality, areal extent, and yield. Most of the groundwater in this aquifer appears to have originated from seepage of tailings liquor from mill impoundments and not to be contributing to contamination of any currently or potentially useful aquifer. Additionally, the quality of this water may be degraded by uncontrolled disposal of municipal refuse north and south of the site. DOE is currently in the process of completing its characterization of this groundwater, and may or may not recommend use of a supplemental standard under @ 192.21(g). In any case, however, it appears unlikely that modification of the existing disposal cell will be necessary.

The site containing the tailings from the Salt Lake City mill is located at Clive, Utah, over groundwater that contains dissolved solids in excess of 10,000 mg/l and is not contributing to contamination of any currently or potentially useful aquifer. Under these circumstances, this site also qualifies for a supplemental standard under @ 192.21(g), and modification of the existing disposal cell is not warranted.

VI. Relationship to Other Policy and Requirements 1In July 1991 EPA completed development of a strategy to guide future EPA and State activities in groundwater protection and cleanup. A key element of this strategy is a statement of EPA Groundwater Protection Principles' n1 that has as its overall goals the prevention of adverse effects on human health and the environment and protection of the environmental integrity of the nation's groundwater resources. To achieve these [*2864] goals, EPA developed principles regarding prevention; remediation; and Federal, State, and local responsibilities. These principles are set forth and their implementation by this rule summarized below.

n1 Protecting the Nation's Groundwater: EPA's Strategy for the 1990s, The Final Report of the EPA Groundwater Task Force, U.S. Environmental Protection Agency, Washington, (Report 21Z-1020), July 1991.

(1) With respect to prevention: groundwater should be protected to ensure that the nation's currently used and reasonably expected drinking water supplies, both public and private, do not present adverse health risks and are preserved for present and future generations. Groundwater should also be protected to ensure that groundwater that is closely hydrologically connected

to surface waters does not interfere with the attainment of surface water quality standards, which is necessary to protect the integrity of associated ecosystems. Groundwater protection can be achieved through a variety of means including: pollution prevention programs; source controls; siting controls; the designation of wellhead protection areas and future public water supply areas; and the protection of aquifer recharge areas. Efforts to protect groundwater must also consider the use, value, and vulnerability of the resource, as well as social and economic values.

This rule for uranium mill tailings protects groundwater by requiring that disposal piles be designed to avoid any new contamination of groundwater that would threaten human health or the environment in the future. Water is scarce in the Western States where these disposal sites occur. Currently almost half of the water consumed in Arizona and New Mexico and 20 to 30 percent of the water consumed in Utah, Colorado, Idaho, and Texas is groundwater. The population in the Mountain States is expected to increase more than that of any other region between now and the year 2010. In particular, the population in Colorado, New Mexico, Arizona, and Utah is expected to increase dramatically. Thus, in order to ensure that all currently used and reasonably expected drinking water supplies near these sites, both public and private, are adequately protected for use by present and future generations, these rules apply drinking water standards to all potable groundwater. The rule also requires that hydrologically-connected aquifers and surface waters, including designated wellhead protection areas and future public water supply areas, be identified and protected, and that other beneficial uses of groundwater besides drinking be identified and protected, including the integrity of associated ecosystems. In this regard we note that DOE has not identified any critical aquatic habitats that have been or could be adversely affected by contamination from these sites.

(2) With respect to remediation: groundwater remediation activities must be prioritized to limit the risk of adverse effects to human health risks first and then to restore currently used and reasonably expected sources of drinking water and groundwater closely hydrologically connected to surface waters, whenever such restorations are practicable and attainable.

Pursuant to our responsibilities under Section 102(b) of UMTRCA, EPA advised DOE in 1979 concerning the criteria which should govern the order in which these sites should be cleaned up. Those criteria specified, in essence, that sites capable of affecting the health of human populations the most should be remediated first. As a result DOE has divided the 24 sites into three levels of priority, based on the populations affected. In order to facilitate implementation of these principles, we have, in this rule, provided DOE with flexibility to prioritize their cleanup activities so as to first minimize human exposure, then restore reasonably expected drinking water sources, and finally to clean up groundwater only when restoration is practicable and attainable. This has been done by relaxing the requirements for cleanup of water:

(a) If it is not a current or potential source of drinking water (i.e., it meets the definition of limited use),

(b) Where natural processes will achieve the standards and there is no current or planned use,

(c) Where adverse environmental impact will occur, and (d) where cleanup is technologically impracticable.

(3) With respect to Federal, State, and local responsibilities: the primary responsibility for coordinating and implementing groundwater protection programs has always been and should continue to be vested with the States. An effective groundwater protection program should link Federal, State, and local activities into a coherent and coordinated plan of action. EPA should continue to improve coordination of groundwater protection efforts within the Agency and with other Federal agencies with groundwater responsibilities.

In the case of the sites covered by these regulations, UMTRCA specifies a primary role for Federal rather than State agencies. However, since these regulations are modeled after existing RCRA regulations, this will serve to insure coherence and coordination with similar prevention and remediation actions by EPA, the States, and other Federal agencies. For example, the concentration limits in groundwater for listed constituents at the sites covered by this rule are the same as those specified for cleanup and disposal at RCRA sites by EPA and the States and at uranium mill sites licensed by NRC.

Executive Order 12866

Under Executive Order 12866 (58 FR 51735; October 4, 1993), EPA must determine whether a rule is "significant" and therefore subject to review by the Office of Management and Budget (OMB) and the requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $ 100 million or more or adversely effect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of the recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, it has been determined that this rule is may be a "significant regulatory action," because it may qualify under criterion #4 above on the basis of comments submitted to EPA by letter on January 15, 1993, as a result of OMB review under the previous Executive Order 12291. This action was therefore resubmitted to OMB for review. Comments from OMB to EPA for their review under the previous Executive Order and EPA's response to those comments are included in the docket. Any changes made in response to OMB suggestions or recommendations as a result of the current review will be documented in the public record.

Paperwork Reduction Act

Under the Paperwork Reduction Act of 1986, the Agency is required to state the information collection requirements of any standard published on or after July 1, 1988. In response to this requirement, this standard contains no information collection requirements and imposes no reporting burden on the

public.

List of Subjects in 40 CFR Part 192

Environmental protection, Groundwater, Radiation protection, Uranium.
[*2865]

Dated: December 14, 1994.

Carol M. Browner,

Administrator, Environmental Protection Agency.

For the reasons set forth in the preamble, 40 CFR part 192 is amended as follows:

PART 192--HEALTH AND ENVIRONMENTAL PROTECTION STANDARDS FOR URANIUM AND THORIUM MILL TAILINGS

1. The authority citation for part 192 continues to read as follows:

Authority: Section 275 of the Atomic Energy Act of 1954, 42 U.S.C. 2022, as added by the Uranium Mill Tailings Radiation Control Act of 1978, Pub. L. 95-604, as amended.

Subpart A--Standards for the Control of Residual Radioactive Materials From Inactive Uranium Processing Sites

2. Section 192.01 is amended by revising paragraphs (a) and (e) and adding paragraphs (g) through (r) to read as follows:

@ 192.01 -- Definitions.

(a) Residual radioactive material means:

(1) Waste (which the Secretary determines to be radioactive) in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores; and

(2) Other wastes (which the Secretary determines to be radioactive) at a processing site which relate to such processing, including any residual stock of unprocessed ores or low-grade materials.

* * * * *

(e) Depository site means a site (other than a processing site) selected under Section 104(b) or 105(b) of the Act.

* * * * *

(g) Act means the Uranium Mill Tailings Radiation Control Act of 1978, as amended.

(h) Administrator means the Administrator of the Environmental Protection Agency.

(i) Secretary means the Secretary of Energy.

(j) Commission means the Nuclear Regulatory Commission.

(k) Indian tribe means any tribe, band, clan, group, pueblo, or community of Indians recognized as eligible for services provided by the Secretary of the Interior to Indians.

(l) Processing site means:

(1) Any site, including the mill, designated by the Secretary under Section 102(a)(1) of the Act; and

(2) Any other real property or improvement thereon which is in the vicinity of such site, and is determined by the Secretary, in consultation with the Commission, to be contaminated with residual radioactive materials derived from such site.

(m) Tailings means the remaining portion of a metal-bearing ore after some or all of such metal, such as uranium, has been extracted.

(n) Disposal period means the period of time beginning March 7, 1983 and ending with the completion of all subpart A requirements specified under a plan for remedial action except those specified in @ 192.03 and @ 192.04.

(o) Plan for remedial action means a written plan (or plans) for disposal and cleanup of residual radioactive materials associated with a processing site that incorporates the results of site characterization studies, environmental assessments or impact statements, and engineering assessments so as to satisfy the requirements of subparts A and B of this part. The plan(s) shall be developed in accordance with the provisions of Section 108(a) of the Act with the concurrence of the Commission and in consultation, as appropriate, with the Indian Tribe and the Secretary of Interior.

(p) Post-disposal period means the period of time beginning immediately after the disposal period and ending at termination of the monitoring period established under @ 192.03.

(q) Groundwater means water below the ground surface in a zone of saturation.

(r) Underground source of drinking water means an aquifer or its portion:

(1)(i) Which supplies any public water system as defined in @ 141.2 of this chapter; or

(ii) Which contains a sufficient quantity of groundwater to supply a public water system; and

(A) Currently supplies drinking water for human consumption; or

(B) Contains fewer than 10,000 mg/l total dissolved solids; and

(2) Which is not an exempted aquifer as defined in @ 144.7 of this chapter.

3. Section 192.02 is revised to read as follows:

@ 192.02 -- Standards.

Control of residual radioactive materials and their listed constituents shall be designed n1 to:

n1 Because the standard applies to design, monitoring after disposal is not required to demonstrate compliance with respect to @ 192.02(a) and (b).

(a) Be effective for up to one thousand years, to the extent reasonably achievable, and, in any case, for at least 200 years, and,

(b) Provide reasonable assurance that releases of radon-222 from residual radioactive material to the atmosphere will not:

(1) Exceed an average n2 release rate of 20 picocuries per square meter per second, or

n2 This average shall apply over the entire surface of the disposal site and over at least a one-year period. Radon will come from both residual radioactive materials and from materials covering them. Radon emissions from the covering materials should be estimated as part of developing a remedial action plan for each site. The standard, however, applies only to emissions from residual radioactive materials to the atmosphere.

(2) Increase the annual average concentration of radon-222 in air at or above any location outside the disposal site by more than one-half picocurie per liter.

(c) Provide reasonable assurance of conformance with the following groundwater protection provisions:

(1) The Secretary shall, on a site-specific basis, determine which of the constituents listed in Appendix I to Part 192 are present in or reasonably derived from residual radioactive materials and shall establish a monitoring program adequate to determine background levels of each such constituent in groundwater at each disposal site.

(2) The Secretary shall comply with conditions specified in a plan for remedial action which includes engineering specifications for a system of disposal designed to ensure that constituents identified under paragraph (c)(1) of this section entering the groundwater from a depository site (or a processing site, if residual radioactive materials are retained on the site) will not exceed the concentration limits established under paragraph (c)(3) of this section (or the supplemental standards established under @ 192.22) in the uppermost aquifer underlying the site beyond the point of compliance established under paragraph (c)(4) of this section.

(3) Concentration limits:

(i) Concentration limits shall be determined in the groundwater for listed constituents identified under paragraph (c)(1) of this section. The

concentration of a listed constituent in groundwater must not exceed:

(A) The background level of that constituent in the groundwater; or

(B) For any of the constituents listed in Table 1 to subpart A, the respective value given in that Table if the background level of the constituent is below the value given in the Table; or

(C) An alternate concentration limit established pursuant to paragraph (c)(3)(ii) of this section.

(ii)(A) The Secretary may apply an alternate concentration limit if, after [*2866] considering remedial or corrective actions to achieve the levels specified in paragraphs (c)(3)(i)(A) and (B) of this section, he has determined that the constituent will not pose a substantial present or potential hazard to human health and the environment as long as the alternate concentration limit is not exceeded, and the Commission has concurred.

(B) In considering the present or potential hazard to human health and the environment of alternate concentration limits, the following factors shall be considered:

(1) Potential adverse effects on groundwater quality, considering:

(i) The physical and chemical characteristics of constituents in the residual radioactive material at the site, including their potential for migration;

(ii) The hydrogeological characteristics of the site and surrounding land;

(iii) The quantity of groundwater and the direction of groundwater flow;

(iv) The proximity and withdrawal rates of groundwater users;

(v) The current and future uses of groundwater in the region surrounding the site;

(vi) The existing quality of groundwater, including other sources of contamination and their cumulative impact on the groundwater quality;

(vii) The potential for health risks caused by human exposure to constituents;

(viii) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents;

(ix) The persistence and permanence of the potential adverse effects;

(x) The presence of underground sources of drinking water and exempted aquifers identified under @ 144.7 of this chapter; and

(2) Potential adverse effects on hydraulically-connected surface-water quality, considering:

(i) The volume and physical and chemical characteristics of the residual radioactive material at the site;

(ii) The hydrogeological characteristics of the site and surrounding land;

(iii) The quantity and quality of groundwater, and the direction of groundwater flow;

(iv) The patterns of rainfall in the region;

(v) The proximity of the site to surface waters;

(vi) The current and future uses of surface waters in the region surrounding the site and any water quality standards established for those surface waters;

(vii) The existing quality of surface water, including other sources of contamination and their cumulative impact on surface water quality;

(viii) The potential for health risks caused by human exposure to constituents;

(ix) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents; and

(x) The persistence and permanence of the potential adverse effects.

(4) Point of compliance: The point of compliance is the location at which the groundwater concentration limits of paragraph (c)(3) of this section apply. The point of compliance is the intersection of a vertical plane with the uppermost aquifer underlying the site, located at the hydraulically downgradient limit of the disposal area plus the area taken up by any liner, dike, or other barrier designed to contain the residual radioactive material.

(d) Each site on which disposal occurs shall be designed and stabilized in a manner that minimizes the need for future maintenance.

4. Section 192.03 is added to read as follows:

@ 192.03 -- Monitoring.

A groundwater monitoring plan shall be implemented, to be carried out over a period of time commencing upon completion of remedial actions taken to comply with the standards in @ 192.02, and of a duration which is adequate to demonstrate that future performance of the system of disposal can reasonably be expected to be in accordance with the design requirements of @ 192.02(c). This plan and the length of the monitoring period shall be modified to incorporate any corrective actions required under @ 192.04 or @ 192.12(c).

5. Section 192.04 is added to read as follows:

@ 192.04 -- Corrective Action.

If the groundwater concentration limits established for disposal sites under provisions of @ 192.02(c) are found or projected to be exceeded, a corrective action program shall be placed into operation as soon as is practicable, and in no event later than eighteen (18) months after a finding of exceedance. This corrective action program will restore the performance of the system of disposal to the original concentration limits established under @ 192.02(c)(3), to the

extent reasonably achievable, and, in any case, as a minimum shall:

(a) Conform with the groundwater provisions of @ 192.02(c)(3), and

(b) Clean up groundwater in conformance with subpart B, modified as appropriate to apply to the disposal site.

6. Table 1 is added to subpart A to read as follows:

Table 1 to Subpart A.--Maximum Concentration of Constituents for Groundwater Protection

Constituent concentration fn 1	Maximum
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Nitrate (as N)	10.
Molybdenum	0.1
Combined radium-226 and radium-228	5 pCi/liter
Combined uranium-234 and uranium-238 fn 2	30 pCi/liter
Gross alpha-particle activity (excluding radon and uranium)	15 pCi/liter
Endrin (1,2,3,4,10,10-hexachloro-6,7-exposy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,endo-5,8-dimethanonaphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma insomer)	0.004
Methoxychlor (1,1,1-trichloro-2,2'-bis(p-methoxyphenylethane))	0.1
Toxaphene (C10H10Cl6, technical chlorinated camphene, 67-69 percent chlorine)	0.005
2,4-D (2,4-dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-trichlorophenoxypropionic acid)	0.01

fn 1 Milligrams per liter, unless stated otherwise.

fn 2 Where secular equilibrium obtains, this criterion will be satisfied by a concentration of 0.044 milligrams per liter (0.044 mg/l). For conditions of other than secular equilibrium, a corresponding value may be derived and applied, based on the measured site-specific ratio of the two isotopes of uranium.

Subpart B--Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites

7. Section 192.11 is amended by revising paragraph (a) and adding paragraph (e) to read as follows:

192.11 -- Definitions.

(a) Unless otherwise indicated in this subpart, all terms shall have the same meaning as defined in subpart A.

* * * * * [*2867]

(e) Limited use groundwater means groundwater that is not a current or potential source of drinking water because (1) the concentration of total dissolved solids is in excess of 10,000 mg/l, or (2) widespread, ambient contamination not due to activities involving residual radioactive materials from a designated processing site exists that cannot be cleaned up using treatment methods reasonably employed in public water systems, or (3) the quantity of water reasonably available for sustained continuous use is less than 150 gallons per day. The parameters for determining the quantity of water reasonably available shall be determined by the Secretary with the concurrence of the Commission.

8. In @ 192.12, the introductory text is republished without change and paragraph (c) is added to read as follows:

192.12 -- Standards.

Remedial actions shall be conducted so as to provide reasonable assurance that, as a result of residual radioactive materials from any designated processing site:

* * * * *

(c) The Secretary shall comply with conditions specified in a plan for remedial action which provides that contamination of groundwater by listed constituents from residual radioactive material at any designated processing site (@ 192.01(1)) shall be brought into compliance as promptly as is reasonably achievable with the provisions of @ 192.02(c)(3) or any supplemental standards established under @ 192.22. For the purposes of this subpart:

(1) A monitoring program shall be carried out that is adequate to define backgroundwater quality and the areal extent and magnitude of groundwater contamination by listed constituents from residual radioactive materials (@ 192.02(c)(1)) and to monitor compliance with this subpart. The Secretary shall determine which of the constituents listed in Appendix I to part 192 are present in or could reasonably be derived from residual radioactive material at the site, and concentration limits shall be established in accordance with @ 192.02(c)(3).

(2) (i) If the Secretary determines that sole reliance on active remedial procedures is not appropriate and that cleanup of the groundwater can be more reasonably accomplished in full or in part through natural flushing, then the period for remedial procedures may be extended. Such an extended period may extend to a term not to exceed 100 years if:

(A) The concentration limits established under this subpart are projected to be satisfied at the end of this extended period,

(B) Institutional control, having a high degree of permanence and which will effectively protect public health and the environment and satisfy beneficial uses of groundwater during the extended period and which is enforceable by the

administrative or judicial branches of government entities, is instituted and maintained, as part of the remedial action, at the processing site and wherever contamination by listed constituents from residual radioactive materials is found in groundwater, or is projected to be found, and

(C) The groundwater is not currently and is not now projected to become a source for a public water system subject to provisions of the Safe Drinking Water Act during the extended period.

(ii) Remedial actions on groundwater conducted under this subpart may occur before or after actions under Section 104(f)(2) of the Act are initiated.

(3) Compliance with this subpart shall be demonstrated through the monitoring program established under paragraph (c)(1) of this section at those locations not beneath a disposal site and its cover where groundwater contains listed constituents from residual radioactive material.

Subpart C--Implementation

9. In @ 192.20, paragraphs (a)(2) and (a)(3) and the first sentence of paragraph (b)(l) are revised and paragraphs (a)(4) and (b)(4) are added to read as follows:

192.20 -- Guidance for implementation.

* * * * *

(a)(1) * * *

(2) Protection of water should be considered on a case-specific basis, drawing on hydrological and geochemical surveys and all other relevant data. The hydrologic and geologic assessment to be conducted at each site should include a monitoring program sufficient to establish background groundwater quality through one or more upgradient or other appropriately located wells. The groundwater monitoring list in Appendix IX of part 264 of this chapter (plus the additional constituents in Table A of this paragraph) may be used for screening purposes in place of Appendix I of part 192 in the monitoring program. New depository sites for tailings that contain water at greater than the level of "specific retention" should use aliner or equivalent. In considering design objectives for groundwater protection, the implementing agencies should give priority to concentration levels in the order listed under @ 192.02(c)(3)(i). When considering the potential for health risks caused by human exposure to known or suspected carcinogens, alternate concentration limits pursuant to paragraph 192.02(c)(3)(ii) should be established at concentration levels which represent an excess lifetime risk, at a point of exposure, to an average individual no greater than between 10-4 and 10-6.

Table A to @ 192.20(a)(2)--Additional Listed Constituents
Nitrate (as N)
Molybdenum
Combined radium-226 and radium-228
Combined uranium-234 and uranium-238
Gross alpha-particle activity (excluding radon and uranium)

(3) The plan for remedial action, concurred in by the Commission, will specify how applicable requirements of subpart A are to be satisfied. The plan should include the schedule and steps necessary to complete disposal operations at the site. It should include an estimate of the inventory of wastes to be disposed of in the pile and their listed constituents and address any need to eliminate free liquids; stabilization of the wastes to a bearing capacity sufficient to support the final cover; and the design and engineering specifications for a cover to manage the migration of liquids through the stabilized pile, function without maintenance, promote drainage and minimize erosion or abrasion of the cover, and accommodate settling and subsidence so that cover integrity is maintained. Evaluation of proposed designs to conform to subpart A should be based on realistic technical judgments and include use of available empirical information. The consideration of possible failure modes and related corrective actions should be limited to reasonable failure assumptions, with a demonstration that the disposal design is generally amenable to a range of corrective actions.

(4) The groundwater monitoring list in Appendix IX of part 264 of this chapter (plus the additional constituents in Table A in paragraph (a)(2) of this section) may be used for screening purposes in place of Appendix I of part 192 in monitoring programs. The monitoring plan required under @ 192.03 should be designed to include verification of site-specific assumptions used to project the performance of the disposal system. Prevention of [*2868] contamination of groundwater may be assessed by indirect methods, such as measuring the migration of moisture in the various components of the cover, the tailings, and the area between the tailings and the nearest aquifer, as well as by direct monitoring of groundwater. In the case of vicinity properties (@ 192.01(l)(2)), such assessments may not be necessary, as determined by the Secretary, with the concurrence of the Commission, considering such factors as local geology and the amount of contamination present. Temporary excursions from applicable limits of groundwater concentrations that are attributable to a disposal operation itself shall not constitute a basis for considering corrective action under @ 192.04 during the disposal period, unless the disposal operation is suspended prior to completion for other than seasonal reasons.

(b)(l) Compliance with @ 192.12(a) and (b) of subpart B, to the extent practical, should be demonstrated through radiation surveys. * * *

* * * * *

(4) The plan(s) for remedial action will specify how applicable requirements of subpart B would be satisfied. The plan should include the schedule and steps necessary to complete the cleanup of groundwater at the site. It should document the extent of contamination due to releases prior to final disposal, including the identification and location of listed constituents and the rate and direction of movement of contaminated groundwater, based upon the monitoring carried out under @ 192.12(c)(1). In addition, the assessment should consider future plume movement, including an evaluation of such processes as attenuation and dilution and future contamination from beneath a disposal site. Monitoring for assessment and compliance purposes should be sufficient to establish the extent and magnitude of contamination, with reasonable assurance, through use of a carefully chosen minimal number of sampling locations. The location and number of monitoring wells, the frequency and duration of monitoring, and the selection of indicator analytes for long-term groundwater monitoring, and, more generally, the design and operation of the monitoring system, will depend on the

potential for risk to receptors and upon other factors, including characteristics of the subsurface environment, such as velocity of groundwater flow, contaminant retardation, time of groundwater or contaminant transit to receptors, results of statistical evaluations of data trends, and modeling of the dynamics of the groundwater system. All of these factors should be incorporated into the design of a site-specific monitoring program that will achieve the purpose of the regulations in this subpart in the most cost-effective manner. In the case of vicinity properties (@ 192.01(l)(2)), such assessments will usually not be necessary. The Secretary, with the concurrence of the Commission, may consider such factors as local geology and amount of contamination present in determining criteria to decide when such assessments are needed. In cases where @ 192.12(c)(2) is invoked, the plan should include a monitoring program sufficient to verify projections of plume movement and attenuation periodically during the extended cleanup period. Finally, the plan should specify details of the method to be used for cleanup of groundwater.

10. In @ 192.21, the introductory text and paragraph (b) are revised, paragraph (f) is redesignated as paragraph (h), and new paragraphs (f) and (g) are added to read as follows:

@ 192.21 -- Criteria for applying supplemental standards

Unless otherwise indicated in this subpart, all terms shall have the same meaning as defined in Title I of the Act or in subparts A and B. The implementing agencies may (and in the case of paragraph (h) of this section shall) apply standards under @ 192.22 in lieu of the standards of subparts A or B if they determine that any of the following circumstances exists:

* * * * *

(b) Remedial actions to satisfy the cleanup standards for land, @ 192.12(a), and groundwater, @ 192.12(c), or the acquisition of minimum materials required for control to satisfy @@ 192.02(b) and (c), would, notwithstanding reasonable measures to limit damage, directly produce health and environmental harm that is clearly excessive compared to the health and environmental benefits, now or in the future. A clear excess of health and environmental harm is harm that is long-term, manifest, and grossly disproportionate to health and environmental benefits that may reasonably be anticipated.

* * * * *

(f) The restoration of groundwater quality at any designated processing site under @ 192.12(c) is technically impracticable from an engineering perspective.

(g) The groundwater meets the criteria of @ 192.11(e).

* * * * *

11. In @ 192.22, paragraphs (a) and (b) are revised and paragraph (d) is added to read as follows:

192.22 -- Supplemental standards.

* * * * *

(a) When one or more of the criteria of @ 192.21(a) through (g) applies, the Secretary shall select and perform that alternative remedial action that comes as close to meeting the otherwise applicable standard under @ 192.02(c)(3) as is reasonably achievable.

(b) When @ 192.21(h) applies, remedial actions shall reduce other residual radioactivity to levels that are as low as is reasonably achievable and conform to the standards of subparts A and B to the maximum extent practicable.

* * * * *

(d) When @ 192.21(b), (f), or (g) apply, implementing agencies shall apply any remedial actions for the restoration of contamination of groundwater by residual radioactive materials that is required to assure, at a minimum, protection of human health and the environment. In addition, when @ 192.21(g) applies, supplemental standards shall ensure that current and reasonably projected uses of the affected groundwater are preserved.

12. Appendix I is added to part 192 to read as follows:

Appendix I to Part 192--Listed Constituents

Acetonitrile

Acetophenone (Ethanone, 1-phenyl)

2-Acetylaminofluorene (Acetamide, N-9H-fluoren-2-yl-)

Acetyl chloride

1-Acetyl-2-thiourea (Acetamide, N-(aminothioxymethyl)-)

Acrolein (2-Propenal)

Acrylamide (2-Propenamide)

Acrylonitrile (2-Propenenitrile)

Aflatoxins

Aldicarb (Propenal, 2-methyl-2-(methylthio)-,O-[(methylamino)carbonyl]oxime

Aldrin (1,4:5,8-Dimethanonaphthalene,
1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro(1 alpha ,4 alpha ,4a beta ,5 alpha,8 alpha,8 alpha beta)-)

Allyl alcohol (2-Propen-1-ol)

Allyl chloride (1-Propane,3-chloro)

Aluminum phosphide

4-Aminobiphenyl ([1,1'-Biphenyl]-4-amine)

5-(Aminomethyl)-3-isoxazolol (3(2H)-Isoxazolone,5-(aminomethyl)-)

4-Aminopyridine (4-Pyridineamine)

Amitrole (lH-1,2,4-Triazol-3-amine)

Ammonium vanadate (Vanadic acid, ammonium salt)

Aniline (Benzenamine)

Antimony and compounds, N.O.S. n1

n1 The abbreviation N.O.S. (not otherwise specified) signifies those members of the general class not specifically listed by name in this appendix.
[*2869]

Aramite (Sulfurous acid, 2-chloroethyl
2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester)

Arsenic and compounds, N.O.S.

Arsenic acid (Arsenic acid H sub 3AsO sub 4)

Arsenic pentoxide (Arsenic oxide As sub 2O sub 5)

Auramine (Benzamine, 4,4'-carbonimidoylbis[N,N-dimethyl-])

Azaserine (L-Serine, diazoacetate (ester))

Barium and compounds, N.O.S.

Barium cyanide

Benz[c]acridine (3,4-Benzacridine)

Benz[a]anthracene (1,2-Benzanthracene)

Benzal chloride (Benzene, dichloromethyl-)

Benzene (Cyclohexatriene)

Benzenearsonic acid (Arsenic acid, phenyl-)

Benzidine ([1,1'-Biphenyl]-4,4'-diamine)

Benzo[b]fluoranthene (Benz[e]acephananthrylene)

Benzo[j]fluoranthene

Benzo[k]fluoranthene

Benzo[a]pyrene

p-Benzoquinone (2,5-Cyclohexadiene-1,4-dione)

Benzotrichloride (Benzene, (trichloro-

methyl)-)

Benzyl chloride (Benzene, (chloromethyl)-)

Beryllium and compounds, N.O.S.

Bromoacetone (2-Propanone, 1-bromo-)

Bromoform (Methane, tribromo-)

4-Bromophenyl phenyl ether (Benzene, l-bromo-4-phenoxy-)

Brucine (Strychnidin-10-one, 2,3-dimeth-

oxy-)

Butyl benzyl phthalate (1,2-Benzenedicarbozylic acid, butyl phenylmethyl ester)

Cacodylic acid (Arsinic acid, dimethyl)

Cadmium and compounds, N.O.S.

Calcium chromate (Chromic acid H sub 2CrO sub 4, calcium salt)

Calcium cyanide (Ca(CN) sub 2)

Carbon disulfide

Carbon oxyfluoride (Carbonic difluoride)

Carbon tetrachloride (Methane, tetrachloro-)

Chloral (Acetaldehyde, trichloro-)

Chlorambucil (Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-)

Chlordane
(4,7-Methano-1H-indene,1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-)

Chlorinated benzenes, N.O.S.

Chlorinated ethane, N.O.S.

Chlorinated fluorocarbons, N.O.S.

Chlorinated naphthalene, N.O.S.

Chlorinated phenol, N.O.S.

Chlornaphazin (Naphthalenamine, N,N'-bis(2-chlorethyl)-)

Chloroacetaldehyde (Acetaldehyde, chloro-)

Chloroalkyl ethers, N.O.S.

p-Chloroaniline (Benzenamine, 4-chloro-)

Chlorobenzene (Benzene, chloro-)

Chlorobenzilate (Benzeneacetic acid, 4-chloro- alpha -(4-chlorophenyl)- alpha -hydroxy-, ethyl ester)

p-Chloro-m-cresol (Phenol, 4-chloro-3-methyl)

2-Chloroethyl vinyl ether (Ethene, (2-chloroethoxy)-)

Chloroform (Methane, trichloro-)

Chloromethyl methyl ether (Methane, chloromethoxy-)

beta -Chloronapthalene (Naphthalene, 2-chloro-)

o-Chlorophenol (Phenol, 2-chloro-)

1-(o-Chlorophenyl)thiourea (Thiourea, (2-chlorophenyl-))

3-Chloropropionitrile (Propanenitrile, 3-chloro-)

Chromium and compounds, N.O.S.

Chrysene

Citrus red No. 2 (2-Naphthalenol, 1-[(2,5-dimethoxyphenyl)azo]-)

Coal tar creosote

Copper cyanide (CuCN)

Creosote

Cresol (Chresylic acid) (Phenol, methyl-)

Crotonaldehyde (2-Butenal)

Cyanides (soluble salts and complexes), N.O.S.

Cyanogen (Ethanedinitrile)

Cyanogen bromide ((CN)Br)

Cyanogen chloride ((CN)Cl)

Cycasin (beta-D-Glucopyranoside, (methyl-ONN-azoxy)methyl)

2-Cyclohexyl-4,6-dinitrophenol (Phenol, 2-cyclohexyl-4,6-dinitro-)

Cyclophosphamide (2H-1,3,2-Oxazaphosphorin-2-amine,N,N-bis(2-chloroethyl) tetrahydro-,2-oxide)

2,4-D and salts and esters (Acetic acid, (2,4-dichlorophenoxy)-)

Daunomycin (5,12-Naphthacenedione,8-acetyl-10-[(3-amino-2,3,6-trideoxy- alpha -Llyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-,(8S-cis))

DDD (Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-)

DDE (Benzene, 1,1-(dichloroethylidene)bis[4-chloro-)

DDT (Benzene, 1,1'-(2,2,2-trichloroethlyidene)bis[4-chloro-)

Diallate (Carbomothioic acid, bis(1-methylethyl)-,S-(2,3-dichloro-2-propenyl) ester)

Dibenz[a,h]acridine

Dibenz[a,j]acridine

Dibenz[a,h]anthracene

7H-Dibenzo[c,g]carbazole

Dibenzo[a,e]pyrene (Naphtho[1,2,4,5-def)crysene)

Dibenzo[a,h]pyrene (Dibenzo[b,def]crysene)

Dibenzo[a,i]pyrene (Benzo[rst]pentaphene)

1,2-Dibromo-3-chloropropane (Propane, 1,2-dibromo-3-chloro-)

Dibutylphthalate (1,2-Benzenedicarboxylic acid, dibutyl ester)

o-Dichlorobenzene (Benzene, 1,2-dichloro-)

m-Dichlorobenzene (Benzene, 1,3-dichloro-)

p-Dichlorobenzene (Benzene, 1,4-dichloro-)

Dichlorobenzene, N.O.S. (Benzene; dichloro-, N.O.S.)

3,3'-Dichlorobenzidine ([1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-)

1,4-Dichloro-2-butene (2-Butene, 1,4-dichloro-)

Dichlorodifluoromethane (Methane, dichlorodifluoro-)

Dichloroethylene, N.O.S.

1,1-Dichloroethylene (Ethene, 1,1-dichloro-)

1,2-Dichloroethylene (Ethene, 1,2-dichloro-,(E)-)

Dichloroethyl ether (Ethane, 1,1'-oxybis[2-chloro-)

Dichloroisopropyl ether (Propane, 2,2'-oxybis[2-chloro-)

Dichloromethoxy ethane (Ethane, 1,1'-[methylenebis(oxy)bis[2-chloro-)

Dichloromethyl ether (Methane, oxybis[chloro-)

2,4-Dichlorophenol (Phenol, 2,4-dichloro-)

2,6-Dichlorophenol (Phenol, 2,6-dichloro-)

Dichlorophenylarsine (Arsinous dichloride, phenyl-)

Dichloropropane, N.O.S. (Propane,

dichloro-,)

Dichloropropanol, N.O.S. (Propanol, dichloro-,)

Dichloropropene; N.O.S. (1-Propane, dichloro-,)

1,3-Dichloropropene (1-Propene, 1,3-dichloro-)

Dieldrin
(2,7:3,6-Dimethanonaphth[2,3-b]oxirene,3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,
7,7a,octahydro-,(1a alpha ,2 beta ,2a alpha ,3 beta ,6 beta ,6a alpha ,7 beta
,7a alpha)-)

1,2:3,4-Diepoxybutane (2,2'-Bioxirane)

Diethylarsine (Arsine, diethyl-)

1,4 Diethylene oxide (1,4-Dioxane)

Diethylhexyl phthalate (1,2-Benzenedicarboxlyic acid, bis(2-ethylhexl) ester)

N,N-Diethylhydrazine (Hydrazine, 1,2-diethyl)

O,O-Diethyl S-methyl dithiophosphate (Phosphorodithioic acid, O,O-diethyl
S-methyl ester)

Diethyl-p-nitrophenyl phosphate (Phosphoric acid, diethyl 4-nitrophenyl ester)

Diethyl phthalate (1,2-Benzenedicarboxylic acid, diethyl ester)

O,O-Diethyl O-pyrazinyl phosphorothioate (Phosphorothioic acid, O,O-diethyl
O-pyrazinyl ester)

Diethylstilbesterol (Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-,(E)-)

Dihydrosafrole (1,3-Benxodioxole, 5-propyl-)

Diisopropylfluorophosphate (DFP) (Phosphorofluoridic acid, bis(1-methyl ethyl)
ester)

Dimethoate (Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino) 2-oxoethyl] ester)

3,3'-Dimethoxybenzidine ([1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethoxy-)

p-Dimethylaminoazobenzene (Benzenamine, N,N-dimethyl-4-(phenylazo)-)

7,12-Dimethylbenz[a]anthracene (Benz[a]anthracene, 7,12-dimethyl-)

3,3'-Dimethylbenzidine ([1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-)

Dimethylcarbamoyl chloride (carbamic chloride, dimethyl-)

1,1-Dimethylhydrazine (Hydrazine, 1,1-dimethyl-)

1,2-Dimethylhydrazine (Hydrazine, 1,2-dimethyl-)

alpha , alpha -Dimethylphenethylamine (Benzeneethanamine, alpha , alpha -dimethyl-)

2,4-Dimethylphenol (Phenol, 2,4-dimethyl-)

Dimethylphthalate (1,2-Benzenedicarboxylic acid, dimethyl ester)

Dimethyl sulfate (Sulfuric acid, dimethyl ester)

Dinitrobenzene, N.O.S. (Benzene, dinitro-)

4,6-Dinitro-o-cresol and salts (Phenol, 2-methyl-4,6-dinitro-)

2,4-Dinitrophenol (Phenol, 2,4-dinitro-)

2,4-Dinitrotoluene (Benzene, 1-methyl-2,4-dinitro-)

2,6-Dinitrotoluene (Benzene, 2-methyl-1,3-dinitro-)

Dinoseb (Phenol, 2-(1-methylpropyl)-4,6-dinitro-)

Di-n-octyl phthalate (1,2-Benzenedicarboxylic acid, dioctyl ester)

1,4-Dioxane (1,4-Diethyleneoxide)

Diphenylamine (Benzenamine, N-phenyl-) [*2870]

1,2-Diphenylhydrazine (Hydrazine, 1,2-diphenyl-)

Di-n-propylnitrosamine (1-Propanamine,N-nitroso-N-propyl-)

Disulfoton (Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester)

Dithiobiuret (Thioimidodicarbonic diamide [(H sub 2N)C(S)] sub 2NH)

Endosulfan (6,9,Methano-2,4,3-benzodioxathiepin,6,7,8,9,10,10-hexachloro-1,5,5a, 6,9,9ahexahydro,3-oxide)

Endothall (7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid)

Endrin and metabolites
(2,7:3,6-Dimethanonaphth[2,3-b]oxirene,3,4,5,6,9,9-hexachloro1a,2,2a,3,6,6a,7,7a
-octa-hydro,(1a alpha ,2 beta ,2a beta ,3 alpha ,6 alpha ,6a beta ,7 beta ,7a
alpha)-)

Epichlorohydrin (Oxirane, (chloromethyl)-)

Epinephrine (1,2-Benzenediol,4-[1-hydroxy-2-(methylamino)ethyl]-,(R)-,)

Ethyl carbamate (urethane) (Carbamic acid, ethyl ester)

Ethyl cyanide (propanenitrile)

Ethylenebisdithiocarbamic acid, salts and esters (Carbamodithioic acid,
1,2-Ethanediylbis-)

Ethylene dibromide (1,2-Dibromoethane)

Ethylene dichloride (1,2-Dichloroethane)

Ethylene glycol monoethyl ether (Ethanol, 2-ethoxy-)

Ethyleneimine (Aziridine)

Ethylene oxide (Oxirane)

Ethylenethiourea (2-Imidazolidinethione)

Ethylidene dichloride (Ethane, 1,1-

Dichloro-)

Ethyl methacrylate (2-Propenoic acid, 2-methyl-, ethyl ester)

Ethylmethane sulfonate (Methanesulfonic acid, ethyl ester)

Famphur (Phosphorothioic acid, O-[4-[(dimethylamino)sulphonyl]phenyl]
O,O-dimethyl ester)

Fluoranthene

Fluorine

Fluoroacetamide (Acetamide, 2-fluoro-)

Fluoroacetic acid, sodium salt (Acetic acid, fluoro-, sodium salt)

Formaldehyde (Methylene oxide)

Formic acid (Methanoic acid)

Glycidylaldehyde (Oxiranecarboxyaldehyde)

Halomethane, N.O.S.

Heptachlor (4,7-Methano-1H-indene,
1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-)

Heptachlor epoxide (alpha , beta , and gamma isomers)
(2,5-Methano-2H-indeno[1,2-b]-oxirene,
2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a-hexa-hydro-,(1a alpha ,1b beta ,2
alpha ,5 alpha ,5a beta ,6 beta ,6a alpha)-)

Hexachlorobenzene (Benzene, hexachloro-)

Hexachlorobutadiene (1,3-Butadiene, 1,1,2,3,4,4-hexachloro-)

Hexachlorocyclopentadiene (1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-)

Hexachlorodibenzofurans

Heptachlorodibenzo-p-dioxins

Hexachloroethane (Ethane, hexachloro-)

Hexachlorophene (phenol, 2,2'-Methylenebis[3,4,6-trichloro-)

Hexachloropropene (1-Propene, 1,1,2,3,3,3-hexachloro-)

Hexaethyl tetraphosphate (Tetraphosphoric acid, hexaethyl ester)

Hydrazine

Hydrocyanic acid

Hydrofluoric acid

Hydrogen sulfide (H sub 2S)

Indeno(1,2,3-cd)pyrene

Isobutyl alcohol (1-Propanol, 2-methyl-)

Isodrin (1,4,5,8-Dimethanonaphthalene,
1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro, (1 alpha ,4 alpha ,4a beta ,5
beta ,8 beta ,8a beta)-)

Isosafrole (1,3-Benzodioxole, 5-(1-propenyl)-)

Kepone (1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one,
1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-)

Lasiocarpine (2-Butenoic acid,
2-methyl-,7-[[2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy]methyl]-
2,3,5,7a-tetrahydro-1H-pyrrolizin-l-yl ester)

Lead and compounds, N.O.S.

Lead acetate (Acetic acid, lead(2+) salt)

Lead phosphate (Phosphoric acid, lead(2+) salt(2:3))

Lead subacetate (Lead, bis(acetato-O)tetrahydroxytri-)

Lindane (Clohexane, 1,2,3,4,5,6-hexachloro-, (1 alpha ,2 alpha ,3 beta ,4 alpha ,5 alpha ,6 beta)-)

Maleic anhydride (2,5-Furandione)

Maleic hydrazide (3,6-Pyridazinedione, 1,2-dihydro-)

Malononitrile (Propanedinitrile)

Melphalan (L-Phenylalanine, 4-[bis(2-chloroethyl)aminol]-)

Mercury and compounds, N.O.S.

Mercury fulminate (Fulminic acid, mercury(2+) salt)

Methacrylonitrile (2-Propenenitrile, 2-methyl-)

Methapyrilene (1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-)

Metholmyl (Ethamidothioic acid, N-[[(methylamino)carbonyl]oxy]thio-, methyl ester)

Methoxychlor (Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-methoxy-)

Methyl bromide (Methane, bromo-)

Methyl chloride (Methane, chloro-)

Methyl chlorocarbonate (Carbonchloridic acid, methyl ester)

Methyl chloroform (Ethane, 1,1,1-trichloro-)

3-Methylcholanthrene (Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-)

4,4'-Methylenebis(2-chloroaniline) (Benzenamine, 4,4'-methylenebis(2-

chloro-)

Methylene bromide (Methane, dibromo-)

Methylene chloride (Methane, dichloro-)

Methyl ethyl ketone (MEK) (2-Butanone)

Methyl ethyl ketone peroxide (2-Butanone, peroxide)

Methyl hydrazine (Hydrazine, methyl-)

Methyl iodide (Methane, iodo-)

Methyl isocyanate (Methane, isocyanato-)

2-Methyllactonitrile (Propanenitrile, 2-hydroxy-2-methyl-)

Methyl methacrylate (2-Propenoic acid, 2-methyl-, methyl ester)

Methyl methanesulfonate (Methanesulfonic acid, methyl ester)

Methyl parathion (Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester)

Methylthiouracil (4(1H)Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-)

Mitomycin C
(Azirino[2',3':3,4]pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[[(aminocarbonyl) oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methy-, [1aS-(1a alpha ,8 beta ,8a alpha ,8b alpha)]-)

MNNG (Guanidine, N-methyl-N'-nitro-N-nitroso-)

Mustard gas (Ethane, 1,1'-thiobis[2-chloro-)

Naphthalene

1,4-Naphthoquinone (1,4-Naphthalenedione)

alpha -Naphthalenamine (1-Naphthylamine)

beta -Naphthalenamine (2-Naphthylamine)

alpha -Naphthylthiourea (Thiourea, 1-naphthalenyl-)

Nickel and compounds, N.O.S.

Nickel carbonyl (Ni(CO) sub 4 (T-4)-)

Nickel cyanide (Ni(CN) sub 2)

Nicotine and salts (Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-)

Nitric oxide (Nitrogen oxide NO)

p-Nitroaniline (Benzenamine, 4-nitro-)

Nitrobenzene (Benzene, nitro-)

Nitrogen dioxide (Nitrogen oxide NO sub 2)

Nitrogen mustard, and hydrochloride salt (Ethanamine, 2-chloro-N-(2-chloroethyl)-N-methyl-)

Nitrogen mustard N-oxide and hydrochloride salt (Ethanamine, 2chloro-N-(2-chloroethyl)N-methyl-, N-oxide)

Nitroglycerin (1,2,3-Propanetriol, trinitrate)

p-Nitrophenol (Phenol, 4-nitro-)

2-Nitropropane (Propane, 2-nitro-)

Nitrosamines, N.O.S.

N-Nitrosodi-n-butylamine (l-Butanamine, N-butyl-N-nitroso-)

N-Nitrosodiethanolamine (Ethanol, 2,2'-(nitrosoimino)bis-)

N-Nitrosodiethylamine (Ethanamine, N-ethyl-N-nitroso-1)

N-Nitrosodimethylamine (Methanamine, N-methyl-N-nitroso-)

N-Nitroso-N-ethylurea (Urea, N-ethyl-N-nitroso-)

N-Nitrosomethylethylamine (Ethanamine, N-methyl-N-nitroso-)

N-Nitroso-N-methylurea (Urea, N-methyl-N-nitroso-)

N-Nitroso-N-methylurethane (Carbamic acid, methylnitroso-, ethyl ester)

N-Nitrosomethylvinylamine (Vinylamine, N-methyl-N-nitroso-)

N-Nitrosomorpholine (Morpholine,

4-nitroso-)

N-Nitrosonornicotine (Pyridine, 3-(1-nitroso-2-pyrrolidinyl)-, (S)-)

N-Nitrosopiperidine (Piperidine, 1-nitroso-)

Nitrosopyrrolidine (Pyrrolidine, 1-nitroso-)

N-Nitrososarcosine (Glycine, N-methyl-N-nitroso-)

5-Nitro-o-toluidine (Benzenamine, 2-methyl-5-nitro-)

Octamethylpyrophosphoramide (Diphosphoramide, octamethyl-)

Osmium tetroxide (Osmium oxide OsO sub 4, (T-4)-)

Paraldehyde (1,3,5-Trioxane, 2,4,6-tri

methyl-)

Parathion (Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester)

Pentachlorobenzene (Benzene, pentachloro-)

Pentachlorodibenzo-p-dioxins

Pentachlorodibenzofurans

Pentachloroethane (Ethane, pentachloro-)

Pentachloronitrobenzene (PCNB) (Benzene, pentachloronitro-)

Pentachlorophenol (Phenol, pentachloro-)

Phenacetin (Acetamide, N-(4-ethoxyphenyl)-)

Phenol

Phenylenediamine (Benzenediamine)

Phenylmercury acetate (Mercury, (acetato-O)phenyl-) [*2871]

Phenylthiourea (Thiourea, phenyl-)

Phosgene (Carbonic dichloride)

Phosphine

Phorate (Phosphorodithioic acid, O,O-diethyl S-[(ethylthiomethyl] ester)

Phthalic acid esters, N.O.S.

Phthalic anhydride (1,3-isobenzofurandione)

2-Picoline (Pyridine, 2-methyl-)

Polychlorinated biphenyls, N.O.S.

Potassium cyanide (K(CN))

Potassium silver cyanide (Argentate(l-), bis(cyano-C)-, potassium)

Pronamide (Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-)

1,3-Propane sultone (1,2-Oxathiolane, 2,2-dioxide)

n-Propylamine (1-Propanamine)

Propargyl alcohol (2-Propyn-1-ol)

Propylene dichloride (Propane, 1,2-

dichloro-)

1,2-Propylenimine (Aziridine, 2-methyl-)

Propylthiouracil (4(1H)-Pyrimidinone, 2,3-dihydro-6-propyl-2-thioxo-)

Pyridine

Reserpinen (Yohimban-16-carboxylic acid,
11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy]-smethyl ester, (3 beta ,16

beta ,17 alpha ,18 beta ,20 alpha)-)

Resorcinol (1,3-Benzenediol)

Saccharin and salts (1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide)

Safrole (1,3-Benzodioxole, 5-(2-propenyl)-)

Selenium and compounds, N.O.S.

Selenium dioxide (Selenious acid)

Selenium sulfide (SeS sub 2)

Selenourea

Silver and compounds, N.O.S.

Silver cyanide (Silver cyanide Ag(CN))

Silvex (Propanoic acid, 2-(2,4,5-trichlorophen

oxy)-)

Sodium cyanide (Sodium cyanide Na(CN))

Streptozotocin (D-Glucose, 2-deoxy-2-[[methylnitrosoamino)carbonyl]amino]-)

Strychnine and salts (Strychnidin-10-one)

TCDD (Dibenzo[b,e][1,4]dioxin, 2,3,7,8-tetrachloro-)

1,2,4,5-Tetrachlorobenzene (Benzene, 1,2,4,5-tetrachloro-)

Tetrachlorodibenzo-p-dioxins

Tetrachlorodibenxofurans

Tetrachloroethane, N.O.S. (Ethane, tetrachloro-, N.O.S.)

1,1,1,2-Tetrachloroethane (Ethane, 1,1,1,2-tetrachloro-)

1,1,2,2-Tetrachloroethane (Ethane, 1,1,2,2-tetrachloro-)

Tetrachloroethylene (Ethene, tetrachloro-)

2,3,4,6-Tetrachlorophenol (Phenol, 2,3,4,6-tetrachloro-)

Tetraethyldithiopyrophosphate (Thiodiphosphoric acid, tetraethyl ester)

Tetraethyl lead (Plumbane, tetraethyl-)

Tetraethyl pyrophosphate (Diphosphoric acid, tetraethyl ester)

Tetranitromethane (Methane, tetranitro-)

Thallium and compounds, N.O.S.

Thallic oxide (Thallium oxide Tl sub 2O sub 3)

Thallium (I) acetate (Acetic acid, thallium (1+) salt)

Thallium (I) carbonate (Carbonic acid, dithallium (1+) salt)

Thallium (I) chloride (Thallium chloride TlCl)

Thallium (I) nitrate (Nitric acid, thallium (1+) salt)

Thallium selenite (Selenius acid, dithallium (1+) salt)

Thallium (I) sulfate (Sulfuric acid, thallium (1+) salt)

Thioacetamide (Ethanethioamide)

3,Thiofanox (2-Butanone, 3,3-dimethyl-1-(methylthio)-, O-[(methylamino)carbonyl] oxime)

Thiomethanol (Methanethiol)

Thiophenol (Benzenethiol)

Thiosemicarbazide (Hydrazinecarbothioamide)

Thiourea

Thiram (Thioperoxydicarbonic diamide [(H sub 2N)C(S)]2S sub 2, tetramethyl-)

Toluene (Benzene, methyl-)

Toluenediamine (Benzenediamine, ar-methyl-)

Toluene-2,4-diamine (1,3-Benzenediamine, 4-methyl-)

Toluene-2,6-diamine (1,3-Benzenediamine, 2-methyl-)

Toluene-3,4-diamine (1,2-Benzenediamine, 4-methyl-)

Toluene diisocyanate (Benzene, 1,3-diisocyanatomethyl-)

o-Toluidine (Benzenamine, 2-methyl-)

o-Toluidine hydrochloride (Benzenamine, 2-methyl-, hydrochloride)

p-Toluidine (Benzenamine, 4-methyl-)

Toxaphene

1,2,4-Trichlorobenzene (Benzene, 1,2,4-trichloro-)

1,1,2-Trichloroethane (Ethane, 1,1,2-trichloro-)

Trichloroethylene (Ethene,trichloro-)

Trichloromethanethiol (Methanethiol, trichloro-)

Trichloromonofluoromethane (Methane, trichlorofluoro-)

2,4,5-Trichlorophenol (Phenol, 2,4,5-trichloro-)

2,4,6-Trichlorophenol (Phenol, 2,4,6-trichloro-)

2,4,5-T (Acetic acid, 2,4,5- trichloro-

phenoxy-)

Trichloropropane, N.O.S.

1,2,3-Trichloropropane (Propane, 1,2,3-trichloro-)

O,O,O-Triethyl phosphorothioate (Phosphorothioic acid, O,O,O-triethyl ester)

Trinitrobenzene (Benzene, 1,3,5-trinitro-)

Tris(1-aziridinyl)phosphine sulfide (Aziridine,
1,1',1"phosphinothioylidynetris-))

Tris(2,3-dibromopropyl) phosphate (1-Propanol, 2,3-dibromo-, phosphate (3:1))

Trypan blue (2,7-Naphthalendisulfonic acid,
3,3'-[(3,3'-dimethyl[1,1'-biphenyl]-4,4'-diyl)bis(azo)]bis(5-amino-4-hydroxy-,
tetrasodium salt)

Uracil mustard (2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl)amino]-)

Vanadium pentoxide (Vanadium oxide V sub 2O sub 5)

Vinyl chloride (Ethene, chloro-)

Wayfarin (2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenlybutyl)-)

Zinc cyanide (Zn(CN) sub 2)

Zinc phosphide (Zn sub 3P sub 2)

[FR Doc. 95-546 Filed 1-10-95; 8:45 am]

Standards for Interstate and Intrastate Waters, 20.6.4 NMAC, 2005
Effective December 29, 2006

The following document includes all provisions that are in effect for Clean Water Act purposes with the following exceptions:

1. EPA has not taken action on new/revised provisions in **Sections 20.6.4.97, 98 and 99.**

2. EPA has not taken action on new and/or revised use designations for classified stream segments listed in **Sections 20.6.4.126, 128, 221, 310, 701 and 702.**

3. EPA has approved **Sections 20.6.4.108, 113, 115, 116, 118, 123, 206, 208, 209, 215, 217, 305, 309, 407 and 804** with the assumption that use designations for all non-perennial reaches and tributaries to classified stream segments that may be covered by these sections are capable of supporting the uses described in CWA Section 101(a)(2).

The corresponding provisions which *are* in effect for Clean Water Act purposes can be found in Standards for Interstate and Intrastate Surface Waters, 20.6.4 (Effective October 23, 2003)

TITLE 20 ENVIRONMENTAL PROTECTION
CHAPTER 6 WATER QUALITY
PART 4 STANDARDS FOR INTERSTATE AND INTRASTATE SURFACE WATERS

20.6.4.1 ISSUING AGENCY: Water Quality Control commission.
[20.6.4.1 NMAC - Rp 20 NMAC 6.1.1001, 10-12-00]

20.6.4.2 SCOPE: Except as otherwise provided by statute or regulation of the water quality control commission, this part governs all surface waters of the state of New Mexico, which are subject to the New Mexico Water Quality Act, Sections 74-6-1 through 74-6-17 NMSA 1978.
[20.6.4.2 NMAC - Rp 20 NMAC 6.1.1002, 10-12-00; A, 05-23-05]

20.6.4.3 STATUTORY AUTHORITY: This part is adopted by the water quality control commission pursuant to Subsection C of Section 74-6-4 NMSA 1978.
[20.6.4.3 NMAC - Rp 20 NMAC 6.1.1003, 10-12-00]

20.6.4.4 DURATION: Permanent.
[20.6.4.4 NMAC - Rp 20 NMAC 6.1.1004, 10-12-00]

20.6.4.5 EFFECTIVE DATE: October 12, 2000, unless a later date is indicated in the history note at the end of a section.
[20.6.4.5 NMAC - Rp 20 NMAC 6.1.1005, 10-12-00]

20.6.4.6 OBJECTIVE:

A. The purpose of this part is to establish water quality standards that consist of the designated use or uses of surface waters of the state, the water quality criteria necessary to protect the use or uses and an antidegradation policy.

B. The state of New Mexico is required under the New Mexico Water Quality Act (Subsection C of Section 74-6-4 NMSA 1978) and the federal Clean Water Act, as amended (33 U.S.C. Section 1251 *et seq*.) to adopt water quality standards that protect the public health or welfare, enhance the quality of water and are consistent with and serve the purposes of the New Mexico Water Quality Act and the federal Clean Water Act. It is the objective of the federal Clean Water Act to restore and maintain the chemical, physical and biological integrity of the nation's waters, including those in New Mexico. This part is consistent with Section 101(a)(2) of the federal Clean Water Act, which declares that it is the national goal that wherever attainable, an interim goal of water quality that provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water be achieved by July 1, 1983. Agricultural, municipal, domestic and industrial water supply are other essential uses of New Mexico's surface water; however, water contaminants resulting from these activities will not be permitted to lower the quality of surface waters of the state below that required for protection and propagation of fish, shellfish and wildlife and recreation in and on the water, where practicable.

C. Pursuant to Subsection A of Section 74-6-12 NMSA 1978, this part does not grant to the water quality control commission or to any other entity the power to take away or modify property rights in water.
[20.6.4.6 NMAC - Rp 20 NMAC 6.1.1006, 10-12-00; A, 05-23-05]

20.6.4.7 DEFINITIONS: Terms defined in the New Mexico Water Quality Act, but not defined in this part will have the meaning given in the Water Quality Act.

A. "Acute toxicity" means toxicity involving a stimulus severe enough to induce a response in 96 hours of exposure or less. Acute toxicity is not always measured in terms of lethality, but may include other toxic effects that occur within a short time period.

B. "**Adjusted gross alpha**" means the total radioactivity due to alpha particle emission as inferred from measurements on a dry sample, including radium-226, but excluding radon-222 and uranium. Also excluded are source, special nuclear and by-product material as defined by the Atomic Energy Act of 1954.

C. "**Aquatic life**" means any plant or animal life that uses surface water as primary habitat for at least a portion of its life cycle, but does not include avian or mammalian species.

D. "**Attainable"** means achievable by the imposition of effluent limits required under sections 301(b) and 306 of the Clean Water Act and implementation of cost-effective and reasonable best management practices for nonpoint source control.

E. "Best management practices" or "BMPs":

(1) for national pollutant discharge elimination system (NPDES) permitting purposes means schedules of activities, prohibitions of practices, maintenance procedures and other management practices to prevent or reduce the pollution of "waters of the United States;" BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal or drainage from raw material storage; or

(2) for nonpoint source pollution control purposes means methods, measures or practices selected by an agency to meet its nonpoint source control needs; BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures; BMPS can be applied before, during and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters; BMPs for nonpoint source pollution control purposes shall not be mandatory except as required by state or federal law.

F. "Bioaccumulation" refers to the uptake and retention of a substance by an organism from its surrounding medium and food.

G. "Bioaccumulation factor" is the ratio of a substance's concentration in tissue versus its concentration in ambient water, in situations where the organism and the food chain are exposed.

H. "Biomonitoring" means the use of living organisms to test the suitability of effluents for discharge into receiving waters or to test the quality of surface waters of the state.

I. "**CAS number**" means an assigned number by chemical abstract service (CAS) to identify a substance. CAS numbers index information published in chemical abstracts by the American chemical society.

J. "cfs" means cubic feet per second.

K. "cfu" means colony forming units.

L. "Chronic toxicity" means toxicity involving a stimulus that lingers or continues for a relatively long period relative to the life span of an organism. Chronic effects include, but are not limited to, lethality, growth impairment, behavioral modifications, disease and reduced reproduction.

M. "Classified water of the state" means a surface water of the state, or reach of a surface water of the state, for which the commission has adopted a segment description and has designated a use or uses and applicable water quality criteria in 20.6.4.101 through 20.6.4.899 NMAC.

N. "Coldwater" in reference to an aquatic life use means a surface water of the state where the water temperature and other characteristics are suitable for the support or propagation or both of coldwater aquatic life.

O. "Commission" means the New Mexico water quality control commission.

P. "Criteria" are elements of state water quality standards, expressed as constituent concentrations, levels or narrative statements, representing a quality of water that supports a use. When criteria are met, water quality will protect the designated use.

Q. "**DDT and derivatives**" means 4,4'-DDT (CAS number 50293), 4,4'-DDE (CAS number 72559) and 4,4'-DDD (CAS number 72548).

R. "Department" means the New Mexico environment department.

S. "Designated use" means a use specified in Sections 20.6.4.101 through 20.6.4.899 NMAC for a surface water of the state whether or not it is being attained.

T. "Dissolved" means a constituent of a water sample that will pass through a 0.45-micrometer pore-size membrane filter under a pressure differential not exceeding one atmosphere. The "dissolved" fraction is also termed "filterable residue."

U. "Domestic water supply" means a surface water of the state that could be used for drinking or culinary purposes after disinfection.

V. "**Escherichia coli" or "E. coli"** means a bacterial species that inhabits the intestinal tract of humans and other warm-blooded animals, the presence of which indicates the potential presence of pathogenic microorganisms capable of producing disease.

W. "Ephemeral" when used to describe a surface water of the state means a water body that flows only in direct response to precipitation or snowmelt in the immediate locality; its bed is always above the water table of the adjacent region.

X. "Existing use" means a use actually attained in a surface water of the state on or after November 28, 1975, whether or not it is a designated use.

Y. "Fecal coliform bacteria" means the portion of the coliform group of bacteria present in the gut or the feces of warmblooded animals. It generally includes organisms capable of producing gas from lactose broth in a suitable culture medium within 24 hours at 44.5 ± 0.2°C.

Z. "Fish culture" means production of coldwater or warmwater fishes in a hatchery or rearing station.

AA. "**Fish early life stages**" means the egg and larval stages of development of fish ending when the fish has its full complement of fin rays and loses larval characteristics.

BB. **"High quality coldwater"** in reference to an aquatic life use means a perennial surface water of the state in a minimally disturbed condition with considerable aesthetic value and superior coldwater aquatic life habitat. A surface water of the state to be so categorized must have water quality, stream bed characteristics and other attributes of habitat sufficient to protect and maintain a propagating coldwater aquatic life population.

CC. **"Intermittent"** when used to describe a surface water of the state means a water body that contains water only at certain times of the year, such as when it receives flow from springs, melting snow or precipitation.

DD. **"Interstate waters"** means all surface waters of the state that cross or form a part of the border between states.

EE. **"Intrastate waters"** means all surface waters of the state that are not interstate waters.

FF. **"Irrigation"** means application of water to land areas to supply the water needs of beneficial plants.

GG. **"LC-50"** means the concentration of a substance that is lethal to 50 percent of the test organisms within a defined time period. The length of the time period, which may vary from 24 hours to one week or more, depends on the test method selected to yield the information desired.

HH. "**Limited aquatic life**" as a designated use, means the surface water is capable of supporting only a limited community of aquatic life. This subcategory includes surface waters that support aquatic species selectively adapted to take advantage of naturally occurring rapid environmental changes, ephemeral or intermittent water, high turbidity, fluctuating temperature, low dissolved oxygen content or unique chemical characteristics.

II. **"Livestock watering"** means the use of a surface water of the state as a supply of water for consumption by livestock.

JJ. **"Marginal coldwater"** in reference to an aquatic life use means that natural intermittent or low flows, or other natural habitat conditions severely limit maintenance of a coldwater aquatic life population or historical data indicate that the maximum temperature in the surface water of the state may exceed 25°C (77°F).

KK. **"Marginal warmwater"** in reference to an aquatic life use means natural intermittent or low flow or other natural habitat conditions severely limit the ability of the surface water of the state to sustain a natural aquatic life population on a continuous annual basis; or historical data indicate that natural water temperature routinely exceeds 32.2°C (90°F).

LL. **"Micrograms per liter (µg/L)"** means micrograms of solute per liter of solution; equivalent to parts per billion when the specific gravity of the solution = 1.000.

MM. **"Milligrams per liter (mg/L)"** means milligrams of solute per liter of solution; equivalent to parts per million when the specific gravity of the solution = 1.000.

NN. **"Minimum quantification level"** means the minimum quantification level for a constituent determined by official published documents of the United States environmental protection agency.

OO. **"Natural causes"** means those causal agents that would affect water quality and the effect is not caused by human activity but is due to naturally occurring conditions.

PP. **"Nonpoint source"** means any source of pollutants not regulated as a point source that degrades the quality or adversely affects the biological, chemical or physical integrity of surface waters of the state.

QQ. **"NTU"** means nephelometric turbidity units based on a standard method using formazin polymer or its equivalent as the standard reference suspension. Nephelometric turbidity measurements expressed in units of NTU are numerically identical to the same measurements expressed in units of FTU (formazin turbidity units).

RR. "**Organoleptic**" means the capability to produce a detectable sensory stimulus such as odor or taste.

SS. "**Playa**" means a shallow closed basin lake typically found in the high plains and deserts.

TT. **"Perennial"** when used to describe a surface water of the state means the water body contains water continuously throughout the year in all years; its upper surface, generally, is lower than the water table of the region adjoining the stream.

UU. **"Picocurie (pCi)"** means a measure of radioactivity equal to the quantity of a radioactive substance in which the rate of disintegrations is 2.22 per minute.

VV. **"Point source"** means any discernible, confined and discrete conveyance from which pollutants are or may be discharged into a surface water of the state, but does not include return flows from irrigated agriculture.

WW. "**Practicable**" means that which may be done, practiced or accomplished; that which is performable, feasible, possible.

XX. "Primary contact" means any recreational or other water use in which there is prolonged and intimate human contact with the water, such as swimming and water skiing, involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard. Primary contact also means any use of surface waters of the state for cultural, religious or ceremonial purposes in which there is intimate human contact with the water, including but not limited to ingestion or immersion, that could pose a significant health hazard.

YY. "Secondary contact" means any recreational or other water use in which human contact with the water may occur and in which the probability of ingesting appreciable quantities of water is minimal, such as fishing, wading, commercial and recreational boating and any limited seasonal contact.

ZZ. "Segment" means a classified surface water of the state described in 20.6.4.101 through 20.6.4.899 NMAC. The water within a segment should have the same uses, similar hydrologic characteristics or flow regimes, and natural physical, chemical and biological characteristics and exhibit similar reactions to external stresses, such as the discharge of pollutants.

AAA. "**Specific conductance**" means conductivity adjusted to 25°C.

BBB. "State" means the state of New Mexico.

CCC. "Surface water(s) of the state" means all surface waters situated wholly or partly within or bordering upon the state, including lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, reservoirs or natural ponds. Surface waters of the state also means all tributaries of such waters, including adjacent wetlands, any manmade bodies of water that were originally created in surface waters of the state or resulted in the impoundment of surface waters of the state, and any "waters of the United States" as defined under the Clean Water Act that are not included in the preceding description. Surface waters of the state does not include private waters that do not combine with other surface or subsurface water or any water under tribal regulatory jurisdiction pursuant to Section 518 of the Clean Water Act. Waste treatment systems, including treatment ponds or lagoons designed and actively used to meet requirements of the Clean Water Act (other than cooling ponds as defined in 40 CFR Part 423.11(m) that also meet the criteria of this definition), are not surface waters of the state, unless they were originally created in surface waters of the state or resulted in the impoundment of surface waters of the state.

DDD. "TDS" means total dissolved solids, also termed "total filterable residue."

EEE. "Technology-based limitations" means the application of technology-based effluent limitations as required under Section 301(b) of the federal Clean Water Act.

FFF. "Total" means a constituent of a water sample that is analytically determined without filtration.

GGG. "**Total PCBs**" means the sum of all homolog, all isomer, all congener or all aroclor analyses.

HHH. "Toxic pollutant" means those pollutants, or combination of pollutants, including disease-causing agents, that after discharge and upon exposure, ingestion, inhalation or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will cause death, shortened life spans, disease, adverse behavioral changes, reproductive or physiological impairment or physical deformations in such organisms or their offspring.

III. "**Tributary**" means a perennial, intermittent or ephemeral waterbody that flows into a larger waterbody, and includes a tributary of a tributary.

JJJ. "Turbidity" is an expression of the optical property in water that causes incident light to be scattered or absorbed rather than transmitted in straight lines.

KKK. "Warmwater" with reference to an aquatic life use means that water temperature and other characteristics are suitable for the support or propagation or both of warmwater aquatic life.

LLL. "Water contaminant" means any substance that could alter if discharged or spilled the physical, chemical, biological or radiological qualities of water. "Water contaminant" does not mean source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, but may include all other radioactive materials, including but not limited to radium and accelerator-produced isotopes.

MMM. "Water pollutant" means a water contaminant in such quantity and of such duration as may with reasonable probability injure human health, animal or plant life or property, or to unreasonably interfere with the public welfare or the use of property.

NNN. "Water quality-based controls" means effluent limitations, as provided under Section 301(b)(1)(C) of the federal Clean Water Act, that are developed and imposed on point-source dischargers in order to protect and maintain applicable water quality standards. These controls are more stringent than the technology-based effluent limitations required under other paragraphs of Section 301(b).

OOO. "Wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions in New Mexico. Wetlands that are constructed outside of a

surface water of the state for the purpose of providing wastewater treatment and that do not impound a surface water of the state are not included in this definition.

PPP. "Wildlife habitat" means a surface water of the state used by plants and animals not considered as pathogens, vectors for pathogens or intermediate hosts for pathogens for humans or domesticated livestock and plants.

[20.6.4.7 NMAC - Rp 20 NMAC 6.1.1007, 10-12-00; A, 7-19-01; A, 05-23-05; A, 07-17-05]

20.6.4.8 ANTIDEGRADATION POLICY AND IMPLEMENTATION PLAN:

A. Antidegradation Policy: This antidegradation policy applies to all surface waters of the state.

(1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state.

(2) Where the quality of a surface water of the state exceeds levels necessary to support the propagation of fish, shellfish, and wildlife, and recreation in and on the water, that quality shall be maintained and protected unless the commission finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic and social development in the area in which the water is located. In allowing such degradation or lower water quality, the state shall assure water quality adequate to protect existing uses fully. Further, the state shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable BMPs for nonpoint source control. Additionally, the state shall encourage the use of watershed planning as a further means to protect surface waters of the state.

(3) No degradation shall be allowed in high quality waters designated by the commission as outstanding national resource waters (ONRWs).

(4) In those cases where potential water quality impairment associated with a thermal discharge is involved, this antidegradation policy and implementing method shall be consistent with Section 316 of the federal Clean Water Act.

(5) In implementing this section, the commission through the appropriate regional offices of the United States environmental protection agency will keep the administrator advised and provided with such information concerning the surface waters of the state as he or she will need to discharge his or her responsibilities under the federal Clean Water Act.

B. Implementation Plan: The department, acting under authority delegated by the commission, implements the water quality standards, including the antidegradation policy, by describing specific methods and procedures in the continuing planning process and by establishing and maintaining controls on the discharge of pollutants to surface waters of the state. The steps summarized in the following paragraphs, which may not all be applicable in every water pollution control action, list the implementation activities of the department. These implementation activities are supplemented by detailed antidegradation review procedures developed under the state's continuing planning process. The department:

(1) obtains information pertinent to the impact of the effluent on the receiving water and advises the prospective discharger of requirements for obtaining a permit to discharge;

(2) reviews the adequacy of existing data and conducts a water quality survey of the receiving water in accordance with an annually reviewed, ranked priority list of surface waters of the state requiring total maximum daily loads pursuant to Section 303(d) of the federal Clean Water Act;

(3) assesses the probable impact of the effluent on the receiving water relative to its attainable or designated uses and numeric and narrative criteria;

(4) requires the highest and best degree of wastewater treatment practicable and commensurate with protecting and maintaining the designated uses and existing water quality of surface waters of the state;

(5) develops water quality based effluent limitations and comments on technology based effluent limitations, as appropriate, for inclusion in any federal permit issued to a discharger pursuant to Section 402 of the federal Clean Water Act;

(6) requires that these effluent limitations be included in any such permit as a condition for state certification pursuant to Section 401 of the federal Clean Water Act;

(7) coordinates its water pollution control activities with other constituent agencies of the commission, and with local, state and federal agencies, as appropriate;

(8) develops and pursues inspection and enforcement programs to ensure that dischargers comply with state regulations and standards, and complements EPA's enforcement of federal permits;

(9) ensures that the provisions for public participation required by the New Mexico Water Quality Act and the federal Clean Water Act are followed;

(10) provides continuing technical training for wastewater treatment facility operators through the utility operators training and certification programs;

(11) provides funds to assist the construction of publicly owned wastewater treatment facilities through the wastewater construction program authorized by Section 601 of the federal Clean Water Act, and through funds appropriated by the New Mexico legislature;

(12) conducts water quality surveillance of the surface waters of the state to assess the effectiveness of water pollution controls, determines whether water quality standards are being attained, and proposes amendments to improve water quality standards;

(13) encourages, in conjunction with other state agencies, implementation of the best management practices set forth in the New Mexico statewide water quality management plan and the nonpoint source management program, such implementation shall not be mandatory except as provided by federal or state law;

(14) evaluates the effectiveness of BMPs selected to prevent, reduce or abate sources of water pollutants;

(15) develops procedures for assessing use attainment as required by 20.6.4.15 NMAC and establishing site-specific standards; and

(**16)** develops list of surface waters of the state not attaining designated uses, pursuant to Sections 305(b) and 303(d) of the federal Clean Water Act.

[20.6.4.8 NMAC - Rp 20 NMAC 6.1.1101, 10-12-00; A, 05-23-05]

20.6.4.9 OUTSTANDING NATIONAL RESOURCE WATERS:

A. Procedures for nominating an ONRW: Any person may nominate a surface water of the state for designation as an ONRW by filing a petition with the commission pursuant to the *guidelines for water quality control commission regulation hearings*. A petition to classify a surface water of the state as an ONRW shall include:

(1) a map of the surface water of the state, including the location and proposed upstream and downstream boundaries;

(2) a written statement and evidence based on scientific principles in support of the nomination, including specific reference to one or more the applicable ONRW criteria listed in Subsection B of this section;

(3) water quality data including chemical, physical or biological parameters, if available, to establish a baseline condition for the proposed ONRW;

(4) a discussion of activities that might contribute to the reduction of water quality in the proposed ONRW;

(5) any additional evidence to substantiate such a designation, including a discussion of the economic impact of the designation on the local and regional economy within the state of New Mexico and the benefit to the state; and

(6) affidavit of publication of notice of the petition in a newspaper of general circulation in the affected counties and in a newspaper of general statewide circulation.

B. Criteria for ONRWs: A surface water of the state, or a portion of a surface water of the state, may be designated as an ONRW where the commission determines that the designation is beneficial to the state of New Mexico, and:

(1) the water is a significant attribute of a state gold medal trout fishery, national or state park, national or state monument, national or state wildlife refuge or designated wilderness area, or is part of a designated wild river under the federal Wild and Scenic Rivers Act; or

(2) the water has exceptional recreational or ecological significance; or

(3) the existing water quality is equal to or better than the numeric criteria for protection of aquatic life uses, recreational uses and human health uses, and the water has not been significantly modified by human activities in a manner that substantially detracts from its value as a natural resource.

C. Pursuant to a petition filed under Subsection A of this section, the commission may classify a surface water of the state or a portion of a surface water of the state as an ONRW if the criteria set out in Subsection B of this section are met.

D. Waters classified as ONRWs: The following waters are classified as ONRWs:

(1) Rio Santa Barbara, including the west, middle and east forks from their headwaters downstream to the boundary of the Pecos Wilderness; and

(2) the waters within the United States forest service Valle Vidal special management unit including:

(a) Rio Costilla, including Comanche, La Cueva, Fernandez, Chuckwagon, Little Costilla, Holman, Gold, Grassy, LaBelle and Vidal creeks, from their headwaters downstream to the boundary of the United States forest service Valle Vidal special management unit;

(b) Middle Ponil creek, including the waters of Greenwood Canyon, from their headwaters downstream to the boundary of the Elliott S. Barker wildlife management area;

(c) Shuree lakes;

(d) North Ponil creek, including McCrystal and Seally Canyon creeks, from their headwaters downstream to the boundary of the United States forest service Valle Vidal special management unit; and

(e) Leandro creek from its headwaters downstream to the boundary of the United States forest service Valle Vidal special management unit.

[20.6.4.9 NMAC - Rn, Subsections B, C and D of 20.6.4.8 NMAC, 05-23-05; A, 05-23-05; A, 07-17-05; A, 02-16-06]

20.6.4.10 REVIEW OF STANDARDS; NEED FOR ADDITIONAL STUDIES:

A. Section 303(c)(1) of the federal Clean Water Act requires that the state hold public hearings at least once every three years for the purpose of reviewing water quality standards and proposing, as appropriate, necessary revisions to water quality standards.

B. It is recognized that, in some cases, numeric criteria have been adopted that reflect use designations rather than existing conditions of surface waters of the state. Narrative criteria are required for many constituents because accurate data on background levels are lacking. More intensive water quality monitoring may identify surface waters of the state where existing quality is considerably better than the established criteria. When justified by sufficient data and information, the water quality criteria will be modified to protect the attainable uses.

C. It is also recognized that contributions of water contaminants by diffuse nonpoint sources of water pollution may make attainment of certain criteria difficult. Revision of these criteria may be necessary as new information is obtained on nonpoint sources and other problems unique to semi-arid regions.

[20.6.4.10 NMAC - Rp 20 NMAC 6.1.1102, 10-12-00; Rn, 20.6.4.9 NMAC, 05-23-05; A, 05-23-05]

20.6.4.11 APPLICABILITY OF WATER QUALITY STANDARDS:

A. Waters Created by Discharge: When a discharge to an otherwise ephemeral or intermittent, non-classified surface water of the state causes a water to enter a surface water of the state with criteria that are more restrictive than the criteria listed in 20.6.4.97 or 20.6.4.98 NMAC, the more restrictive criteria shall apply at the point such a water enters the surface water of the state with the more restrictive criteria. If discharge to such otherwise ephemeral or intermittent, non-classified waters of the state ceases or is diverted elsewhere the criteria listed in 20.6.4.97 or 20.6.4.98 NMAC shall apply.

B. Critical Low Flow: The numeric standards set under Subsection F of 20.6.4.13 NMAC, 20.6.4.101 through 20.6.4.899 NMAC and 20.6.4.900 NMAC may not be attainable when streamflow is less than the critical low flow, but narrative criteria in 20.6.4.13 NMAC will continue to apply. The critical low flow of a stream at a particular site shall be:

(1) for human health criteria, the harmonic mean flow; "harmonic mean flow" is the number of daily flow measurements divided by the sum of the reciprocals of the flows; that is, it is the reciprocal of the mean of reciprocals; for ephemeral waters the calculation shall be based upon the nonzero flow intervals and modified by including a factor to adjust for the proportion of intervals with zero flow;

$$\text{Harmonic Mean} = \frac{n}{\sum 1/Q}$$

where n = number of flow values
and Q = flow value

$$\text{Modified Harmonic Mean} = \left[\frac{\sum_{i=1}^{Nt-N0} \frac{1}{Qi}}{Nt - N0} \right]^{-1} x \left[\frac{Nt - N0}{Nt} \right]$$

where, Qi = nonzero flow
Nt = total number of flow values
and N_0 = number of zero flow values

(2) for all other narrative and numeric criteria, the minimum average four consecutive day flow that occurs with a frequency of once in three years (4Q3); critical low-flow numeric values may be determined on an annual, a seasonal or a monthly basis, as appropriate, after due consideration of site-specific conditions.

C. Guaranteed Minimum Flow: The commission may allow the use of a contractually guaranteed minimum streamflow in lieu of a critical low flow determined under Subsection B of this section on a case-by-case basis and upon consultation with the interstate stream commission. Should drought, litigation or any other reason interrupt or interfere with minimum flows under a guaranteed minimum flow contract for a period of at least thirty consecutive days, such permission, at the sole discretion of the commission, may then be revoked. Any minimum flow specified under such revoked permission shall be superseded by a critical low flow determined under Subsection B of this section. A public notice of the request for a guaranteed minimum flow shall be published in a newspaper of general circulation by the department at least 30 days prior to scheduled action by the commission. These water quality standards do not grant to the commission or any other entity the power to create, take away or modify property rights in water.

D. Mixing Zones: A limited mixing zone, contiguous to a point source wastewater discharge, may be allowed in any stream receiving such a discharge. Mixing zones serve as regions of initial dilution that allow the application of a dilution factor in calculations of effluent limitations. Effluent limitations shall be developed that will protect the most sensitive existing, designated or attainable use of the receiving water.

E. Mixing Zone Limitations: Wastewater mixing zones, in which the numeric criteria set under Subsection F of 20.6.4.13 NMAC, 20.6.4.101 through 20.6.4.899 NMAC or 20.6.4.900 NMAC may be exceeded, shall be subject to the following limitations:

(1) Mixing zones are not allowed for discharges to publicly owned lakes, reservoirs, or playas; these effluents shall meet all applicable criteria set under Subsection F of 20.6.4.13 NMAC, 20.6.4.101 through 20.6.4.899 NMAC and 20.6.4.900 NMAC at the point of discharge.

(2) The acute numeric criteria, as set out in Paragraph (1) of Subsection I, Subsection J, and Subsection K of 20.6.4.900 NMAC, shall be attained at the point of discharge for any discharge to a surface water of the state with a designated aquatic life use.

(3) The general criteria set out in Subsections A, B, C, D, E, G, H and J of 20.6.4.13 NMAC, and the provision set out in Subsection D of 20.6.4.14 NMAC are applicable within mixing zones.

(4) The areal extent and concentration isopleths of a particular mixing zone will depend on site-specific conditions including, but not limited to, wastewater flow, receiving water critical low flow, outfall design, channel characteristics and climatic conditions and, if needed, shall be determined on a case-by-case basis. When the physical boundaries or other characteristics of a particular mixing zone must be known, the methods presented in Section 4.4.5, "Ambient-induced mixing," in "Technical support document for water quality-based toxics control" (March 1991, EPA/505/2-90-001) shall be used.

(5) All applicable water quality criteria set under Subsection F of 20.6.4.13 NMAC, 20.6.4.101 through 20.6.4.899 NMAC and 20.6.4.900 NMAC, shall be attained at the boundaries of mixing zones. A continuous zone of passage through or around the mixing zone shall be maintained in which the water quality meets all applicable criteria and allows the migration of aquatic life presently common in surface waters of the state with no effect on their populations.

F. Multiple Uses: When a classified water of the state has more than a single designated use, the applicable numeric criteria shall be the most stringent of those established for such classified water.

G. Human health criteria in Subsection J of Section 20.6.4.900 NMAC shall apply to those waters with a designated, existing or attainable aquatic life use. When limited aquatic life is a designated use, the human health criteria shall apply only if adopted on a segment-specific basis. The human health criteria for persistent toxic

pollutants, as identified in Subsection J of Section 20.6.4.900 NMAC, shall also apply to all tributaries of waters with a designated, existing or attainable aquatic life use.

H. Aquatic Life: Aquatic life criteria shall apply to all surface waters of the state containing an aquatic life community. Except when a limited aquatic life use and specific criteria have been designated on a segment-specific basis, or when otherwise provided in this part, chronic aquatic life criteria listed in Subsection J of 20.6.4.900 NMAC are applicable to all perennial surface waters of the state, and acute aquatic life criteria listed in Subsection J of 20.6.4.900 NMAC are applicable to all surface waters of the state.

I. Exceptions: Numeric criteria for temperature, dissolved solids, dissolved oxygen, sediment or turbidity adopted under the Water Quality Act do not apply when changes in temperature, dissolved solids, dissolved oxygen, sediment or turbidity in a surface water of the state are attributable to:

(1) natural causes (discharges from municipal separate storm sewers are not covered by this exception.); or

(2) the reasonable operation of irrigation and flood control facilities that are not subject to federal or state water pollution control permitting; major reconstruction of storage dams or division dams except for emergency actions necessary to protect health and safety of the public are not covered by this exception.

[20.6.4.11 NMAC - Rp 20 NMAC 6.1.1103, 10-12-00; A, 10-11-02; Rn, 20.6.4.10 NMAC, 05-23-05; A, 05-23-05]

20.6.4.12 COMPLIANCE WITH WATER QUALITY STANDARDS: The following provisions apply to determining compliance for enforcement purposes; they do not apply for purposes of determining attainment of uses. The department has developed assessment protocols for the purpose of determining attainment of uses that are available for review from the department's surface water quality bureau.

A. Compliance with acute water quality criteria shall be determined from the analytical results of a single grab sample. Acute criteria shall not be exceeded.

B. Compliance with chronic water quality criteria shall be determined from the arithmetic mean of the analytical results of samples collected using applicable protocols. Chronic criteria shall not be exceeded more than once every three years.

C. Compliance with water quality standards for total ammonia shall be determined by performing the biomonitoring procedures set out in Subsections D and E of 20.6.4.14 NMAC, or by attainment of applicable ammonia criteria set out in Subsections K, L and M of 20.6.4.900 NMAC.

D. Compliance with water quality criteria for the protection of human health shall be determined from the analytical results of representative grab samples, as defined in the water quality management plan. Human health criteria shall not be exceeded.

E. The commission may establish a numeric water quality standard at a concentration that is below the minimum quantification level. In such cases, the water quality standard is enforceable at the minimum quantification level.

F. In determining compliance with criteria for chromium an analysis that measures both the trivalent and hexavalent ions shall be used.

G. For compliance with hardness-dependent numeric criteria, hardness (as mg $CaCO_3$/L) shall be determined from a sample taken at the same time that the sample for the water contaminant is taken.

H. The hardness-dependent formulae for metals shall be valid only for hardness values of 0-400 mg/L. For values above 400 mg/L, the value for 400 mg/L shall apply.

I. The total ammonia tables shall be valid only for temperatures of 0 to 30°C and for pH values of 6.5 to 9.0. For temperatures below 0°C, the total ammonia criteria for 0°C shall apply; for temperatures above 30°C, the total ammonia criteria for 30°C shall apply. For pH values below 6.5, the total ammonia criteria for 6.5 shall apply; for pH values above 9.0, the total ammonia criteria for 9.0 shall apply.

J. Compliance Schedules: It shall be the policy of the commission to allow on a case-by-case basis the inclusion of a schedule of compliance in a NPDES permit issued to an existing facility. Such schedule of compliance will be for the purpose of providing a permittee with adequate time to make treatment facility modifications necessary to comply with water quality based permit limitations determined to be necessary to implement new or revised water quality standards. Compliance schedules may be included in NPDES permits at the time of permit renewal or modification and shall be written to require compliance at the earliest practicable time. Compliance schedules shall also specify milestone dates so as to measure progress towards final project completion (e.g., design completion, construction start, construction completion, date of compliance).

[20.6.4.12 NMAC - Rp 20 NMAC 6.1.1104, 10-12-00; A, 10-11-02; Rn, 20.6.4.11 NMAC, 05-23-05; A, 05-23-05]

20.6.4.13 GENERAL CRITERIA: General criteria are established to sustain and protect existing or attainable uses of surface waters of the state. These general criteria apply to all surface waters of the state at all times, unless a specified criterion is provided elsewhere in this part. Surface waters of the state shall be free of any water contaminant in such quantity and of such duration as may with reasonable probability injure human health, animal or plant life or property, or unreasonably interfere with the public welfare or the use of property.

A. Bottom Deposits and Suspended or Settleable Solids:

(1) Surface waters of the state shall be free of water contaminants including fine sediment particles (less than two millimeters in diameter), precipitates or organic or inorganic solids from other than natural causes that have settled to form layers on or fill the interstices of the natural or dominant substrate in quantities that damage or impair the normal growth, function or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom.

(2) Suspended or settleable solids from other than natural causes shall not be present in surface waters of the state in quantities that damage or impair the normal growth, function or reproduction of aquatic life or adversely affect other designated uses.

B. Floating Solids, Oil and Grease: Surface waters of the state shall be free of oils, scum, grease and other floating materials resulting from other than natural causes that would cause the formation of a visible sheen or visible deposits on the bottom or shoreline, or would damage or impair the normal growth, function or reproduction of human, animal, plant or aquatic life.

C. Color: Color-producing materials resulting from other than natural causes shall not create an aesthetically undesirable condition nor shall color impair the use of the water by desirable aquatic life presently common in surface waters of the state.

D. Organoleptic Quality:

(1) Flavor of Fish: Water contaminants from other than natural causes shall be limited to concentrations that will not impart unpalatable flavor to fish.

(2) Odor and Taste of Water: Water contaminants from other than natural causes shall be limited to concentrations that will not result in offensive odor or taste arising in a surface water of the state or otherwise interfere with the reasonable use of the water.

E. Plant Nutrients: Plant nutrients from other than natural causes shall not be present in concentrations that will produce undesirable aquatic life or result in a dominance of nuisance species in surface waters of the state.

F. Toxic Pollutants:

(1) Except as provided in 20.6.4.16 NMAC, surface waters of the state shall be free of toxic pollutants from other than natural causes in amounts, concentrations or combinations that affect the propagation of fish or that are toxic to humans, livestock or other animals, fish or other aquatic organisms, wildlife using aquatic environments for habitation or aquatic organisms for food, or that will or can reasonably be expected to bioaccumulate in tissues of fish, shellfish and other aquatic organisms to levels that will impair the health of aquatic organisms or wildlife or result in unacceptable tastes, odors or health risks to human consumers of aquatic organisms.

(2) Pursuant to this section, the human health criteria shall be as set out in 20.6.4.900 NMAC. For a toxic pollutant for human health not listed in 20.6.4.900 NMAC, the following provisions shall be applied in accordance with 20.6.4.11, 20.6.4.12 and 20.6.4.14 NMAC.

(a) The human health criterion shall be the recommended human health criterion for "consumption of organisms only" published by the U.S. environmental protection agency pursuant to Section 304(a) of the federal Clean Water Act. In determining such criterion for a cancer-causing toxic pollutant, a cancer risk of 10^{-5} (one cancer per 100,000 exposed persons) shall be used.

(b) When a numeric criterion for the protection of human health has not been published by the U.S. environmental protection agency, a quantifiable criterion may be derived from data available in the U.S. environmental protection agency's Integrated Risk Information System (IRIS) using the appropriate formula specified in *methodology for deriving ambient water quality criteria for the protection of human health (2000)*, EPA-822-B-00-004.

(3) Pursuant to this section, the chronic aquatic life standard shall be as set out in 20.6.4.900 NMAC. For a toxic pollutant for aquatic life with no chronic standard listed in 20.6.4.900 NMAC, the following provisions shall be applied in sequential order in accordance with 20.6.4.11, 20.6.4.12 and 20.6.4.14 NMAC.

(a) The chronic aquatic life criterion shall be the "freshwater criterion continuous concentration" published by the U.S. environmental protection agency pursuant to Section 304(a) of the federal Clean Water Act;

(b) If the U.S. environmental protection agency has not published a chronic aquatic life criterion, a geometric mean LC-50 value shall be calculated for the particular species, genus or group that is representative of the form of life to be preserved, using the results of toxicological studies published in scientific journals.

(i) The chronic aquatic life criterion for a toxic pollutant that does not bioaccumulate shall be 10 percent of the calculated geometric mean LC-50 value; and

(ii) The chronic aquatic life criterion for a toxic pollutant that does bioaccumulate shall be: the calculated geometric mean LC-50 adjusted by a bioaccumulation factor for the particular species, genus or group representative of the form of life to be preserved, but when such bioaccumulation factor has not been published, the criterion shall be one percent of the calculated geometric mean LC-50 value.

(4) Pursuant to this section, the acute aquatic life criteria shall be as set out in 20.6.4.900 NMAC. For a toxic pollutant for aquatic life with no acute criterion listed in 20.6.4.900 NMAC, the acute aquatic life criterion shall be the "freshwater criterion maximum concentration" published by the U.S. environmental protection agency pursuant to Section 304(a) of the federal Clean Water Act.

(5) Within 90 days of the issuance of a final NPDES permit containing a numeric criterion selected or calculated pursuant to Paragraph 2, Paragraph 3 or Paragraph 4 of Subsection F of this section, the department shall petition the commission to adopt such criterion into these standards.

G. Radioactivity: The radioactivity of surface waters of the state shall be maintained at the lowest practical level and shall in no case exceed the criteria set forth in the New Mexico Radiation Protection Regulations, 20.3.1 and 20.3.4 NMAC.

H. Pathogens: Surface waters of the state shall be free of pathogens from other than natural sources in sufficient quantity to impair public health or the designated, existing or attainable uses of a surface water of the state.

I. Temperature: Maximum temperatures for each classified water of the state have been specified in 20.6.4.101 through 20.6.4.899 NMAC. However, the introduction of heat by other than natural causes shall not increase the temperature, as measured from above the point of introduction, by more than 2.7°C (5°F) in a stream, or more than 1.7°C (3°F) in a lake or reservoir. In no case will the introduction of heat be permitted when the maximum temperature specified for the reach would thereby be exceeded. These temperature criteria shall not apply to impoundments constructed offstream for the purpose of heat disposal. High water temperatures caused by unusually high ambient air temperatures are not violations of these standards.

J. Turbidity: Turbidity attributable to other than natural causes shall not reduce light transmission to the point that the normal growth, function or reproduction of aquatic life is impaired or that will cause substantial visible contrast with the natural appearance of the water. Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or increase more than 20 percent when the background turbidity is more than 50 NTU. Background turbidity shall be measured at a point immediately upstream of the turbidity-causing activity. However, limited-duration activities necessary to accommodate dredging, construction or other similar activities and that cause the criterion to be exceeded may be authorized provided all practicable turbidity control techniques have been applied and all appropriate permits and approvals have been obtained.

K. Total Dissolved Solids (TDS): TDS attributable to other than natural causes shall not damage or impair the normal growth, function or reproduction of animal, plant or aquatic life. TDS shall be measured by either the "calculation method" (sum of constituents) or the filterable residue method. Approved test procedures for these determinations are set forth in 20.6.4.14 NMAC.

L. Dissolved Gases: Surface waters of the state shall be free of nitrogen and other dissolved gases at levels above 110 percent saturation when this supersaturation is attributable to municipal, industrial or other discharges.

[20.6.4.13 NMAC - Rp 20 NMAC 6.1.1105, 10-12-00; A, 10-11-02; Rn, 20.6.4.12 NMAC, 05-23-05; A, 05-23-05]

20.6.4.14 SAMPLING AND ANALYSIS:

A. Sampling and analytical techniques shall conform with methods described in the following references unless otherwise specified by the commission pursuant to a petition to amend these standards:

(1) *"guidelines establishing test procedures for the analysis of pollutants under the Clean Water Act,"* 40 CFR Part 136 or any test procedure approved or accepted by EPA using procedures provided in 40 CFR Parts 136.3(d), 136.4, and 136.5;

(2) *standard methods for the examination of water and wastewater*, latest edition, American public health association;

(3) *methods for chemical analysis of water and waste*, and other methods published by EPA office of research and development or office of water;

(4) *techniques of water resource investigations of the U.S. geological survey*;

(5) *annual book of ASTM standards*: volumes 11.01 and 11.02, water (I) and (II), latest edition, ASTM international;

(6) *federal register*, latest methods published for monitoring pursuant to Resource Conservation and Recovery Act regulations;

(7) *national handbook of recommended methods for water-data acquisition*, latest edition, prepared cooperatively by agencies of the United States government under the sponsorship of the U.S. geological survey; or

(8) *federal register*, latest methods published for monitoring pursuant to the Safe Drinking Water Act regulations.

B. Bacteriological Surveys: The monthly geometric mean shall be used in assessing attainment of criteria when a minimum of five samples is collected in a 30-day period.

C. Sampling Procedures:

(1) Streams: Stream monitoring stations below discharges shall be located a sufficient distance downstream to ensure adequate vertical and lateral mixing.

(2) Lakes: Sampling stations in lakes shall be located at least 250 feet from a discharge.

(3) Lakes: Except for the restriction specified in Paragraph (2) of this subsection, lake sampling stations shall be located at any site where the attainment of a water quality standard is to be assessed. Water quality measurements taken at intervals in the entire water column at a sampling station shall be averaged for the epilimnion, or in the absence of an epilimnion, for the upper one-third of the water column of the lake to determine attainment of criteria, except that attainment of criteria for toxic pollutants shall be assessed during periods of complete vertical mixing, e.g., during spring or fall turnover, or by taking depth-integrated composite samples of the water column.

D. Acute toxicity of effluent to aquatic life shall be determined using the procedures specified in U.S. environmental protection agency "methods for measuring the acute toxicity of effluents to freshwater and marine organisms" (5th Ed., 2002, EPA 821-R-02-012), or latest edition thereof if adopted by EPA at 40 CFR Part 136, which is incorporated herein by reference. Acute toxicities of substances shall be determined using at least two species tested in whole effluent and a series of effluent dilutions. Acute toxicity due to discharges shall not occur within the wastewater mixing zone in any surface water of the state with an existing or designated aquatic life use.

E. Chronic toxicity of effluent or ambient surface waters of the state to aquatic life shall be determined using the procedures specified in U.S. environmental protection agency "Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms" (4th Ed., 2002, EPA 821-R-02-013), or latest edition thereof if adopted by EPA at 40 CFR Part 136, which is incorporated herein by reference. Chronic toxicities of substances shall be determined using at least two species tested in ambient surface water or whole effluent and a series of effluent dilutions. Chronic toxicity due to discharges shall not occur at the critical low flow, or any flow greater than the critical low flow, in any surface water of the state with an existing or designated aquatic life use more than once every three years.

[20.6.4.14 NMAC - Rp 20 NMAC 6.1.1106, 10-12-00; Rn, 20.6.4.13 NMAC, 05-23-05, A, 05-23-05]

20.6.4.15 USE ATTAINABILITY ANALYSIS:

A. A use attainability analysis is a scientific study that shall be conducted only for the purpose of assessing the factors affecting the attainment of a use. Whenever a use attainability analysis is conducted, it shall be subject to the requirements and limitations set forth in 40 CFR Part 131, Water Quality Standards; specifically, Subsections 131.3(g), 131.10(g), 131.10(h) and 131.10(j) shall be applicable.

(1) Any person who proposes to classify, or reclassify to a designated use with less stringent criteria, a surface water of the state with designated uses that do not include the uses specified in Section 101(a)(2) of the federal Clean Water Act must conduct a use attainability analysis. Section 101(a)(2) uses are also specified in Subsection B of 20.6.4.6 NMAC.

(2) A designated use cannot be removed if it is an existing use.

(3) A use attainability analysis or an equivalent study approved by the department and the regional administrator must be conducted to remove any non-existing designated use from any classified waters of the state.

B. Physical, chemical and biological evaluations of surface waters of the state other than lakes and reservoirs for purposes of use attainability analyses or equivalent studies shall be conducted according to the procedures outlined in the "*technical support manual: waterbody surveys and assessments for conducting use attainability analyses*," United States environmental protection agency, office of water, regulations and standards,

Washington, D.C., November 1983, or latest edition thereof, which is incorporated herein by reference, or an alternative equivalent study methodology approved by the department.

C. Physical, chemical and biological evaluations of lakes and reservoirs for purposes of use attainability analyses or equivalent studies shall be conducted according to the procedures outlined in the "*technical support manual: waterbody surveys and assessments for conducting use attainability analyses, volume III: lake systems*," United States environmental protection agency, office of water, regulations and standards, Washington, D.C., November 1984, or latest edition thereof, which is incorporated herein by reference, or an alternative equivalent study methodology approved by the department.

D. A use attainability analysis or equivalent study should include:

(1) identification of existing uses of the surface water of the state to be reviewed that have existed since 1975;

(2) an evaluation of the best water quality attained in the surface water of the state to be reviewed that has existed since 1975;

(3) an analysis of appropriate factors demonstrating that attaining the designated use is not feasible because of the condition listed in 40 CFR Part 131.10(g);

(4) a physical evaluation of the surface water of the state to be reviewed to identify factors that impair attainment of designated uses and to determine which designated uses are feasible to attain in such surface water of the state;

(5) an evaluation of the water chemistry of the surface water of the state to be reviewed to identify chemical constituents that impair the designated uses that are feasible to attain in such water; and

(6) an evaluation of the aquatic and terrestrial biota utilizing the surface water of the state to determine resident species and which species could potentially exist in such water if physical and chemical factors impairing a designated use are corrected.

E. Any person may submit notice to the department stating that they intend to conduct a use attainability analysis or equivalent study. The proponent shall develop a work plan to conduct the use attainability analysis or equivalent study and shall submit the work plan to the department and the regional EPA staff for review and comment. The work plan should identify the scope of data currently available and proposed to be gathered, the factors affecting use attainment that will be analyzed and must contain provisions for public notice and consultation with appropriate state and federal agencies. A copy of the notice and the work plan must be submitted concurrently to the commission. Upon approval of the work plan by the department, the proponent shall conduct the use attainability analysis or equivalent study in accordance with the approved work plan. The cost of such analysis or equivalent study shall be the responsibility of the proponent. Upon completion of the use attainability analysis or equivalent study, the proponent shall submit the data, findings and conclusions to the department and the commission.

F. If the department determines that the analysis or equivalent study was conducted in accordance with the approved work plan and the findings and conclusions are based upon sound scientific rationale, and demonstrates that it is not feasible to attain the designated use, the department or the proponent may request the commission to initiate rulemaking proceedings to modify the designated use for the surface water of the state that was reviewed.

[20.6.4.15 NMAC - Rp 20 NMAC 6.1.1107, 10-12-00; Rn, 20.6.4.14 NMAC, 05-23-05; A, 05-23-05; A, 07-17-05]

20.6.4.16 PLANNED USE OF A PISCICIDE: The use of a piscicide registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. Section 136 *et seq*., and under the New Mexico Pesticide Control Act (NMPCA), Section 76-4-1 *et seq*. NMSA 1978 (1973) in a surface water of the state, shall not be a violation of Subsection F of 20.6.4.13 NMAC when such use has been approved by the commission under procedures provided in this section. The commission may approve the reasonable use of a piscicide under this section to further a Clean Water Act objective to restore and maintain the physical or biological integrity of surface waters of the state, including restoration of native species.

A. Any person seeking commission approval of the use of a piscicide shall file a written petition concurrently with the commission and the surface water bureau of the department. The petition shall contain, at a minimum, the following information:

(1) petitioner's name and address;

(2) identity of the piscicide and the period of time (not to exceed five years) or number of applications for which approval is requested;

(3) documentation of registration under FIFRA and NMPCA and certification that the petitioner intends to use the piscicide according to the label directions, for its intended function;

(4) target and potential non-target species in the treated waters and adjacent riparian area, including threatened or endangered species;

(5) potential environmental consequences to the treated waters and the adjacent riparian area, and protocols for limiting such impacts;

(6) surface water of the state proposed for treatment;

(7) results of pre-treatment survey;

(8) evaluation of available alternatives and justification for selecting piscicide use;

(9) post-treatment assessment monitoring protocol; and

(10) any other information required by the commission.

B. Within thirty days of receipt of the petition, the department shall review the petition and file a recommendation with the commission to grant, grant with conditions or deny the petition. The recommendation shall include reasons, and a copy shall be sent to the petitioner by certified mail.

C. The commission shall review the petition and the department's recommendation and shall within 90 days of receipt of the department's recommendation hold a public hearing in the locality affected by the proposed use in accordance with Adjudicatory Procedures, 20.1.3 NMAC. In addition to the public notice requirements in Adjudicatory Procedures, 20.1.3 NMAC, the petitioner shall provide written notice to:

(1) local political subdivisions;

(2) local water planning entities;

(3) local conservancy and irrigation districts; and

(4) local media outlets, except that the petitioner shall only be required to publish notice in a newspaper of circulation in the locality affected by the proposed use.

D. In a hearing provided for in this Section, registration of a piscicide under FIFRA and NMPCA shall provide a rebuttable presumption that the determinations of the EPA Administrator in registering the piscicide, as outlined in 7 U.S.C. Section 136a(c)(5), are valid. For purposes of this Section the rebuttable presumptions regarding the piscicide include:

(1) Its composition is such as to warrant the proposed claims for it;

(2) Its labeling and other material submitted for registration comply with the requirements of FIFRA and NMPCA;

(3) It will perform its intended function without unreasonable adverse effects on the environment; and

(4) When used in accordance with all FIFRA label requirements it will not generally cause unreasonable adverse effects on the environment.

(5) "Unreasonable adverse effects on the environment" has the meaning provided in FIFRA, 7 U.S.C. Section 136(bb): "any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide."

E. After a public hearing, the commission may grant the petition in whole or in part, may grant the petition subject to conditions, or may deny the petition. In granting any petition in whole or part or subject to conditions, the commission shall require the petitioner to implement post-treatment assessment monitoring and provide notice to the public in the immediate and near downstream vicinity of the application prior to and during the application.

[20.6.4.16 NMAC - Rn, Paragraph (6) of Subsection F of 20.6.4.12 NMAC, 05-23-05; A, 05-23-05]

20.6.4.17 - 20.6.4.49: [RESERVED]

20.6.4.50 BASINWIDE PROVISIONS - Special provisions arising from interstate compacts, international treaties or court decrees or that otherwise apply to a basin are contained in 20.6.4.51 through 20.6.4.59 NMAC.

[20.6.4.50 NMAC - N, 05-23-05]

20.6.4.51 - 20.6.4.53: [RESERVED]

20.6.4.54 COLORADO RIVER BASIN - For the tributaries of the Colorado river system, the state of New Mexico will cooperate with the Colorado river basin states and the federal government to support and implement the salinity policy and program outlined in the most current "review, water quality standards for salinity, Colorado river system" or equivalent report by the Colorado river salinity control forum.

A. Numeric criteria expressed as the flow-weighted annual average concentration for salinity are established at three points in the Colorado river basin as follows: below Hoover dam, 723 mg/L; below Parker dam, 747 mg/L; and at Imperial dam, 879 mg/L.

B. As a part of the program, objectives for New Mexico shall include the elimination of discharges of water containing solids in solution as a result of the use of water to control or convey fly ash from coal-fired electric generators, wherever practicable.

[20.6.4.54 NMAC - Rn, Paragraphs (1) through (3) of Subsection K of 20.6.4.12 NMAC, 05-23-05; A, 05-23-05]

20.6.4.55 - 20.6.4.96: [RESERVED]

20.6.4.97 EPHEMERAL WATERS - All ephemeral surface waters of the state that are not included in a classified water of the state in 20.6.4.101 through 20.6.4.899 NMAC.

A. Designated Uses: livestock watering, wildlife habitat, limited aquatic life and secondary contact.

B. Criteria:

(1) The use-specific criteria in 20.6.4.900 NMAC, with the exception of the chronic criteria for aquatic life, are applicable for the designated uses listed in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria shall not exceed 548 cfu/100 mL, no single sample shall exceed 2507 cfu/100 mL (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.97 NMAC - N, 05-23-05]

20.6.4.98 INTERMITTENT WATERS - All intermittent surface waters of the state that are not included in a classified water of the state in 20.6.4.101 through 20.6.4.899 NMAC.

A. Designated Uses: livestock watering, wildlife habitat, aquatic life and secondary contact.

B. Criteria:

(1) The use-specific criteria in 20.6.4.900 NMAC.

(2) The monthly geometric mean of E. coli bacteria shall not exceed 548 cfu/100 mL, no single sample shall exceed 2507 cfu/100 mL (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.98 NMAC - N, 05-23-05]

20.6.4.99 PERENNIAL WATERS - All perennial surface waters of the state that are not included in a classified water of the state in 20.6.4.101 through 20.6.4.899 NMAC.

A. Designated Uses: aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) Temperature shall not exceed 34°C (93.2°F). The use-specific criteria in 20.6.4.900 NMAC are applicable to the designated uses listed in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria shall not exceed 548 cfu/100 mL, no single sample shall exceed 2507 cfu/100 mL (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.99 NMAC - N, 05-23-05]

20.6.4.100: [RESERVED]

20.6.4.101 RIO GRANDE BASIN - The main stem of the Rio Grande from the international boundary with Mexico upstream to one mile below Percha dam.

A. Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH: within the range of 6.6 to 9.0 and temperature 34°C (93.2°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL (see Subsection B of 20.6.4.14 NMAC).

(3) At mean monthly flows above 350 cfs, the monthly average concentration for: TDS 2,000 mg/L or less, sulfate 500 mg/L or less and chlorides 400 mg/L or less.

C. Remarks: Sustained flow in the Rio Grande below Caballo reservoir is dependent on release from Caballo reservoir during the irrigation season; at other times of the year, there may be little or no flow.

[20.6.4.101 NMAC - Rp 20 NMAC 6.1.2101, 10-12-00; A, 12-15-01; A, 05-23-05]

20.6.4.102 RIO GRANDE BASIN - The main stem of the Rio Grande from one mile below Percha dam upstream to Caballo dam.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

C. Remarks: Sustained flow in the Rio Grande below Caballo reservoir is dependent on release from Caballo reservoir during the irrigation season; at other times of the year, there may be little or no flow.

[20.6.4.102 NMAC - Rp 20 NMAC 6.1.2102, 10-12-00; A, 05-23-05]

20.6.4.103 RIO GRANDE BASIN - The main stem of the Rio Grande from the headwaters of Caballo reservoir upstream to Elephant Butte dam and perennial reaches of tributaries to the Rio Grande in Sierra and Socorro counties.

A. Designated Uses: fish culture, irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, secondary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less, single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

C. Remarks: Flow in this reach of the Rio Grande main stem is dependent upon release from Elephant Butte dam.

[20.6.4.103 NMAC - Rp 20 NMAC 6.1.2103, 10-12-00; A, 05-23-05]

20.6.4.104 RIO GRANDE BASIN - Caballo and Elephant Butte reservoir.

A. Designated Uses: irrigation storage, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.104 NMAC - Rp 20 NMAC 6.1.2104, 10-12-00; A, 05-23-05]

20.6.4.105 RIO GRANDE BASIN - The main stem of the Rio Grande from the headwaters of Elephant Butte reservoir upstream to Alameda bridge (Corrales bridge) and intermittent water below the perennial reaches of the Rio Puerco that enters the main stem of the Rio Grande.

A. Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS l,500 mg/L or less, sulfate 500 mg/L or less and chloride 250 mg/L or less.

[20.6.4.105 NMAC - Rp 20 NMAC 6.1.2105, 10-12-00; A, 05-23-05]

20.6.4.106 RIO GRANDE BASIN - The main stem of the Rio Grande from Alameda bridge (Corrales bridge) upstream to the Angostura diversion works and intermittent water in the Jemez river below the Jemez pueblo boundary that enters the main stem of the Rio Grande.

A. Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: dissolved oxygen greater than 5.0 mg/L, pH within the range of 6.6 to 9.0 and temperature less than 32.2°C (90°F). The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS 1,500 mg/L or less, sulfate 500 mg/L or less and chloride 250 mg/L or less.

[20.6.4.106 NMAC - Rp 20 NMAC 6.1.2105.1, 10-12-00; A, 05-23-05]

20.6.4.107 RIO GRANDE BASIN - The Jemez river from the Jemez pueblo boundary upstream to Soda dam near the town of Jemez Springs and perennial reaches of Vallecito creek.

A. Designated Uses: coldwater aquatic life, primary contact, irrigation, livestock watering and wildlife habitat.

B. Criteria:

(1) In any single sample: temperature 25°C (77°F) and pH within the range of 6.6 to 8.8. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.107 NMAC - Rp 20 NMAC 6.1.2105.5, 10-12-00; A, 05-23-05]

20.6.4.108 RIO GRANDE BASIN - Perennial reaches of the Jemez river and all its tributaries above Soda dam near the town of Jemez Springs, except Sulphur creek above its confluence with Redondo creek, and perennial reaches of the Guadalupe river and all its tributaries.

A. Designated Uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 400 µmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.108 NMAC - Rp 20 NMAC 6.1.2106, 10-12-00; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.124 NMAC.**]

20.6.4.109 RIO GRANDE BASIN - Perennial reaches of Bluewater creek, Rio Moquino, Seboyeta creek, Rio Paguate, the Rio Puerco above the village of Cuba and all other perennial reaches of tributaries to the Rio Puerco including the Rio San Jose in Cibola county from the USGS gaging station at Correo upstream to Horace springs.

A. Designated Uses: coldwater aquatic life, domestic water supply, fish culture, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) In any single sample: pH shall be within the range of 6.6 to 8.8, temperature 20°C (68°F) or less and total phosphorus (as P) 0.1 mg/L. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.109 NMAC - Rp 20 NMAC 6.1.2107, 10-12-00; A, 05-23-05]

20.6.4.110 RIO GRANDE BASIN - The main stem of the Rio Grande from Angostura diversion works upstream to Cochiti dam.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, secondary contact, coldwater aquatic life and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.110 NMAC - Rp 20 NMAC 6.1.2108, 10-12-00; A, 05-23-05]

20.6.4.111 RIO GRANDE BASIN - Perennial reaches of Las Huertas creek.

A. Designated Uses: high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.111 NMAC - Rp 20 NMAC 6.1.2108.5, 10-12-00; A, 7-25-01; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.125 NMAC**.]

20.6.4.112 RIO GRANDE BASIN - Cochiti reservoir.

A. Designated Uses: livestock watering, wildlife habitat, warmwater aquatic life, coldwater aquatic life and primary contact.

B. Criteria:

(l) At any sampling site: pH within the range of 6.6 to 9.0 and temperature 25°C (77°F). The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.112 NMAC - Rp 20 NMAC 6.1.2109, 10-12-00; A, 05-23-05]

20.6.4.113 RIO GRANDE BASIN - The Santa Fe river and perennial reaches of its tributaries from Cochiti reservoir upstream to the outfall of the Santa Fe wastewater treatment facility.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, secondary contact, and warmwater aquatic life.

B. Criteria:

(l) In any single sample: pH within the range of 6.6 to 9.0, temperature 30°C (86°F) or less and dissolved oxygen 4.0 mg/L or more. Dissolved oxygen 5.0 mg/L or more as a 24-hour average. Values used in the calculation of the 24-hour average for dissolved oxygen shall not exceed the dissolved oxygen saturation value. For a measured value above the dissolved oxygen saturation value, the dissolved oxygen saturation value will be used in calculating the 24-hour average. The dissolved oxygen saturation value shall be determined from the table set out in Subsection N of 20.6.4.900 NMAC. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less, single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.113 NMAC - Rp 20 NMAC 6.1.2110, 10-12-00; A, 10-11-02; A, 05-23-05]

20.6.4.114 RIO GRANDE BASIN - The main stem of the Rio Grande from the headwaters of Cochiti reservoir upstream to Rio Pueblo de Taos, Embudo creek from its mouth on the Rio Grande upstream to the junction of the Rio Pueblo and the Rio Santa Barbara, the Santa Cruz river below Santa Cruz dam, the Rio Tesuque below the Santa Fe national forest and the Pojoaque river below Nambe dam.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, primary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 22°C (71.6°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS 500 mg/L or less, sulfate 150 mg/L or less and chloride 25 mg/L or less.

[20.6.4.114 NMAC - Rp 20 NMAC 6.1.2111, 10-12-00; A, 05-23-05]

20.6.4.115 RIO GRANDE BASIN - The perennial reaches of Rio Vallecitos and its tributaries, and perennial reaches of Rio del Oso and perennial reaches of El Rito creek above the town of El Rito.

A. Designated Uses: domestic water supply, irrigation, high quality coldwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 300 μmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.115 NMAC - Rp 20 NMAC 6.1.2112, 10-12-00; A, 05-23-05]

20.6.4.116 RIO GRANDE BASIN - The Rio Chama from its mouth on the Rio Grande upstream to Abiquiu reservoir, perennial reaches of the Rio Tusas, perennial reaches of the Rio Ojo Caliente, perennial reaches of Abiquiu creek and perennial reaches of El Rito creek below the town of El Rito.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, coldwater aquatic life, warmwater aquatic life and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 31°C (87.8°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less; single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.116 NMAC - Rp 20 NMAC 6.1.2113, 10-12-00; A, 05-23-05]

20.6.4.117 RIO GRANDE BASIN - Abiquiu reservoir.

A. Designated Uses: irrigation storage, livestock watering, wildlife habitat, primary contact, coldwater aquatic life and warmwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 8.8 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.117 NMAC - Rp 20 NMAC 6.1.2114, 10-12-00; A, 05-23-05]

20.6.4.118 RIO GRANDE BASIN - The Rio Chama from the headwaters of Abiquiu reservoir upstream to El Vado reservoir and perennial reaches of the Rio Gallina and Rio Puerco de Chama north of state highway 96.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, coldwater aquatic life, warmwater aquatic life and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 26°C (78.8°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.118 NMAC - Rp 20 NMAC 6.1.2115, 10-12-00; A, 05-23-05]

20.6.4.119 RIO GRANDE BASIN - All perennial reaches of tributaries to the Rio Chama above Abiquiu dam except the Rio Gallina and Rio Puerco de Chama north of state highway 96 and the main stem of the Rio Chama from the headwaters of El Vado reservoir upstream to the New Mexico-Colorado line.

A. Designated Uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 500 µmhos/cm or less (1,000 µmhos or less for Coyote creek), pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.119 NMAC - Rp 20 NMAC 6.1.2116, 10-12-00; A, 05-23-05]

20.6.4.120 RIO GRANDE BASIN - El Vado and Heron reservoirs.

A. Designated Uses: irrigation storage, livestock watering, wildlife habitat, primary contact and coldwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.120 NMAC - Rp 20 NMAC 6.1.2117, 10-12-00; A. 05-23-05]

20.6.4.121 RIO GRANDE BASIN - Perennial tributaries to the Rio Grande in Bandelier national monument and their headwaters in Sandoval county and all perennial reaches of tributaries to the Rio Grande in Santa Fe county unless included in other segments.

A. Designated Uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat, municipal and industrial water supply, secondary contact and primary contact.

B. Criteria:

(1) In any single sample: specific conductance 300 µmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.121 NMAC - Rp 20 NMAC 6.1.2118, 10-12-00; A. 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segments are under 20.6.4.126, 20.6.4.127 and 20.6.4.128 NMAC.**]

20.6.4.122 RIO GRANDE BASIN - The main stem of the Rio Grande from Rio Pueblo de Taos upstream to the New Mexico-Colorado line, the Red river from its mouth on the Rio Grande upstream to the mouth of Placer creek, and the Rio Pueblo de Taos from its mouth on the Rio Grande upstream to the mouth of the Rio Grande del Rancho.

A. Designated Uses: coldwater aquatic life, fish culture, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.122 NMAC - Rp 20 NMAC 6.1.2119, 10-12-00; A, 05-23-05]

20.6.4.123 RIO GRANDE BASIN - Perennial reaches of the Red river upstream of the mouth of Placer creek, all perennial reaches of tributaries to the Red river, and all other perennial reaches of tributaries to the Rio Grande in Taos and Rio Arriba counties unless included in other segments.

A. Designated Uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 400 µmhos/cm or less (500 µmhos or less for the Rio Fernando de Taos) and pH within the range of 6.6 to 8.8, temperature 20°C (68°F) or less. For the Red river in this segment, total phosphorus (as P) less than 0.1 mg/L. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.123 NMAC - Rp 20 NMAC 6.1.2120, 10-12-00; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.129 NMAC**.]

20.6.4.124 RIO GRANDE BASIN - Perennial reaches of Sulphur creek from its headwaters to its confluence with Redondo creek.

A. Designated Uses: limited aquatic life, wildlife habitat, livestock watering and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 2.0 to 9.0 and temperature 30ºC (86ºF) or less. The use-specific criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less, single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) The chronic aquatic life criteria of Subsections I and J of 20.6.4.900 NMAC shall also apply.

[20.6.4.124 NMAC - N, 05-23-05]

20.6.4.125 RIO GRANDE BASIN - Perennial reaches of San Pedro creek.

A. Designated Uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.125 NMAC - N, 05-23-05]

20.6.4.126 RIO GRANDE BASIN - Perennial portions of Cañon deValle from Los Alamos national laboratory (LANL) stream gage E256 upstream to Burning Ground spring, Sandia canyon from Sigma canyon upstream to LANL NPDES outfall 001, Pajarito canyon from Arroyo de La Delfe upstream into Starmers gulch and Starmers spring and Water canyon from Area-A canyon upstream to State Route 501.

A. Designated Uses: coldwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 24°C (75.2°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less; single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).
[20.6.4.126 NMAC - N, 05-23-05]

20.6.4.127 RIO GRANDE BASIN - Perennial portions of Los Alamos canyon upstream from Los Alamos reservoir and Los Alamos reservoir.

A. Designated Uses: coldwater aquatic life, livestock watering, wildlife habitat, irrigation and primary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).
[20.6.4.127 NMAC - N, 05-23-05]

20.6.4.128 RIO GRANDE BASIN - Ephemeral and intermittent portions of watercourses within lands managed by U.S. department of energy (DOE) within LANL, including but not limited to: Mortandad canyon, Cañada del Buey, Ancho canyon, Chaquehui canyon, Indio canyon, Fence canyon, Potrillo canyon and portions of Cañon de Valle, Los Alamos canyon, Sandia canyon, Pajarito canyon and Water canyon not specifically identified in 20.6.4.126 NMAC. (Surface waters within lands scheduled for transfer from DOE to tribal, state or local authorities are specifically excluded.)

A. Designated Uses: livestock watering, wildlife habitat, limited aquatic life and secondary contact.

B. Criteria:

(1) The use-specific criteria in 20.6.4.900 NMAC, except the chronic criteria for aquatic life are applicable for the designated uses listed in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less; single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) The acute total ammonia criteria set forth in Subsection K of 20.6.4.900 NMAC (salmonids absent) are applicable to this use.
[20.6.4.128 NMAC - N, 05-23-05]

20.6.4.129 RIO GRANDE BASIN - Perennial reaches of the Rio Hondo.

A. Designated Uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact**.**

B. Criteria:

(1) In any single sample: specific conductance 400 µmhos/cm or less, pH within the range of 6.6 to 8.8, total phosphorous (as P) less than 0.1 mg/L and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).
[20.6.4.129 NMAC - N, 05-23-05]

20.6.4.130 - 20.6.4.200: [RESERVED]

20.6.4.201 PECOS RIVER BASIN - The main stem of the Pecos river from the New Mexico-Texas line upstream to the mouth of the Black river (near Loving).

A. Designated Uses: irrigation, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(l) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 50 cfs: TDS 20,000 mg/L or less, sulfate 3,000 mg/L or less and chloride 10,000 mg/L or less.

[20.6.4.201 NMAC - Rp 20 NMAC 6.1.2201, 10-12-00; A, 05-23-05]

20.6.4.202 PECOS RIVER BASIN - The main stem of the Pecos river from the mouth of the Black river upstream to lower Tansil dam, including perennial reaches of the Black river, the Delaware river and Blue spring.

A. Designated Uses: industrial water supply, irrigation, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(l) In any single sample: pH within the range of 6.6 to 9.0 and temperature 34°C (93.2°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 50 cfs: TDS 8,500 mg/L or less, sulfate 2,500 mg/L or less and chloride 3,500 mg/L or less.

C. Remarks: Diversion for irrigation frequently limits summer flow in this reach of the main stem Pecos river to that contributed by springs along the watercourse.

[20.6.4.202 NMAC - Rp 20 NMAC 6.1.2202, 10-12-00; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.218 NMAC**.]

20.6.4.203 PECOS RIVER BASIN - The main stem of the Pecos river from lower the headwaters of Lake Carlsbad upstream to Avalon dam.

A. Designated Uses: industrial water supply, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 34°C (93.2°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.203 NMAC - Rp 20 NMAC 6.1.2203, 10-12-00; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.219 NMAC**.]

20.6.4.204 PECOS RIVER BASIN - The main stem of the Pecos river from the headwaters of Avalon reservoir upstream to Brantley dam.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less, single sample 2880 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.204 NMAC - Rp 20 NMAC 6.1.2204, 10-12-00; A, 05-23-05]

20.6.4.205 PECOS RIVER BASIN - Brantley reservoir.

A. Designated Uses: irrigation storage, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).
[20.6.4.205 NMAC - Rp 20 NMAC 6.1.2205, 10-12-00; A, 05-23-05]

20.6.4.206 PECOS RIVER BASIN - The main stem of the Pecos river from the headwaters of Brantley reservoir upstream to Salt creek (near Acme), perennial reaches of the Rio Peñasco downstream from state highway 24 near Dunken, perennial reaches of the Rio Hondo and its tributaries below Bonney canyon and perennial reaches of the Rio Felix.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less; single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 50 cfs: TDS 14,000 mg/L or less, sulfate 3,000 mg/L or less and chloride 6,000 mg/L or less.
[20.6.4.206 NMAC - Rp 20 NMAC 6.1.2206, 10-12-00; A, 05-23-05]

20.6.4.207 PECOS RIVER BASIN - The main stem of the Pecos river from Salt creek (near Acme) upstream to Sumner dam.

A. Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli 548 cfu/100 mL or less; single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 50 cfs: TDS 8,000 mg/L or less, sulfate 2,500 mg/L or less and chloride 4,000 mg/L or less.
[20.6.4.207 NMAC - Rp 20 NMAC 6.1.2207, 10-12-00; A, 05-23-05]

20.6.4.208 PECOS RIVER BASIN - Perennial reaches of the Rio Peñasco and its tributaries above state highway 24 near Dunken, perennial reaches of the Rio Bonito downstream from state highway 48 (near Angus), the Rio Ruidoso downstream of the U.S. highway 70 bridge near Seeping Springs lakes, perennial reaches of the Rio Hondo upstream from Bonney canyon and perennial reaches of Agua Chiquita.

A. Designated Uses: fish culture, irrigation, livestock watering, wildlife habitat, coldwater aquatic life and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8, temperature 30°C (86°F) or less and total phosphorus (as P) less than 0.1 mg/L. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).
[20.6.4.208 NMAC - Rp 20 NMAC 6.1.2208, 10-12-00; A, 05-23-05]

20.6.4.209 PECOS RIVER BASIN - Perennial reaches of Eagle creek above Alto reservoir, perennial reaches of the Rio Bonito and its tributaries upstream of state highway 48 (near Angus) and perennial reaches of the Rio Ruidoso and its tributaries upstream of the U.S. highway 70 bridge near Seeping Springs lakes.

A. Designated Uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat, municipal and industrial water supply and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 600 µmhos/cm or less in Eagle creek, 1,100 µmhos or less in Bonito creek, and 1,500 µmhos or less in the Rio Ruidoso, pH within the range of 6.6 to 8.8, total phosphorus (as P) less than 0.1 mg/L and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.209 NMAC - Rp 20 NMAC 6.1.2209, 10-12-00; A, 05-23-05]

20.6.4.210 PECOS RIVER BASIN - Sumner reservoir.

A. Designated Uses: irrigation storage, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.210 NMAC - Rp 20 NMAC 6.1.2210, 10-12-00; A, 05-23-05]

20.6.4.211 PECOS RIVER BASIN - The main stem of the Pecos river from the headwaters of Sumner reservoir upstream to Tecolote creek.

A. Designated Uses: fish culture, irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 50 cfs: TDS 3,000 mg/L or less, sulfate 2,000 mg/L or less and chloride 400 mg/L or less.

[20.6.4.211 NMAC - Rp 20 NMAC 6.1.2211, 10-12-00; A, 05-23-05]

20.6.4.212 PECOS RIVER BASIN - Perennial tributaries to the main stem of the Pecos river from the headwaters of Sumner reservoir upstream to Santa Rosa dam.

A. Designated Uses: irrigation, coldwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.212 NMAC - Rp 20 NMAC 6.1.2211.1, 10-12-00; A, 05-23-05]

20.6.4.213 PECOS RIVER BASIN - McAllister lake.

A. Designated Uses: coldwater aquatic life, secondary contact, livestock watering and wildlife habitat.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 8.8 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less; single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.213 NMAC - Rp 20 NMAC 6.1.2211.3, 10-12-00; A, 05-23-05]

20.6.4.214 PECOS RIVER BASIN - Storrie lake.

A. Designated Uses: coldwater aquatic life, warmwater aquatic life, primary contact, livestock watering, wildlife habitat, municipal water supply and irrigation storage.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.214 NMAC - Rp 20 NMAC 6.1.2211.5, 10-12-00; A, 05-23-05]

20.6.4.215 PECOS RIVER BASIN - Perennial reaches of the Gallinas river and all its tributaries above the diversion for the Las Vegas municipal reservoir and perennial reaches of Tecolote creek and its perennial tributaries.

A. Designated Uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat, municipal and industrial water supply and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 300 µmhos/cm or less except specific conductance 450 µmhos/cm or less in Wright Canyon creek, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.215 NMAC - Rp 20 NMAC 6.1.2212, 10-12-00; A, 05-23-05]

20.6.4.216 PECOS RIVER BASIN - The main stem of the Pecos river from Tecolote creek upstream to Cañon de Mazanita.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life and primary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 30°C (86°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 10 cfs: TDS 250 mg/L or less, sulfate 25 mg/L or less and chloride 5 mg/L or less.

[20.6.4.216 NMAC - Rp 20 NMAC 6.1.2213, 10-12-00; A, 05-23-05]

20.6.4.217 PECOS RIVER BASIN - Perennial reaches of Cow creek and all perennial reaches of its tributaries and the main stem of the Pecos river from Cañon de Manzanita upstream to its headwaters, including perennial reaches of all tributaries thereto.

A. Designated Uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 300 µmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.217 NMAC - Rp 20 NMAC 6.1.2214, 10-12-00; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segments are under 20.6.4.220 and 20.6.4.221 NMAC**.]

20.6.4.218 PECOS RIVER BASIN - Tansil lake and Lake Carlsbad.

A. Designated Uses: industrial water supply, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 9.0 and temperature 34°C (93.2°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.218 NMAC - N, 05-23-05]

20.6.4.219 PECOS RIVER BASIN - Avalon reservoir.

A. Designated Uses: irrigation storage, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less, single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.219 NMAC - N, 05-23-05]

20.6.4.220 PECOS RIVER BASIN - Perennial reaches of the Gallinas river and its tributaries from its mouth upstream to the diversion for the Las Vegas municipal reservoir, except Pecos Arroyo.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life and primary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 30°C (86°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section. (see Subsection B of 20.6.4.14 NMAC)

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 410 cfu/100 mL or less.

[20.6.4.220 NMAC - N, 05-23-05]

20.6.4.221 PECOS RIVER BASIN - Pecos Arroyo.

A. Designated Uses: livestock watering, wildlife habitat, warmwater aquatic life and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less, single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.221 NMAC - N, 05-23-05]

20.6.4.222 - 20.6.4.300: [RESERVED]

20.6.4.301 CANADIAN RIVER BASIN - The main stem of the Canadian river from the New Mexico-Texas line upstream to Ute dam, and any flow that enters the main stem from Revuelto creek.

A. Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0, temperature 32.2°C (90°F) or less and TDS 6,500 mg/L or less at flows above 25 cfs. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.301 NMAC - Rp 20 NMAC 6.1.2301, 10-12-00; A, 05-23-05]

20.6.4.302 CANADIAN RIVER BASIN - Ute reservoir.

A. Designated Uses: livestock watering, wildlife habitat, municipal and industrial water supply, primary contact and warmwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.302 NMAC - Rp 20 NMAC 6.1.2302, 10-12-00; A, 05-23-05]

20.6.4.303 CANADIAN RIVER BASIN - The main stem of the Canadian river from the headwaters of Ute reservoir upstream to Conchas dam, the perennial reaches of Pajarito and Ute creeks and their perennial tributaries.

A. Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.303 NMAC - Rp 20 NMAC 6.1.2303, 10-12-00; A, 05-23-05]

20.6.4.304 CANADIAN RIVER BASIN - Conchas reservoir.

A. Designated Uses: irrigation storage, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.304 NMAC - Rp 20 NMAC 6.1.2304, 10-12-00; A, 05-23-05]

20.6.4.305 CANADIAN RIVER BASIN - The main stem of the Canadian river from the headwaters of Conchas reservoir upstream to the New Mexico-Colorado line, perennial reaches of the Conchas river, the Mora river downstream from the USGS gaging station near Shoemaker, the Vermejo river downstream from Rail canyon and perennial reaches of Raton, Chicorica and Uña de Gato creeks.

A. Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0, temperature 32.2°C (90°F) or less and TDS 3,500 mg/L or less at flows above 10 cfs. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.305 NMAC - Rp 20 NMAC 6.1.2305, 10-12-00; A, 05-23-05]

20.6.4.306 CANADIAN RIVER BASIN - The Cimarron river downstream from state highway 21 in Cimarron to the Canadian river and all perennial reaches of tributaries to the Cimarron river downstream from state highway 21 in Cimarron.

A. Designated Uses: irrigation, warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0, temperature 32.2°C (90°F) or less and TDS 3,500 mg/L or less at flows above 10 cfs. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.306 NMAC - Rp 20 NMAC 6.1.2305.1, 10-12-00; A, 7-19-01; A, 05-23-05]

20.6.4.307 CANADIAN RIVER BASIN - Perennial reaches of the Mora river from the USGS gaging station near Shoemaker upstream to the state highway 434 bridge in Mora, all perennial reaches of tributaries to the Mora river downstream from the USGS gaging station at La Cueva in San Miguel and Mora counties, perennial reaches of Ocate creek and its tributaries downstream of Ocate, and perennial reaches of Rayado creek downstream of Miami lake diversion in Colfax county.

A. Designated Uses: marginal coldwater aquatic life, warmwater aquatic life, secondary contact, irrigation, livestock watering and wildlife habitat.

B. Criteria:

(1) In any single sample: temperature 25°C (77°F) or less and pH within the range of 6.6 to 9.0. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.307 NMAC - Rp 20 NMAC 6.1.2305.3, 10-12-00; A, 05-23-05]

20.6.4.308 CANADIAN RIVER BASIN - Charette lakes.

A. Designated Uses: coldwater aquatic life, warmwater aquatic life, secondary contact, livestock watering and wildlife habitat.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less; single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.308 NMAC - Rp 20 NMAC 6.1.2305.5, 10-12-00; A, 05-23-05]

20.6.4.309 CANADIAN RIVER BASIN - The Mora river and perennial reaches of its tributaries upstream from the state highway 434 bridge in Mora, all perennial reaches of tributaries to the Mora river upstream from the USGS gaging station at La Cueva, perennial reaches of Coyote creek and its tributaries, the Cimarron river and its perennial tributaries above state highway 21 in Cimarron, all perennial reaches of tributaries to the Cimarron river north and northwest of highway 64, perennial reaches of Rayado creek and its tributaries above Miami lake diversion, Ocate creek and perennial reaches of its tributaries upstream of Ocate, perennial reaches of the Vermejo river upstream from Rail canyon and all other perennial reaches of tributaries to the Canadian river northwest and north of U.S. highway 64 in Colfax county unless included in other segments.

A. Designated Uses: domestic water supply, irrigation, high quality coldwater aquatic life, livestock watering, wildlife habitat, municipal and industrial water supply and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 500 µmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.309 NMAC - Rp 20 NMAC 6.1.2306, 10-12-00; A, 7-19-01; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.310 NMAC**.]

20.6.4.310 CANADIAN RIVER BASIN - Perennial reaches of Corrumpa creek and perennial reaches of tributaries of the Canadian river north of U.S. highway 54/66 and east and northeast of the Ute creek drainage.

A. Designated Uses: livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less, single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.310 NMAC - N, 05-23-05]

20.6.4.311 - 20.6.4.400: [RESERVED]

20.6.4.401 SAN JUAN RIVER BASIN - The main stem of the San Juan river from the Navajo Nation boundary at the Hogback upstream to its confluence with the Animas river.

A. Designated Uses: municipal and industrial water supply, irrigation, livestock watering, wildlife habitat, secondary contact, marginal coldwater aquatic life and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.401 NMAC - Rp 20 NMAC 6.1.2401, 10-12-00; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.408 NMAC**.]

20.6.4.402 SAN JUAN RIVER BASIN - La Plata river from its confluence with the San Juan river upstream to the New Mexico-Colorado line.

A. Designated Uses: irrigation, marginal warmwater aquatic life, marginal coldwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.402 NMAC - Rp 20 NMAC 6.1.2402, 10-12-00; A, 05-23-05]

20.6.4.403 SAN JUAN RIVER BASIN - The Animas river from its confluence with the San Juan upstream to Estes Arroyo.

A. Designated Uses: municipal and industrial water supply, irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, primary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 27°C (80.6°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.403 NMAC - Rp 20 NMAC 6.1.2403, 10-12-00; A, 05-23-05]

20.6.4.404 SAN JUAN RIVER BASIN - The Animas river from Estes Arroyo upstream to the New Mexico-Colorado line.

A. Designated Uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat, municipal and industrial water supply and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8, temperature 20°C (68°F) or less and total phosphorus (as P) 0.l mg/L or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.404 NMAC - Rp 20 NMAC 6.1.2404, 10-12-00; A, 05-23-05]

20.6.4.405 SAN JUAN RIVER BASIN - The main stem of the San Juan river from Canyon Largo upstream to the Navajo dam.

A. Designated Uses: high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat, municipal and industrial water supply and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 400 µmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.405 NMAC - Rp 20 NMAC 6.1.2405, 10-12-00; A, 05-23-05]

20.6.4.406 SAN JUAN RIVER BASIN - Navajo reservoir in New Mexico.

A. Designated Uses: coldwater aquatic life, warmwater aquatic life, irrigation storage, livestock watering, wildlife habitat, municipal and industrial water storage and primary contact.

B. Criteria:

(1) At any sampling site: pH within the range of 6.6 to 8.8, temperature 20°C (68°F) or less and total phosphorus (as P) 0.1 mg/L or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.406 NMAC - Rp 20 NMAC 6.1.2406, 10-12-00; A, 05-23-05]

20.6.4.407 SAN JUAN RIVER BASIN - Perennial reaches of the Navajo and Los Pinos rivers in New Mexico.

A. Designated Uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8, temperature 20°C (68°F) or less and total phosphorus (as P) 0.1 mg/L or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.407 NMAC - Rp 20 NMAC 6.1.2407, 10-12-00; A, 05-23-05]

20.6.4.408 SAN JUAN RIVER BASIN - The main stem of the San Juan river from its confluence with the Animas river upstream to its confluence with Canyon Largo.

A. Designated Uses: municipal and industrial water supply, irrigation, livestock watering, wildlife habitat, secondary contact, marginal coldwater aquatic life and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0, and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.408 NMAC - N, 05-23-05]

20.6.4.409 - 20.6.4.500: [RESERVED]

20.6.4.501 GILA RIVER BASIN - The main stem of the Gila river from the New Mexico-Arizona line upstream to Redrock canyon and perennial reaches of streams in Hidalgo county.

A. Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.501 NMAC - Rp 20 NMAC 6.1.2501, 10-12-00; A, 05-23-05]

20.6.4.502 GILA RIVER BASIN - The main stem of the Gila river from Redrock canyon upstream to the confluence of the West Fork Gila river and East Fork Gila river and perennial reaches of tributaries to the Gila river below Mogollon creek.

A. Designated Uses: industrial water supply, irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, primary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 28°C (82.4°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.502 NMAC - Rp 20 NMAC 6.1.2502, 10-12-00; A, 05-23-05]

20.6.4.503 GILA RIVER BASIN - All perennial tributaries to the Gila river above and including Mogollon creek.

A. Designated Uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 300 µmhos/cm or less for the main stem of the Gila river above Gila hot springs and 400 µmhos or less for other reaches, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less except 32.2°C (90°F) or less in the east fork of the Gila river and Sapillo creek below lake Roberts. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.503 NMAC - Rp 20 NMAC 6.1.2503, 10-12-00; A, 05-23-05]

20.6.4.504 GILA RIVER BASIN - Wall lake, Lake Roberts and Snow lake.

A. Designated Uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 300 µmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 22°C (72°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.504 NMAC - Rp 20 NMAC 6.1.2504, 10-12-00; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.806 NMAC**.]

20.6.4.505 - 20.6.4.600: [RESERVED]

20.6.4.601 SAN FRANCISCO RIVER BASIN - The main stem of the San Francisco river from the New Mexico-Arizona line upstream to state highway 12 at Reserve and perennial reaches of Mule creek.

A. Designated Uses: irrigation, marginal warmwater and marginal coldwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.601 NMAC - Rp 20 NMAC 6.1.2601, 10-12-00; A, 05-23-05]

20.6.4.602 SAN FRANCISCO RIVER BASIN - The main stem of the San Francisco river from state highway 12 at Reserve upstream to the New Mexico-Arizona line.

A. Designated Uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.602 NMAC - Rp 20 NMAC 6.1.2602, 10-12-00; A, 05-23-05]

20.6.4.603 SAN FRANCISCO RIVER BASIN - All perennial reaches of tributaries to the San Francisco river above the confluence of Whitewater creek and including Whitewater creek.

A. Designated Uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 400 µmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less except 25°C (77°F) or less in Tularosa creek. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.603 NMAC - Rp 20 NMAC 6.1.2603, 10-12-00; A, 05-23-05]

20.6.4.604 - 20.6.4.700: [RESERVED]

20.6.4.701 DRY CIMARRON RIVER - Perennial portions of the Dry Cimarron river above Oak creek and perennial reaches of Oak creek.

A. Designated Uses: marginal coldwater aquatic life, warmwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8, temperature 25°C (77°F) or less, TDS 1,200 mg/L or less, sulfate 600 mg/L or less, and chloride 40 mg/L or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.701 NMAC - Rp 20 NMAC 6.1.2701, 10-12-00; A, 05-23-05]

[**NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.702 NMAC.**]

20.6.4.702 DRY CIMARRON RIVER - Perennial portions of the Dry Cimarron river below Oak creek, and perennial portions of Long canyon and Carrizozo creeks.

A. Designated Uses: warmwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8, temperature 32.2°C (90°F) or less, TDS 1,200 mg/L or less, sulfate 600 mg/L or less and chloride 40 mg/L or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.702 NMAC - N, 05-23-05]

20.6.4.703 - 20.6.4.800: [RESERVED]

20.6.4.801 CLOSED BASINS - Rio Tularosa lying east of the old U.S. highway 70 bridge crossing east of Tularosa and all perennial tributaries to the Tularosa basin except Three Rivers.

A. Designated Uses: coldwater aquatic life, fish culture, irrigation, livestock watering, wildlife habitat, municipal and industrial water supply and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.801 NMAC - Rp 20 NMAC 6.1.2801, 10-12-00; A, 05-23-05]

20.6.4.802 CLOSED BASINS - Perennial reaches of Three Rivers.

A. Designated Uses: irrigation, domestic water supply, high quality coldwater aquatic life, secondary contact, livestock watering and wildlife habitat.

B. Criteria:

(1) In any single sample: specific conductance 500 µmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.802 NMAC - Rp 20 NMAC 6.1.2802, 10-12-00; A, 05-23-05]

20.6.4.803 CLOSED BASINS - Perennial reaches of the Mimbres river downstream of the confluence with Willow Springs canyon and all perennial reaches of tributaries thereto.

A. Designated Uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.803 NMAC - Rp 20 NMAC 6.1.2803, 10-12-00; A, 05-23-05]

20.6.4.804 CLOSED BASINS - Perennial reaches of the Mimbres river upstream of the confluence with Willow Springs canyon and all perennial tributaries thereto.

A. Designated Uses: irrigation, domestic water supply, high quality coldwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 300 µmhos or less, pH within the range of 6.6 to 8.8 and temperature 20°C (68°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235

cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).
[20.6.4.804 NMAC - Rp 20 NMAC 6.1.2804, 10-12-00; A, 05-23-05]

20.6.4.805 CLOSED BASINS - Perennial reaches of the Sacramento river (Sacramento-Salt Flat closed basin) and all perennial tributaries thereto.

A. Designated Uses: domestic and municipal water supply, livestock watering, wildlife habitat, marginal coldwater aquatic life and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).
[20.6.4.805 NMAC - Rp 20 NMAC 6.1.2805, 10-12-00; A, 05-23-05]

20.6.4.806 CLOSED BASINS - Bear canyon reservoir.

A. Designated Uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: specific conductance 300 µmhos/cm or less, pH within the range of 6.6 to 8.8 and temperature 22°C (72°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).
[20.6.4.806 NMAC - N, 05-23-05]

20.6.4.807 - 20.6.4.899: [RESERVED]

20.6.4.900 CRITERIA APPLICABLE TO ATTAINABLE OR DESIGNATED USES UNLESS OTHERWISE SPECIFIED IN 20.6.4.97 THROUGH 20.6.4.899 NMAC.

A. Fish Culture, Water Supply and Storage: Fish culture and municipal and industrial water supply and storage are designated uses in particular classified waters of the state where these uses are actually being realized. However, no numeric criteria apply uniquely to these uses. Water quality adequate for these uses is ensured by the general criteria and numeric criteria for bacterial quality, pH and temperature that are established for all classified waters of the state listed in 20.6.4.97 through 20.6.4.899 NMAC.

B. Domestic Water Supply: Surface waters of the state designated for use as domestic water supplies shall not contain substances in concentrations that create a lifetime cancer risk of more than one cancer per 100,000 exposed persons. Those criteria listed under domestic water supply in Subsection J of this section apply to this use.

C. Irrigation and Irrigation Storage: The following numeric criteria and those criteria listed under irrigation in Subsection J of this section apply to this use:

(1)	dissolved selenium	0.13	mg/L
(2)	dissolved selenium in presence of >500 mg/L SO_4	0.25	mg/L

D. Primary Contact: The monthly geometric mean of E. coli bacteria of 126 cfu/100 mL and single sample of 410 cfu/100 mL, apply to this use and pH shall be within the range of 6.6 to 9.0.

E. Secondary Contact: The monthly geometric mean of E. coli bacteria of 548 cfu/100 mL and single sample of 2507 cfu/100 mL apply to this use.

F. Livestock Watering: The criteria listed in Subsection J for livestock watering apply to this use.

G. Wildlife Habitat: Wildlife habitat shall be free from any substances at concentrations that are toxic to or will adversely affect plants and animals that use these environments for feeding, drinking, habitat or propagation; can bioaccumulate; or might impair the community of animals in a watershed or the ecological integrity of surface waters of the state. The discharge of substances that bioaccumulate, in excess of levels listed in Subsection J for wildlife habitat is allowed if, and only to the extent that, the substances are present in the intake waters that are diverted and utilized prior to discharge, and then only if the discharger utilizes best available treatment technology to reduce the amount of bioaccumulating substances that are discharged. The numeric criteria

listed in Subsection J for wildlife habitat apply to this use except when a site-specific or segment-specific criterion has been adopted under 20.6.4.101 through 20.6.4.899 NMAC.

H. Aquatic Life: Surface waters of the state with a designated, existing or attainable use of aquatic life shall be free from any substances at concentrations that can impair the community of plants and animals in or the ecological integrity of surface waters of the state. Except as provided in paragraph 6 below, the acute and chronic aquatic life criteria set out in subsections I and J of this section are applicable to this use. In addition, the specific criteria for aquatic life subcategories in the following paragraphs shall apply to waters classified under the respective designations

(1) High Quality Coldwater: Dissolved oxygen 6.0 mg/L or more, temperature 20°C (68°F) or less, pH within the range of 6.6 to 8.8 and specific conductance a limit varying between 300 µmhos/cm and 1,500 µmhos /cm depending on the natural background in particular surface waters of the state (the intent of this criterion is to prevent excessive increases in dissolved solids which would result in changes in community structure). The total ammonia criteria set out in Subsections K, L and M of this section and the human health criteria for pollutants listed in Subsection J of this section are applicable to this use.

(2) Coldwater: Dissolved oxygen 6.0 mg/L or more, temperature 20°C (68°F) or less and pH within the range of 6.6 to 8.8. The total ammonia criteria set out in Subsections K, L and M of this section and the human health criteria listed in Subsection J of this section are applicable to this use.

(3) Marginal Coldwater: Dissolved oxygen than 6 mg/L or more, on a case by case basis maximum temperatures may exceed 25°C (77°F) and the pH may range from 6.6 to 9.0. The total ammonia criteria set out in Subsections K, L and M of this section and the human health criteria listed in Subsection J of this section are applicable to this use.

(4) Warmwater: Dissolved oxygen 5 mg/L or more, temperature 32.2°C (90°F) or less, and pH within the range of 6.6 to 9.0. The total ammonia criteria set out in Subsections K, L and M of this section and the human health criteria listed in Subsection J of this section are applicable to this use.

(5) Marginal Warmwater: Dissolved oxygen 5 mg/L or more, pH within the range of 6.6 to 9.0 and on a case by case basis maximum temperatures may exceed 32.2°C (90°F). The total ammonia criteria set out in Subsections K, L and M of this section and the human health criteria listed in Subsection J of this section are applicable to this use.

(6) Limited Aquatic Life: Criteria shall be developed on a segment-specific basis. The acute aquatic life criteria of Subsections I and J of this section shall apply. Chronic aquatic life criteria do not apply unless adopted on a segment specific basis.

I. The following schedule of equations for the determination of numeric criteria for the substances listed and those criteria listed in Subsection J for aquatic life shall apply to the subcategories of aquatic life identified in this section.

(1) Acute criteria:

(a) dissolved silver $0.85\ e^{(1.72(\ln(\text{hardness}))-6.59)}$ µg/L

(b) dissolved cadmium $(e^{(1.0166(\ln(\text{hardness}))-3.924)})\text{cf}$ µg/L, the hardness-dependent formulae for cadmium must be multiplied by a conversion factor (cf) to be expressed as dissolved values; the acute factor for cadmium is cf = 1.136672 - ((ln hardness)(0.041838))

(c) dissolved chromium $0.316\ e^{(0.819(\ln(\text{hardness}))+3.7256)}$ µg/L

(d) dissolved copper $0.960\ e^{(0.9422(\ln(\text{hardness}))-1.700)}$ µg/L

(e) dissolved lead $(e^{(1.273(\ln(\text{hardness}))-1.46)})\text{cf}$ µg/L, the hardness-dependent formulae for lead must be multiplied by a conversion factor (cf) to be expressed as dissolved values; the acute and chronic factor for lead is cf = 1.46203 - ((ln hardness)(0.145712))

(f) dissolved nickel $0.998\ e^{(0.8460(\ln(\text{hardness}))+2.255)}$ µg/L

(g) dissolved zinc $0.978\ e^{(0.8473(\ln(\text{hardness}))+0.884)}$ µg/L

(2) Chronic criteria:

(a) dissolved cadmium $(e^{(0.7409(\ln(\text{hardness}))-4.719)})\text{cf}$ µg/L, the hardness-dependent formulae for cadmium must be multiplied by a conversion factor (cf) to be expressed as dissolved values; the chronic factor for cadmium is cf = 1.101672 - ((ln hardness)(0.041838))

(b) dissolved chromium $0.860\ e^{(0.819(\ln(\text{hardness}))+0.6848)}$ µg/L

(c) dissolved copper $0.960\ e^{(0.8545(\ln(\text{hardness}))-1.702)}$ µg/L

(d) dissolved lead $(e^{(1.273(\ln(\text{hardness}))-4.705)})\text{cf}$ µg/L, the hardness-dependent formulae for lead must be multiplied by a conversion factor (cf) to be expressed as dissolved values; the acute and chronic factor for lead is cf = 1.46203 - ((ln hardness)(0.145712))

(e) dissolved nickel $0.997\ e^{(0.846(\ln(\text{hardness}))+0.0584)}$ µg/L

(f) dissolved zinc $0.986\ e^{(0.8473(\ln(\text{hardness}))+0.884)}$ µg/L

J. Numeric criteria. The following table sets forth the numeric criteria adopted by the commission to protect existing, designated and attainable uses. Additional criteria that are not compatible with this table are found in Subsections A through I of this section.

Pollutant total, unless indicated	**CAS Number**	**Domestic Water Supply** µg/L unless indicated	**Irrigation** µg/L unless indicated	**Livestock Watering** µg/L unless indicated	**Wildlife Habitat** µg/L unless indicated	**Aquatic Life**		**Human Health** µg/L	**Cancer Causing (C) or Persistent (P)**
						Acute µg/L	**Chronic** µg/L		
Aluminum, dissolved	7429-90-5		5,000			750	87		
Antimony, dissolved	7440-36-0	5.6						640	P
Arsenic, dissolved	7440-38-2	2.3	100	200		340	150	9.0	C,P
Asbestos	1332-21-4	7,000,000 fibers/L							
Barium, dissolved	7440-39-3	2,000							
Beryllium, dissolved	7440-41-7	4							
Boron, dissolved	7440-42-8		750	5,000					
Cadmium, dissolved	7440-43-9	5	10	50		see 20.6.4.900.I	see 20.6.4.900.I		
Chlorine residual	7782-50-5				11	19	11		
Chromium, dissolved	18540-29-9	100	100	1,000		see 20.6.4.900.I	see 20.6.4.900.I		
Cobalt, dissolved	7440-48-4		50	1,000					
Copper, dissolved	7440-50-8	1300	200	500		see 20.6.4.900.I	see 20.6.4.900.I		
Cyanide, dissolved	57-12-5	200							
Cyanide, weak acid dissociable	57-12-5	700			5.2	22.0	5.2	220,000	
Lead, dissolved	7439-92-1	50	5,000	100		see 20.6.4.900.I	see 20.6.4.900.I		
Mercury	7439-97-6	2		10	0.77				
Mercury, dissolved	7439-97-6					1.4	0.77		
Methymercury	22967-92-6							0.3 mg/kg in fish tissue	P
Molybdenum, dissolved	7439-98-7		1,000						
Nickel, dissolved	7440-02-0	100				see 20.6.4.900.I	see 20.6.4.900.I	4,600	P
Nitrate as N		10 mg/L							
Nitrite + Nitrate				132 mg/L					
Selenium, dissolved	7782-49-2	50	see 20.6.4.900.C	50				4,200	P
Selenium, total recoverable	7782-49-2				5.0	20.0	5.0		

Pollutant total, unless indicated	CAS Number	Domestic Water Supply µg/L unless indicated	Irrigation µg/L unless indicated	Livestock Watering µg/L unless indicated	Wildlife Habitat µg/L unless indicated	Aquatic Life		Human Health µg/L	Cancer Causing (C) or Persistent (P)
						Acute µg/L	Chronic µg/L		
Silver, dissolved	7440-22-4					see 20.6.4 .900.I			
Thallium, dissolved	7440-28-0	1.7						6.3	P
Uranium, dissolved	7440-61-1	5,000							
Vanadium, dissolved	7440-62-2		100	100					
Zinc, dissolved	7440-66-6	7,400	2,000	25,000		see 20.6.4 .900.I	see 20.6.4.900. I	26,000	P
Adjusted gross alpha (see 20.6.4.900.B and .F)		15 pCi/L		15 pCi/L					
Radium 226 + Radium 228		5 pCi/L		30.0 pCi/L					
Strontium 90		8 pCi/L							
Tritium		20,000 pCi/L		20,000 pCi/L					
Acenaphthene	83-32-9	670						990	
Acrolein	107-02-8	190						290	
Acrylonitrile	107-13-1	0.51						2.5	C
Aldrin	309-00-2	0.00049				3.0		0.00050	C,P
Anthracene	120-12-7	8,300						40,000	
Benzene	71-43-2	22						510	C
Benzidine	92-87-5	0.00086						0.0020	C
Benzo(a)anthracene	56-55-3	0.038						0.18	C
Benzo(a)pyrene	50-32-8	0.038						0.18	C,P
Benzo(b)fluoranthene	205-99-2	0.038						0.18	C
Benzo(k)fluoranthene	207-08-9	0.038						0.18	C
alpha-BHC	319-84-6	0.026						0.049	C
beta-BHC	319-85-7	0.091						0.17	C
Gamma-BHC (Lindane)	58-89-9	0.19				0.95		0.63	C
Bis(2-chloroethyl) ether	111-44-4	0.30						5.3	C
Bis(2-chloroisopropyl) ether	108-60-1	1,400						65,000	
Bis(2-ethylhexyl) phthalate	117817	12						22	C
Bromoform	75-25-2	43						1,400	C
Butylbenzyl phthalate	85-68-7	1,500						1,900	
Carbon tetrachloride	56-23-5	2.3						16	C
Chlordane	57-74-9	0.0080				2.4	0.0043	0.0081	C,P

Pollutant total, unless indicated	**CAS Number**	**Domestic Water Supply** µg/L unless indicated	**Irrigation** µg/L unless indicated	**Livestock Watering** µg/L unless indicated	**Wildlife Habitat** µg/L unless indicated	**Aquatic Life**		**Human Health** µg/L	**Cancer Causing (C) or Persistent (P)**
						Acute µg/L	**Chronic** µg/L		
Chlorobenzene	108-90-7	680						21,000	
Chlorodibromomethane	124-48-1	4.0						130	C
Chloroform	67-66-3	57						4,700	C
2-Chloronaphthalene	91-58-7	1,000						1,600	
2-Chlorophenol	95-57-8	81						150	
Chrysene	218-01-9	0.038						0.18	C
4,4'-DDT and derivatives		0.0022			0.001	1.1	0.001	0.0022	C,P
Dibenzo(a,h)anthracene	53-70-3	0.038						0.18	C
Dibutyl phthalate	84-74-2	2,000						4,500	
1,2-Dichlorobenzene	95-50-1	2,700						17,000	
1,3-Dichlorobenzene	541-73-1	320						960	
1,4-Dichlorobenzene	106-46-7	400						2,600	
3,3'-Dichlorobenzidine	91-94-1	0.21						0.28	C
Dichlorobromomethane	75-27-4	5.5						170	C
1,2-Dichloroethane	107-06-2	3.8						370	C
1,1-Dichloroethylene	75-35-4	0.57						32	C
2,4-Dichlorophenol	120-83-2	77						290	
1,2-Dichloropropane	78-87-5	5.0						150	C
1,3-Dichloropropene	542-75-6	10						1,700	
Dieldrin	60-57-1	0.00052				0.24	0.056	0.00054	C,P
Diethyl phthalate	84-66-2	17,000						44,000	
Dimethyl phthalate	131-11-3	270,000						1,100,000	
2,4-Dimethylphenol	105-67-9	380						850	
2,4-Dinitrophenol	51-28-5	69						5,300	
2,4-Dinitrotoluene	121-14-2	1.1						34	C
2,3,7,8-TCDD Dioxin	1746-01-6	5.0E-08						5.1E-08	C,P
1,2-Diphenylhydrazine	122-66-7	0.36						2.0	C
alpha-Endosulfan	959-98-8	62				0.22	0.056	89	
beta-Endosulfan	33213-65-9	62				0.22	0.056	89	
Endosulfan sulfate	1031-07-8	62						89	
Endrin	72-20-8	0.76				0.086	0.036	0.81	
Endrin aldehyde	7421-93-4	0.29						0.30	
Ethylbenzene	100-41-4	3,100						29,000	
Fluoranthene	206-44-0	130						140	
Fluorene	86-73-7	1,100						5,300	

Pollutant total, unless indicated	CAS Number	Domestic Water Supply µg/L unless indicated	Irrigation µg/L unless indicated	Livestock Watering µg/L unless indicated	Wildlife Habitat µg/L unless indicated	Aquatic Life		Human Health µg/L	Cancer Causing (C) or Persistent (P)
						Acute µg/L	Chronic µg/L		
Heptachlor	76-44-8	0.00079				0.52	0.0038	0.00079	C
Heptachlor epoxide	1024-57-3	0.00039				0.52	0.0038	0.00039	C
Hexachlorobenzene	118-74-1	0.0028						0.0029	C,P
Hexachlorobutadiene	87-68-3	4.4						180	C
Hexachlorocyclopentadiene	77-47-4	240						17,000	
Hexachloroethane	67-72-1	14						33	C
Ideno(1,2,3-cd)pyrene	193-39-5	0.038						0.18	C
Isophorone	78-59-1	350						9,600	C
Methyl bromide	74-83-9	47						1,500	
2-Methyl-4,6-dinitrophenol	534-52-1	13						280	
Methylene chloride	75-09-2	46						5,900	C
Nitrobenzene	98-95-3	17						690	
N-Nitrosodimethylamine	62-75-9	0.0069						30	C
N-Nitrosodi-n-propylamine	621-64-7	0.050						5.1	C
N-Nitrosodiphenylamine	86-30-6	33						60	C
PCBs	1336-36-3	0.00064			0.014		0.014	0.00064	C,P
Pentachlorophenol	87-86-5	2.7				19	15	30	C
Phenol	108-95-2	21,000						1,700,000	
Pyrene	129-00-0	830						4,000	
1,1,2,2-Tetrachloroethane	79-34-5	1.7						40	C
Tetrachloroethylene	127-18-4	6.9						33	C,P
Toluene	108-88-3	6,800						200,000	
Toxaphene	8001-35-2	0.0028				0.73	0.0002	0.0028	C
1,2-Trans-dichloroethylene	156-60-5	700						140,000	
1,2,4-Trichlorobenzene	120-82-1	260						940	
1,1,2-Trichloroethane	79-00-5	5.9						160	C
Trichloroethylene	79-01-6	25						300	C
2,4,6-Trichlorophenol	88-06-2	14						24	C
Vinyl chloride	75-01-4	20						5,300	C

K. Acute Criteria, Total Ammonia (mg/L as N)

pH	Salmonids Present	Salmonids Absent

pH	Salmonids Present	Salmonids Absent
6.5	32.6	48.8
6.6	31.3	46.8
6.7	29.8	44.6
6.8	28.1	42.0
6.9	26.2	39.1
7.0	24.1	36.1
7.1	22.0	32.8
7.2	19.7	29.5
7.3	17.5	26.2
7.4	15.4	23.0
7.5	13.3	19.9
7.6	11.4	17.0
7.7	9.65	14.4
7.8	8.11	12.1
7.9	6.77	10.1
8.0	5.62	8.40
8.1	4.64	6.95
8.2	3.83	5.72
8.3	3.15	4.71
8.4	2.59	3.88
8.5	2.14	3.20
8.6	1.77	2.65
8.7	1.47	2.20
8.8	1.23	1.84
8.9	1.04	1.56
9.0	0.885	1.32

L. Chronic Criteria, Total Ammonia (mg/L as N), Fish Early Life Stages Present

pH	Temperature (°C)										
	0	14	15	16	18	20	22	24	26	28	30
6.5	6.67	6.67	6.46	6.06	5.33	4.68	4.12	3.62	3.18	2.80	2.46
6.6	6.57	6.57	6.36	5.97	5.25	4.61	4.05	3.56	3.13	2.75	2.42
6.7	6.44	6.44	6.25	5.86	5.15	4.52	3.98	3.50	3.07	2.70	2.37
6.8	6.29	6.29	6.10	5.72	5.03	4.42	3.89	3.42	3.00	2.64	2.32
6.9	6.12	6.12	5.93	5.56	4.89	4.30	3.78	3.32	2.92	2.57	2.25
7.0	5.91	5.91	5.73	5.37	4.72	4.15	3.65	3.21	2.82	2.48	2.18
7.1	5.67	5.67	5.49	5.15	4.53	3.98	3.50	3.08	2.70	2.38	2.09
7.2	5.39	5.39	5.22	4.90	4.31	3.78	3.33	2.92	2.57	2.26	1.99
7.3	5.08	5.08	4.92	4.61	4.06	3.57	3.13	2.76	2.42	2.13	1.87
7.4	4.73	4.73	4.59	4.30	3.78	3.32	2.92	2.57	2.26	1.98	1.74
7.5	4.36	4.36	4.23	3.97	3.49	3.06	2.69	2.37	2.08	1.83	1.61
7.6	3.98	3.98	3.85	3.61	3.18	2.79	2.45	2.16	1.90	1.67	1.47
7.7	3.58	3.58	3.47	3.25	2.86	2.51	2.21	1.94	1.71	1.50	1.32
7.8	3.18	3.18	3.09	2.89	2.54	2.23	1.96	1.73	1.52	1.33	1.17
7.9	2.80	2.80	2.71	2.54	2.24	1.96	1.73	1.52	1.33	1.17	1.03
8.0	2.43	2.43	2.36	2.21	1.94	1.71	1.50	1.32	1.16	1.02	0.897
8.1	2.10	2.10	2.03	1.91	1.68	1.47	1.29	1.14	1.00	0.879	0.773
8.2	1.79	1.79	1.74	1.63	1.43	1.26	1.11	0.973	0.855	0.752	0.661
8.3	1.52	1.52	1.48	1.39	1.22	1.07	0.941	0.827	0.727	0.639	0.562
8.4	1.29	1.29	1.25	1.17	1.03	0.906	0.796	0.700	0.615	0.541	0.475
8.5	1.09	1.09	1.06	0.990	0.870	0.765	0.672	0.591	0.520	0.457	0.401
8.6	0.920	0.920	0.892	0.836	0.735	0.646	0.568	0.499	0.439	0.386	0.339

pH	Temperature (°C)										
	0	14	15	16	18	20	22	24	26	28	30
8.7	0.778	0.778	0.754	0.707	0.622	0.547	0.480	0.422	0.371	0.326	0.287
8.8	0.661	0.661	0.641	0.601	0.528	0.464	0.408	0.359	0.315	0.277	0.244
8.9	0.565	0.565	0.548	0.513	0.451	0.397	0.349	0.306	0.269	0.237	0.208
9.0	0.486	0.486	0.471	0.442	0.389	0.342	0.300	0.264	0.232	0.204	0.179

M. Chronic Criteria, Total Ammonia (mg/L as N), Fish Early Life Stages Absent

pH	Temperature (°C)									
	0	7	8	9	10	11	12	13	14	15
6.5	10.8	10.8	10.1	9.51	8.92	8.36	7.84	7.35	6.89	6.46
6.6	10.7	10.7	9.99	9.37	8.79	8.24	7.72	7.24	6.79	6.36
6.7	10.5	10.5	9.81	9.20	8.62	8.08	7.58	7.11	6.66	6.25
6.8	10.2	10.2	9.58	8.98	8.42	7.90	7.40	6.94	6.51	6.10
6.9	9.93	9.93	9.31	8.73	8.19	7.68	7.20	6.75	6.33	5.93
7.0	9.60	9.60	9.00	8.43	7.91	7.41	6.95	6.52	6.11	5.73
7.1	9.20	9.20	8.63	8.09	7.58	7.11	6.67	6.25	5.86	5.49
7.2	8.75	8.75	8.20	7.69	7.21	6.76	6.34	5.94	5.57	5.22
7.3	8.24	8.24	7.73	7.25	6.79	6.37	5.97	5.60	5.25	4.92
7.4	7.69	7.69	7.21	6.76	6.33	5.94	5.57	5.22	4.89	4.59
7.5	7.09	7.09	6.64	6.23	5.84	5.48	5.13	4.81	4.51	4.23
7.6	6.46	6.46	6.05	5.67	5.32	4.99	4.68	4.38	4.11	3.85
7.7	5.81	5.81	5.45	5.11	4.79	4.49	4.21	3.95	3.70	3.47
7.8	5.17	5.17	4.84	4.54	4.26	3.99	3.74	3.51	3.29	3.09
7.9	4.54	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89	2.71
8.0	3.95	3.95	3.70	3.47	3.26	3.05	2.86	2.68	2.52	2.36
8.1	3.41	3.41	3.19	2.99	2.81	2.63	2.47	2.31	2.17	2.03
8.2	2.91	2.91	2.73	2.56	2.40	2.25	2.11	1.98	1.85	1.74
8.3	2.47	2.47	2.32	2.18	2.04	1.91	1.79	1.68	1.58	1.48
8.4	2.09	2.09	1.96	1.84	1.73	1.62	1.52	1.42	1.33	1.25
8.5	1.77	1.77	1.66	1.55	1.46	1.37	1.28	1.20	1.13	1.06
8.6	1.49	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.951	0.892
8.7	1.26	1.26	1.18	1.11	1.04	0.976	0.915	0.858	0.805	0.754
8.8	1.07	1.07	1.01	0.944	0.855	0.829	0.778	0.729	0.684	0.641
8.9	0.917	0.917	0.860	0.806	0.756	0.709	0.664	0.623	0.584	0.548
9.0	0.790	0.790	0.740	0.694	0.651	0.610	0.572	0.536	0.503	0.471
At 15º C and above, the criterion for fish early life stages absent is the same as the criterion for fish early life stages present (refer to Subsection L of 20.6.4.900 NMAC).										

N. Dissolved oxygen saturation based on temperature and elevation.

(1) Elevation 5,000 feet or less:

		Elevation (feet)										
		0	**500**	**1,000**	**1,500**	**2,000**	**2,500**	**3,000**	**3,500**	**4,000**	**4,500**	**5,000**
Temperature (°C)	**0**	14.6	14.3	14.1	13.8	13.6	13.3	13.1	12.8	12.6	12.3	12.1
	1	14.2	13.9	13.7	13.4	13.2	12.9	12.7	12.5	12.2	12.0	11.8
	2	13.8	13.6	13.3	13.1	12.8	12.6	12.4	12.1	11.9	11.7	11.5
	3	13.4	13.2	13.0	12.7	12.5	12.3	12.0	11.8	11.6	11.4	11.1
	4	13.1	12.8	12.6	12.4	12.2	11.9	11.7	11.5	11.3	11.1	10.9
	5	12.7	12.5	12.3	12.1	11.8	11.6	11.4	11.2	11.0	10.8	10.6
	6	12.4	12.2	12.0	11.8	11.5	11.3	11.1	10.9	10.7	10.5	10.3
	7	12.1	11.9	11.7	11.5	11.3	11.1	10.8	10.6	10.4	10.2	10.1
	8	11.8	11.6	11.4	11.2	11.0	10.8	10.6	10.4	10.2	10.0	9.8

		Elevation (feet)										
		0	**500**	**1,000**	**1,500**	**2,000**	**2,500**	**3,000**	**3,500**	**4,000**	**4,500**	**5,000**
	9	11.5	11.3	11.1	10.9	10.7	10.5	10.3	10.1	9.9	9.8	9.6
	10	11.3	11.1	10.9	10.7	10.5	10.3	10.1	9.9	9.7	9.5	9.4
	11	11.0	10.8	10.6	10.4	10.2	10.0	9.9	9.7	9.5	9.3	9.1
	12	10.8	10.6	10.4	10.2	10.0	9.8	9.6	9.5	9.3	9.1	8.9
	13	10.5	10.3	10.1	9.9	9.8	9.6	9.4	9.2	9.1	8.9	8.7
	14	10.3	10.1	9.9	9.7	9.6	9.4	9.2	9.0	8.9	8.7	8.5
	15	10.1	9.9	9.7	9.5	9.3	9.2	9.0	8.8	8.7	8.5	8.4
	16	9.8	9.7	9.5	9.3	9.2	9.0	8.8	8.7	8.5	8.3	8.2
	17	9.6	9.5	9.3	9.1	9.0	8.8	8.6	8.5	8.3	8.2	8.0
	18	9.4	9.3	9.1	8.9	8.8	8.6	8.5	8.3	8.1	8.0	7.8
	19	9.3	9.1	8.9	8.8	8.6	8.4	8.3	8.1	8.0	7.8	7.7
	20	9.1	8.9	8.7	8.6	8.4	8.3	8.1	8.0	7.8	7.7	7.5
	21	8.9	8.7	8.6	8.4	8.3	8.1	8.0	7.8	7.7	7.5	7.4
	22	8.7	8.6	8.4	8.2	8.1	8.0	7.8	7.7	7.5	7.4	7.2
	23	8.6	8.4	8.2	8.1	7.9	7.8	7.7	7.5	7.4	7.2	7.1
	24	8.4	8.2	8.1	7.9	7.8	7.7	7.5	7.4	7.2	7.1	7.0
	25	8.2	8.1	7.9	7.8	7.7	7.5	7.4	7.2	7.1	7.0	6.8
	26	8.1	7.9	7.8	7.7	7.5	7.4	7.2	7.1	7.0	6.8	6.7
	27	7.9	7.8	7.7	7.5	7.4	7.2	7.1	7.0	6.8	6.7	6.6
	28	7.8	7.7	7.5	7.4	7.2	7.1	7.0	6.9	6.7	6.6	6.5
	29	7.7	7.5	7.4	7.3	7.1	7.0	6.9	6.7	6.6	6.5	6.4
	30	7.5	7.4	7.3	7.1	7.0	6.9	6.7	6.6	6.5	6.4	6.3

(2) Elevation greater than 5,000 feet:

		Elevation (feet)									
		5,500	**6,000**	**6,500**	**7,000**	**7,500**	**8,000**	**8,500**	**9,000**	**9,500**	**10,000**
Temperature (°C)	**0**	11.9	11.6	11.4	11.2	11.0	10.8	10.6	10.3	10.1	9.9
	1	11.5	11.3	11.1	10.9	10.7	10.5	10.3	10.1	9.9	9.7
	2	11.2	11.0	10.8	10.6	10.4	10.2	10.0	9.8	9.6	9.4
	3	10.9	10.7	10.5	10.3	10.1	9.9	9.7	9.5	9.3	9.1
	4	10.7	10.4	10.2	10.0	9.8	9.7	9.5	9.3	9.1	8.9
	5	10.4	10.2	10.0	9.8	9.6	9.4	9.2	9.0	8.9	8.7
	6	10.1	9.9	9.7	9.5	9.4	9.2	9.0	8.8	8.6	8.5
	7	9.9	9.7	9.5	9.3	9.1	8.9	8.8	8.6	8.4	8.2
	8	9.6	9.4	9.3	9.1	8.9	8.7	8.6	8.4	8.2	8.0
	9	9.4	9.2	9.0	8.9	8.7	8.5	8.3	8.2	8.0	7.8
	10	9.2	9.0	8.8	8.7	8.5	8.3	8.1	8.0	7.8	7.7
	11	9.0	8.8	8.6	8.5	8.3	8.1	8.0	7.8	7.6	7.5
	12	8.8	8.6	8.4	8.3	8.1	7.9	7.8	7.6	7.5	7.3
	13	8.6	8.4	8.2	8.1	7.9	7.8	7.6	7.5	7.3	7.2
	14	8.4	8.2	8.1	7.9	7.7	7.6	7.4	7.3	7.1	7.0
	15	8.2	8.0	7.9	7.7	7.6	7.4	7.3	7.1	7.0	6.8
	16	8.0	7.9	7.7	7.6	7.4	7.3	7.1	7.0	6.8	6.7
	17	7.9	7.7	7.6	7.4	7.3	7.1	7.0	6.8	6.7	6.6
	18	7.7	7.5	7.4	7.3	7.1	7.0	6.8	6.7	6.6	6.4
	19	7.5	7.4	7.2	7.1	7.0	6.8	6.7	6.6	6.4	6.3
	20	7.4	7.2	7.1	7.0	6.8	6.7	6.6	6.4	6.3	6.2
	21	7.2	7.1	7.0	6.8	6.7	6.6	6.4	6.3	6.2	6.0
	22	7.1	7.0	6.8	6.7	6.6	6.4	6.3	6.2	6.1	5.9
	23	7.0	6.8	6.7	6.6	6.4	6.3	6.2	6.1	5.9	5.8
	24	6.8	6.7	6.6	6.4	6.3	6.2	6.1	5.9	5.8	5.7

	25	6.7	6.6	6.5	6.3	6.2	6.1	6.0	5.8	5.7	5.6
	26	6.6	6.5	6.3	6.2	6.1	6.0	5.8	5.7	5.6	5.5
	27	6.5	6.3	6.2	6.1	6.0	5.9	5.7	5.6	5.5	5.4
	28	6.4	6.2	6.1	6.0	5.9	5.8	5.6	5.5	5.4	5.3
	29	6.2	6.1	6.0	5.9	5.8	5.7	5.5	5.4	5.3	5.2
	30	6.1	6.0	5.9	5.8	5.7	5.6	5.4	5.3	5.2	5.1

[20.6.4.900 NMAC - Rp 20 NMAC 6.1.3100, 10-12-00; A, 10-11-02; A, 05-23-05; A, 07-17-05]

20.6.4.901 PUBLICATION REFERENCES: These documents are intended as guidance and are available for public review during regular business hours at the offices of the surface water quality bureau and the New Mexico environment department public library. Copies of these documents have also been filed with the New Mexico state records center in order to provide greater access to this information.

A. American public health association. 1992. *Standard methods for the examination of water and wastewater, 18th Edition.* Washington, D.C. 1048 p.

B. American public health association. 1995. *Standard methods for the examination of water and wastewater, 19th Edition.* Washington, D.C. 1090 p.

C. American public health association. 1998. *Standard methods for the examination of water and wastewater, 20th Edition.* Washington, D.C. 1112 p.

D. United States geological survey. 1987. *Methods for determination of inorganic substances in water and fluvial sediments, techniques of water-resource investigations of the United States geological survey.* Washington, D.C. 80 p.

E. United States geological survey. 1987. *Methods for the determination of organic substances in water and fluvial sediments, techniques of water-resource investigations of the U.S. geological survey.* Washington, D.C. 80 p.

F. United States environmental protection agency. 1974. *Methods for chemical analysis of water and wastes.* National environmental research center, Cincinnati, Ohio. (EPA-625-/6-74-003). 298 p.

G. New Mexico water quality control commission. 2003. *(208) state of New Mexico water quality management plan*. Santa Fe, New Mexico. 85 p.

H. Colorado river basin salinity control forum. 2002. *2002 Review, water quality standards for salinity, Colorado river system.* Phoenix, Arizona. 176 p.

I. United States environmental protection agency. 2002. *Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms.* Office of research and development, Washington, D.C. (5th Ed., EPA 821-R-02-012). 293 p. http://www.epa.gov/ost/WET/disk2/atx.pdf

J. United States environmental protection agency. 1989. *Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms.* Environmental monitoring systems laboratory, Cincinnati, Ohio. (2nd Ed., EPA 600/4-89/001). 250 p.

K. Ambient-induced mixing, in United States environmental protection agency. 1991. *Technical support document for water quality-based toxics control*. Office of water, Washington, D.C. (EPA/505/2-90-001). 2 p.

L. United States environmental protection agency. 1983. *Technical support manual: waterbody surveys and assessments for conducting use attainability analyses*. Office of water, regulations and standards, Washington, D.C. 251 p. http://www.epa.gov/OST/library/wqstandards/uaavol123.pdf

M. United States environmental protection agency. 1984. *Technical support manual: waterbody surveys and assessments for conducting use attainability analyses, volume III: lake systems*. Office of water, regulations and standards, Washington, D.C. 208 p. http://www.epa.gov/OST/library/wqstandards/uaavol123.pdf

[20.6.4.901 NMAC - Rp 20 NMAC 6.1.4000, 10-12-00; A, 05-23-05]

HISTORY of 20.6.4 NMAC:

Pre-NMAC History:

Material in the part was derived from that previously filed with the commission of public records - state records center and archives:

WQC 67-1, Water Quality Standards, filed 7-17-67, effective 8-18-67

WQC 67-1, Amendment Nos. 1-6, filed 3-21-68, effective 4-22-68

WQC 67-1, Amendment No. 7, filed 2-27-69, effective 3-30-69

WQC 67-1, Amendment No. 8, filed 7-14-69, effective 8-15-69

WQC 70-1, Water Quality Standards for Intrastate Waters and Tributaries to Interstate Streams, filed July 17, 1970;

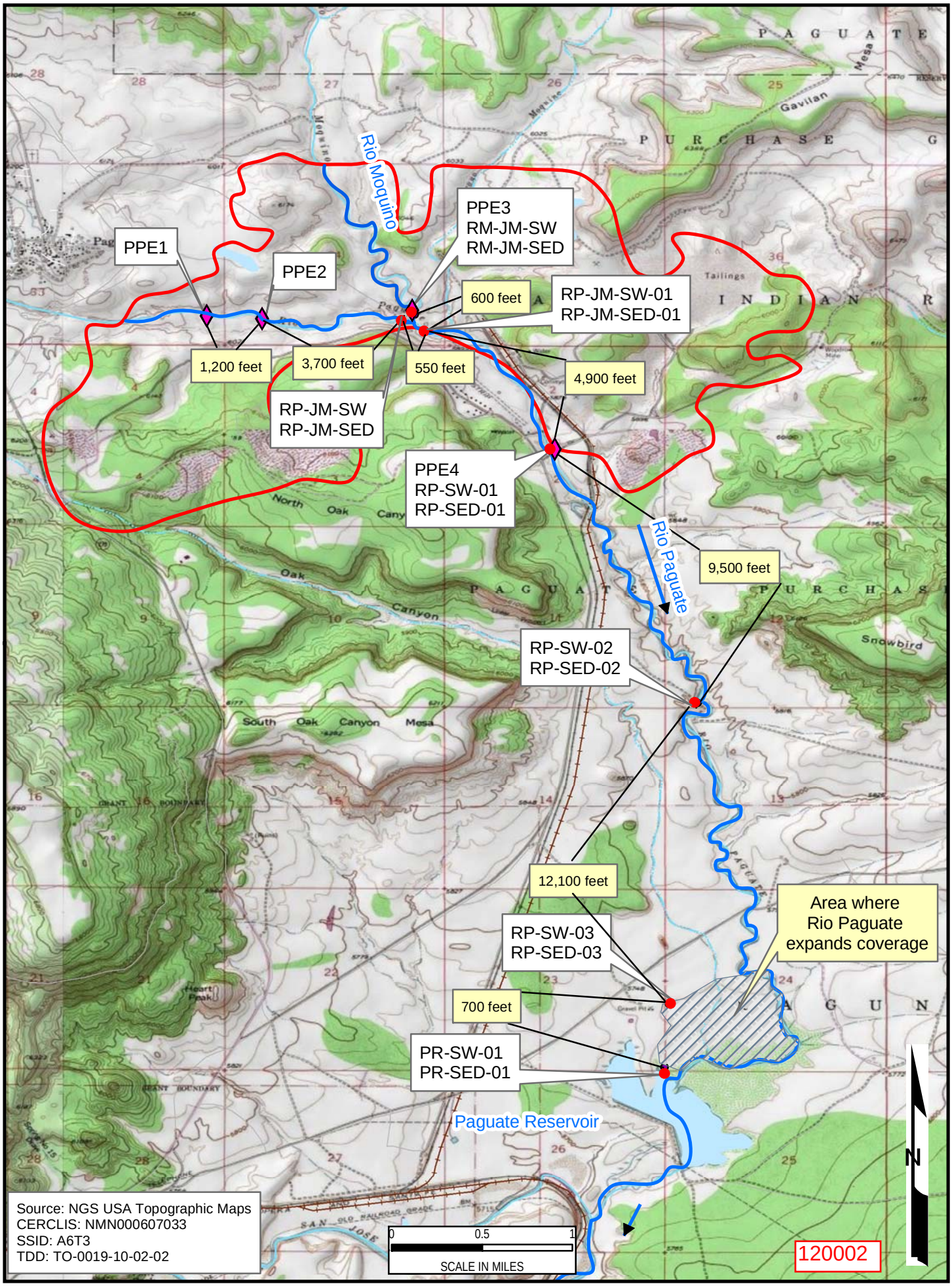
WQC 67-1, Amendment Nos. 9 and 10, filed 2-12-71, effective 3-15-71
WQC 67-1, Amendment No. 11, filed 3-4-71, effective 4-5-71
WQC 73-1, New Mexico Water Quality Standards, filed 9-17-73, effective 10-23-73
WQC 73-1, Amendment Nos. 1 and 2, filed 10-3-75, effective 11-4-75
WQC 73-1, Amendment No. 3, filed 1-19-76, effective 2-14-76
WQC 77-2, Amended Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 2-24-77, effective 3-11-77
WQC 77-2, Amendment No. 1, filed 3-23-78, effective 4-24-78
WQC 77-2, Amendment No. 2, filed 6-12-79, effective 7-13-79
WQCC 80-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 8-28-80, effective 9-28-80
WQCC 81-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 5-5-81, effective 6-4-81
WQCC 81-1, Amendment No. 1, filed 5-19-82, effective 6-18-82
WQCC 81-1, Amendment No. 2, filed 6-24-82, effective 7-26-82
WQCC 85-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 1-16-85, effective 2-15-85
WQCC 85-1, Amendment No. 1, filed 8-28-87, effective 9-28-87
WQCC 88-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 3-24-88, effective 4-25-88
WQCC 91-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 5-29-91, effective 6-29-91
WQCC 91-1, Amendment No. 1, filed 10-11-91, effective 11-12-91

History of the Repealed Material:
WQC 67-1, Water Quality Standards, - Superseded, 10-23-73
WQC 73-1, New Mexico Water Quality Standards, - Superseded, 3-11-77
WQC 77-2, Amended Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 9-28-80
WQCC 80-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 6-4-81
WQCC 81-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 2-15-85
WQCC 85-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 4-25-88
WQCC 88-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 6-29-91
WQCC 91-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 1-23-95
20 NMAC 6.1, Standards for Interstate and Intrastate Streams, - Repealed, 2-23-00
20 NMAC 6.1, Standards for Interstate and Intrastate Surface Waters, - Repealed, 10-12-00

PROJECT NOTE

TO:	Project File
SUBJECT:	Jackpile-Paguate Uranium Mine Paguate, Cibola County, New Mexico CERCLIS ID No. NMN00607033
TASK DESCRIPTION:	calculating distance from the PPEs to Level II samples RM-JM-SW, RP-JM-SW, RP-JM-01, RP-SW-01, RP-SW-02, RP-SW-03, PR-SW-01
W.O. NO.:	20406.012.019.0514.01
DATE:	March 11, 2010 (updated October 18, 2011)
PREPARED BY:	Michelle Brown, Weston Solutions, Inc.
TITLE:	Senior Project Leader

WESTON utilized the Environmental Systems Research Institute (ESRI) ArcView GIS software version 9.2 to measure the distance between PPE 1 through PPE 4 and samples RM-JM-SW/SED, RP-JM-SW/SED, RP-JM-SW/SED-01, RP-SW/SED-01, RP-SW/SED-02, RP-SW/SED-03, and PR-SW/SED-01. The PPE1 was plotted in Rio Paguate at the closest point of entry from the South Paguate Pit. PPE2 was plotted on the Rio pagaute at the closest point of entry from the North Paguate Pit. PPE3 was plotted on the Rio Moquino at the closest point of entry from Waste Dump V. PPE4 was plotted on the Rio Paguate at the closest point of entry from the Jackpile Pit. The data on the sample locations was gathered using Global Positioning System (GPS) coordinates collected in the field using a Trimble® GeoXT™ Handheld computer. See attached map for calculated distances.



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JACKPILE-PAGUATE URANIUM MINE
RECORD OF DECISION
COMPLIANCE ASSESSMENT

September 2007

Prepared for:
Pueblo of Laguna

Prepared by:
OA Systems Corporation

Table of Contents

Section	Title	Page
I	BACKGROUND AND OVERVIEW	1
II	RECORD OF DECISION REQUIREMENTS	1
III	OAS APPROACH	3
IV	ROD COMPLIANCE	5
	1. PIT BOTTOMS	6
	A. Backfill Levels	6
	1. Pits will remain as closed basins	6
	2. Groundwater recovery level monitoring program	7
	B. Backfill Materials	9
	C Stabilization	10
	1. Sloping	10
	2. Pit Berms and Retention Ponds	11
	D. Post-Reclamation Access	11
	2. PIT HIGHWALLS	13
	A. Jackpile Pit Highwall	13
	B. North Paguate Pit Highwall	13
	C. South Paguate Pit Highwall	13
	3. WASTE DUMPS	15
	a. Waste dumps H and J	15
	b. Dump slopes reduced to 3:1	15
	c. Dumps with Jackpile Sandstone	16
	c.(1) Shale Cover	17
	c.(2) Topsoil	18
	d. Berms installed to control erosion	20
	e. Additional surface treatment	21
	4. PROTORE STOCKPILES	21
	5. SITE STABILITY AND DRAINAGE	22

Section	Title	Page
	A. Stream Stability	22
	1. Rio Paguate	22
	2. Rio Moquino	23
	3. Concrete drop structure across Rio Moquino	24
	B. Arroyo Headcutting	25
	C. Blocked Drainages	25
	1. Waste dump J & protore stockpiles SP-17BC & SP-6-B	25
	2. Blocked drainages north of FD-I and F dumps	26
6.	SURFACE FACILITIES/STRUCTURES	27
	A. Lease No. 1	27
	B. Lease No. 4	28
	C. Access Routes	29
	D. Water Wells	30
	E. Rail Spur	30
7.	DRILL HOLES	31
8.	UNDERGROUND MODIFICATIONS	31
	A. Ventilation Holes	31
	B. Adits and Declines	32
9.	REVEGETATION METHODS	33
	A. Top Dressing	33
	B. Surface Preparation	34
	C. Seeding and Seed Mixtures	34
	D. Revegetation Success	35
10.	MONITORING	39
	a. Meteorologic	40
	b. Air Particulates	40
	c. Ambient Radon	42
	d. Radon Daughter Levels	43
	e. Radon Exhalation	43

Section	Title	Page
	f. Gamma Survey	44
	g. Soil	46
	h. Radionuclide and Heavy Metal Uptake into Vegetation	48
	i. Water Quality	50
	11. SECURITY	67
	12. RECLAMATION COMPLETION	68
	13. POST-RECLAMATION LAND USES	68
V	CONCLUSIONS AND RECOMMENDATIONS	69

TABLES

		Page
Table 1	Monitor Well Survey Information	7
Table 2	Groundwater Elevations in Pits	8
Table 3	Shale Layer for Radon Cap, Field Verification Depths	18
Table 4	Top Soil Layer, Field Verification Depths	19
Table 5	Areas with Chronic Erosion Problems	21
Table 6	Movement of Contaminated Soils & Fill Material	23
Table 7	Movement of Waste and Protore Piles Along the Rio Moquino	24
Table 8	Lease No. 1 - Facilities Structures Status	27
Table 9	Lease No. 4 - Facilities Structures Status	29
Table 10	New Shops - Facilities Structures Status	29
Table 11	Access Routes Status	30
Table 12	Water Wells Status	30
Table 13	Adits and Declines Status	32
Table 14	Revegetation Success Sampling Requirements Comparison	36
Table 15	Meteorologic Monitoring Requirements Comparison	40
Table 16	Air Particulate Monitoring Requirements Comparison	41
Table 17	Radon Gas Monitoring Requirements Comparison	42
Table 18	Radon Exhalation Monitoring Requirements Comparison	43
Table 19	Gamma Radiation Monitoring Requirements Comparison	44

Table 20 Soils Testing Requirements Comparison 46
Table 21 Monitoring Requirements for Radionuclide and Heavy Metal Uptake into Vegetation Comparison 48
Table 22 Summary of Results of the Heavy Metal and Radionuclide Vegetation Uptake Monitoring for the Jackpile Reclamation Project 49
Table 23 Groundwater Monitoring Points 51
Table 24 Surface Water Monitoring Points 53
Table 25 Groundwater Parameters 53
Table 26 Surface Water Parameters 55
Table 27 Water Quality Data Condition 57
Table 28 2005 Groundwater Quality (Major Cation and Anion) Summary 60
Table 29 Gross Alpha Exceedances of the MCL = 15 pCi/L 62
Table 30 Total Uranium Exceedances of the MCL = 0.03 mg/L 62
Table 31 Salinity Hazard (USDA) 64
Table 32 Subsidence Monitoring Requirements Comparison 66
Table 33 Blast Monitoring Requirements Comparison 67

APPENDICES

Appendix A Comparative Tables of Contractor Work Breakout Schedules and Work Activities
Table A-1 ROD Requirements Versus Likely Data Sources
Table A-2 Comparative Table to Identify Work Areas to EIS Designated Areas
Table A-3 Matrix Relating the Work Units to the ROD Areas
Table A-4 Matrix Tracking the Work Unit Progress
Appendix B Photographic Documentation
Appendix C Jackpile-Paguate Uranium Mine Site Maps (on CD-ROM)
Exhibit 1 2003 Aerial Photograph – With Site Features of the Jackpile-Paguate Uranium Mine
Exhibit 2 1995 Topographic Base Map – With Site Features of the Jackpile-Paguate Uranium Mine
Appendix D Analysis and Review of Re-vegetation, Cedar Creek Vegetation Survey, Gamma Rad-Radon Gas, Soils and Uptake, Water Quality and Water Quality Addendum (Monitoring Results, Water Quality and Water Quality Addendum also on CD-ROM)
Appendix E Aerial Photographs - Jackpile-Paguate Uranium Mine, 1989 – 2003 (on DVD-ROM)

SURFACE WATER RT (Railroad Tressel)

	Analyte	Units	April 19,2007	June 6, 2006	May 17,2005	May 17, 2004	May 20, 2003	May 10, 2002	May 15, 2001	May 2, 2000	April 21, 1999	May 1, 1998	June 19, 1997
Field Measurements	sample temperature @	deg C		17.2	12.9	18.7	17.5						
	Conductivity	umhos/cm	1500	1930	1720	2506	2700	2500	2020	1,800	3230	1800	1656
	pH	units	8.4	8.46	8.32	8.2	8.2	8.3	8.2	8.8	8.4	8.4	8.4
Major Cations and Anions	Total Dissolved Solids	mg/L	1200	1500	658	2370	2180	2230	1850	1,390	2940	1440	1220
	Alkalinity, Bicarbonate	mg/L	260	239	311	288	252	308	241	190	436	225	207
	Alkalinity, Carbonate	mg/L	< 5	6	< 2	< 2	< 2	< 2	< 2	21.8	1.9	< 2	4.1
	Alkalinity, Total	mg/L	260	ND	311	288	252	308	241	212	438	225	211.1
	Chloride	mg/L	11	17.3	14.7	26.9	25	28	20.4	16.6	37.2	16.6	16.5
	Sulfate	pCi/L	630	ND	619	1280	1280	1240	850	724	1810	784	671
	Calcium, dissolved	mg/L	120	132	116	162	196	182	198	127	208	138	110
	Magnesium, dissolved	mg/L	79	121	83.5	155	162	171	132	103	221	112	83.9
	Potassium, dissolved	mg/L	7.2	9.47	6.69	9.2	7.63	9.44	9.8	7.91	11.2	7.2	7.1
	Sodium, dissolved	mg/L	110	170	130	214	219	264	199	182	334	155	128
	Silica	mg/L	33	10.9	27.6							11.9	16.8
	Silica, as SiO2	mg/L	NA	23.3		14.5	17.3	10.3	20.3	29.5	18		
Nutrients	Nitrate, as N	mg/L	0.095B	< 0.05	< 0.05	0.7	0.53	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	0.5
	Nitrite, as N	mg/L	0.082B	< 0.05	0.299	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1
	Orthophosphate, as P	mg/L	< 0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5
Trace Metals	Arsenic, dissolved	mg/L	0.0016	0.0016	0.0013	0.0012	0.0021	0.0012	0.0012	0.0016	< 0.001	< 0.001	< 0.001
	Barium, dissolved	mg/L	0.04	0.028	0.0375	0.0344	0.0459	0.0376	0.031	0.0366	0.02	0.03	0.03
	Cadmium, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Chromium, dissolved	mg/L	0.002	< 0.001	0.0011	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Cyanide, Total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Fluoride	mg/L	0.35	0.295	0.334	0.6	1.01	0.56	< 0.05	0.7	0.7	0.6	0.5
	Lead, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Lead-210	pCi/L	1.1		-0.88+/-0.34	-0.020+/-0.2800	-0.03+/-0.16	0.06+/-0.24	1.23+/-0.23	17.16+/-0.26	2.21+/-0.26	ND	0.26
	Manganese, dissolved	mg/L	0.094	0.0019	0.0259	< 0.01	10.7	0.129	0.0264	0.0104	0.02	0.037	0.026
	Mercury	mg/L	< 0.0002	< 0.2	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
	Molybdenum, dissolved	mg/L	0.0025	< 0.005	< 0.005	< 0.005	0.0038	0.0036	0.0034	0.0031	0.005	< 0.005	< 0.005
	Selenium, dissolved	mg/L	0.0016	< 0.005	< 0.005	< 0.005	0.0026	0.004	0.0039	0.0045	0.007	< 0.005	< 0.005
	Silver, dissolved	mg/L	< 0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 5.00E-04	< 0.0005	< 0.0005	< 0.0005
	Vanadium, dissolved	mg/L	0.0022	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001
	Zinc, dissolvec	mg/L	< 0.001	< 0.005	< 0.001	0.005	0.012	< 0.005	0.013	0.008	< 0.005	< 0.005	< 0.005
Radiation	Gross Alpha	pCi/L	37.591		37.9+/-4.02	82.590+/-8.423	202.04+/-9.07	214.33+/-8.35	50.49+/-4.62	38.11+/-3.26	213.41+/-9.32	39.43	58.81
	Gross Beta	pCi/L	13.018		-125.96+/-2.87	39.710+/-6.064	68.83+/-4.58	101.83+/-4.31	75.03+/-3.58	41.59+/-2.49	108.58+/-5.71	36.97	56.65
	Polonium 210	pCi/L	0.031		0.310+/-0.0982	0.041+/-0.04	0.08+/-0.08	0.09+/-0.05	0.27+/-0.17	0.06+/-0.05	0.08+/-0.16	0.25	0.05
	Radium-226	pCi/L	0.328			0.250+/-0.5400	0.45+/-0.13	0.74+/-0.18	0.48+/-0.16	0.32+/-0.15	0.78+/-0.36	1.11	2.46
	Total Uranium (KPA)	mg/L	47.169		0.083+/-0.0058	0.515+/-0.016	544.14+/-33.19	0.16+/-0.005	0.08+/-0.004	0.11+/-0.0046	90.85+/-0.68	27.47	21.8

1997 Data: "E" - Analyte concentration (result) is an estimated value or exceeds analysis calibration range
1997 Comments: Samples analyzed for ortho-phosphate were received outside of EPA recommended holding time & the results were estimated.
Total Phosphorus was performed on the samples. The ortho-phosphate content will not be greater than the total phosphorus result.

Light blue = Exceedances of MCL concentrations
Light gray = Exceedances of Secondary Standards

National Maximum Contaminate Levels (USEPA 2002)

Inorganic Chemical	Standard
Arsenic	0.01 mg/L
Barium	2 mg/L
Cadmium	0.005 mg/L
Chromium (total)	0.1 mg/L
Copper	Action Level = 1.3
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4 mg/L
Lead	0.015 mg/L
Mercury (inorganic)	0.002 mg/L
Nitrate (measured as Nitrogen)	10 mg/L
Nitrite (measured as Nitrogen)	1 mg/L
Selenium	0.05 mg/L
Alpha particles	15 (pCi/L)
Beta particles and photon emitters	4 millirems/yr
Radium 226 & 228 (combined)	5 pCi/L
Uranium	30 ug/L

National Secondary Drinking Water Standards (USEPA 2002)

Contaminant	Standard
Aluminum	0.02 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor #
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Zinc	5 mg/L

Salinity Hazard (USDA)

Salinity	Conductivity (umhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	< 250	< 200
Medium salinity, detrimental effects to sensitive crops	250-750	200-500
High Salinity, adverse effects on many crops	750-2250	500-1500
Very high salinity, suitable only for salt tolerant plants	2250-5000	1500-3000

SURFACE WATER RT

	Analyte	Units	Number	Mean	Maximum	Minimum	Median
Field Measurements	sample temperature @	deg C					
	Conductivity	umhos/cm	11	2,123	3,230	1,500	1,930
	pH	units	11	8.338	8.5	8.2	8.36
Major Cations and Anions	Total Dissolved Solids	mg/L	11	1777.8	2940	658.00	1675
	Alkalinity, Bicarbonate	mg/L	11	269.7	436	190.00	246.5
	Alkalinity, Carbonate	mg/L	11	4.58	21.8	1.90	2
	Alkalinity, Total	mg/L	10	276.233333	438	211.1	252
	Chloride	mg/L	11	21.92	37.2	14.7	18.85
	Sulfate	mg/L	10	1029	1810	619	850
	Calcium, dissolved	mg/L	11	156.9	208	110.0	150.0
	Magnesium, dissolved	mg/L	11	134.4	221	83.5	126.5
	Potassium, dissolved	mg/L	11	8.6	11.2	6.7	8.6
	Sodium, dissolved	mg/L	11	199.5	334	128.0	190.5
	Silica	mg/L	5	16.8	33	10.9	14.4
	Silica, as SiO2	mg/L	7	19.03	29.5	10.3	18
Nutrients	Nitrate, as N	mg/L	10	0.22	0.7	0.05	0.10
	Nitrite, as N	mg/L	10	0.0949	0.299	0.05	0.075
	Orthophosphate, as P	mg/L	11	0.23	0.5	0.05	0.05
Trace Metals	Arsenic, dissolved	mg/L	11	0.00132	0.0021	0.001	0.0012
	Barium, dissolved	mg/L	11	0.0331	0.0459	0.02	0.0327
	Cadmium, dissolved	mg/L	11	0.0005	0.001	0.0005	0.0005
	Chromium, disssolved	mg/L	11	0.00101	0.002	0.001	0.001
	Cyanide, Total	mg/L	11	0.01	0.01	0.01	0.01
	Fluoride	mg/L	11	0.5349	1.01	0.05	0.58
	Lead, dissolved	mg/L	11	0.0005	0.001	0.0005	0.0005
	Lead-210	pCi/L	2	0.26	1.1	0.26	0.26
	Manganese, dissolved	mg/L	11	1.09866	10.7	0.0019	0.02595
	Mercury	mg/L	11	0.0202	0.2	0.0002	0.0002
	Molybdenum, dissolved	mg/L	11	0.004	0.005	0.003	0.005
	Selenium, dissolved	mg/L	11	0.0047	0.007	0.0026	0.0050
	Silver, dissolved	mg/L	11	0.0005	0.005	0.0005	0.0005
	Vanadium, dissolved	mg/L	11	0.0012	0.0022	0.001	0.001
	Zinc, dissolvec	mg/L	11	0.0064	0.013	0.001	0.005
Radiation	Gross Alpha	pCi/L					
	Gross Beta	pCi/L					
	Polonium 210	pCi/L					
	Radium-226	pCi/L					
	Total Uranium	mg/L					

SURFACE WATER LRM (Lower Rio Moquino)

	Analyte	Units	April 19,2007	June 6, 2006	May 17,2005	May 17, 2004	May 20, 2003	May 10, 2002	May 15, 2001	May 2, 2000	April 21, 1999	May 1, 1998	June 19, 1997
Field Measurements	sample temperature @	deg C		16.5	10.3	18.5	14.6						
	Conductivity	umhos/cm	2200	826	773	2480	2610	3800	2150	610	3010	2600	1300
	pH	units	8.2	8.23	8.35	8.2	8.1	8.1	8.2	8.5	8.2	8.2	8.4
Major Cations and Anions	Total Dissolved Solids	mg/L	1800	571	553	2400	1570	3480	2070	411	2710	1970	930
	Alkalinity, Bicarbonate	mg/L	240	227	265	286	222	289	200	181	270	246	300
	Alkalinity, Carbonate	mg/L	< 5	< 2	< 2	< 2	< 2	< 2	< 2	15.8	< 2	< 2	< 2
	Alkalinity, Total	mg/L	240	ND	265	286	222	289	200	197	270	246	300
	Chloride	mg/L	16	6.3	6.62	22.9	15.4	35.6	20.6	7.5	28.7	19.8	16.2
	Sulfate	mg/L	1100	ND	197	1300	814	2020	995	118	1640	1160	427
	Calcium, dissolved	mg/L	150	87.9	74.8	160	167	272	161	73	196	174	119
	Magnesium, dissolved	mg/L	130	37.2	30.2	151	100	258	144	34	152	136	68.6
	Potassium, dissolved	mg/L	11	5.45	5.15	8.6	6.57	10.2	9.7	5.8	8.7	8.7	7.7
	Sodium, dissolved	mg/L	210	39.3	33.2	225	130	442	244	51.6	214	222	89.6
	Silica	mg/L	21	16								8	15.2
	Silica, as SiO2	mg/L	NA	34.2	37	14.1	21.6	11.3	14.5	40.6	15.2		
Nutrients	Nitrate, as N	mg/L	0.096B	< 0.05	< 0.05	< 0.05	0.53	< 0.05	< 0.05	1	0.3	< 0.05	0.2
	Nitrite, as N	mg/L	0.082B	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	0.2
	Orthophosphate, as P	mg/L	< 0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5
Trace Metals	Arsenic, dissolved	mg/L	0.0013	0.0022	< 0.001	0.0011	0.0021	0.0012	0.0011	0.0019	< 0.001	< 0.001	< 0.001
	Barium, dissolved	mg/L	0.039	0.0531	0.042	0.0276	0.0597	0.0228	0.0292	0.0407	0.03	0.03	0.06
	Cadmium, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 5.00E-04	< 0.0005	< 0.0005	< 5.00E-04	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Chromium, dissolved	mg/L	0.0017	< 0.001	< 0.001	< 1.00E-03	< 0.001	< 0.001	< 1.00E-03	< 0.001	< 0.001	< 0.001	< 0.001
	Cyanide, Total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Fluoride	mg/L	0.55	0.27	0.212	0.61	0.83	0.85	0.5	< 0.5	0.7	0.7	0.5
	Lead, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 5.00E-04	< 0.0005	0.0005	< 5.00E-04	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Lead-210	pCi/L	-1.3		-032+/-0.38	0.050+/-0.2700	-0.46+/-0.16	0.65+/-0.30	1.09+/-0.23	-0.75+/-0.18	ND	ND	3.7
	Manganese, dissolved	mg/L	0.13	0.0089	0.0396	0.02	0.0634	0.06	0.0293	0.0245	0.08	0.062	0.127
	Mercury	mg/L	< 0.0002	< 0.2	< 0.0005	< 2.00E-04	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
	Molybdenum, dissolved	mg/L	0.0048	< 0.005	0.0058	< 0.005	0.003	0.0043	0.0032	0.0019	0.004	< 0.005	< 0.005
	Selenium, dissolved	mg/L	< 0.005	< 0.005	< 0.005	0.0051	0.0026	0.0099	0.0038	0.0013	< 0.005	< 0.005	< 0.005
	Silver, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 5.00E-04	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.01	< 0.0005	< 0.0005
	Vanadium, dissolved	mg/L	0.0012	0.0027	< 0.001	< 1.00E-03	< 0.001	< 0.001	< 0.001	0.003	< 0.001	< 0.001	< 0.001
	Zinc, dissolvec	mg/L	< 0.001	< 0.005	0.0085	0.009	< 0.005	< 0.005	0.011	0.006	< 0.005	< 0.005	< 0.005
Radiation	Gross Alpha	pCi/L	16.622		5.24+/-4.75	28.680+/-6.034	25.65+/-3.59	49.38+/-6.17	10.24+/-2.87	9.76+/-1.06	43.82+/-3.92	40.52	53.05
	Gross Beta	pCi/L	8.148		2.00+/-4.22	2.037+/-6.895	19.73+/-2.96	49.29+/-4.77	19.31+/-3.08	13.63+/-0.90	19.01+/-3.37	18.48	44.5
	Polonium 210	pCi/L	0.19		0.358+/-0.1057	-0.149+/-0.03	0.01+/-0.03	0.02+/-0.02	0.08+/-0.07	0.025+/-0.019	0.09+/-0.05	0.34	0.1
	Radium-226	pCi/L	0.49			0.170+/-0.4000	0.69+/-0.13	0.25+/-0.12	0.27+/-0.11	0.34+/-0.14	0.66+/-0.35	0.87	2.23
	Total Uranium (KPA)	mg/L	24.391		0.041+/-0.0031	0.176+/-0.005	234.95+/-24.51	0.07+/-0.004	0.04+/-0.003	0.03+/-0.0023	28.12+/-0.4	23.49	21.06

1997 Data: "E" - Analyte concentration (result) is an estimated value or exceeds analysis calibration range
1997 Comments: Samples analyzed for ortho-phosphate were received outside of EPA recommended holding time & the results were estimated.
Total Phosphorus was performed on the samples. The ortho-phosphate content will not be greater than the total phosphorus result.

Light blue = Exceedances of MCL concentrations
Light gray = Exceedances of Secondary Standards

National Maximum Contaminate Levels (USEPA 2002)

Inorganic Chemical	Standard
Arsenic	0.01 mg/L
Barium	2 mg/L
Cadmium	0.005 mg/L
Chromium (total)	0.1 mg/L
Copper	Action Level = 1.3
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4 mg/L
Lead	0.015 mg/L
Mercury (inorganic)	0.002 mg/L
Nitrate (measured as Nitrogen)	10 mg/L
Nitrite (measured as Nitrogen)	1 mg/L
Selenium	0.05 mg/L
Alpha particles	15 (pCi/L)
Beta particles and photon emitters	4 millirems/yr
Radium 226 & 228 (combined)	5 pCi/L
Uranium	30 ug/L

National Secondary Drinking Water Standards (USEPA 2002)

Contaminant	Standard
Aluminum	0.02 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor #
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Zinc	5 mg/L

Salinity Hazard (USDA)

Salinity	Conductivity (umhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	< 250	< 200
Medium salinity, detrimental effects to sensitive crops	250-750	200-500
High Salinity, adverse effects on many crops	750-2250	500-1500
Very high salinity, suitable only for salt tolerant plants	2250-5000	1500-3000

SURFACE WATER LRM

	Analyte	Units	Number	Mean	Maximum	Minimum	Median
Field Measurements	sample temperature @	deg C					
	Conductivity	umhos/cm	11	2032.63636	3800	610	2200
	pH	units	11	8.243636364	8.5	8.1	8.2
Major Cations and Anions	Total Dissolved Solids	mg/L	11	1678.63636	3480	411	1800
	Alkalinity, Bicarbonate	mg/L	11	247.818182	300	181	246
	Alkalinity, Carbonate	mg/L	11	3.52727273	15.8	2	2
	Alkalinity, Total	mg/L	10	251.5	300	197	255.5
	Chloride	mg/L	11	17.7836364	35.6	6.3	16.2
	Sulfate	mg/L	10	977.1	2020	118	1047.5
	Calcium, dissolved	mg/L	11	148.609091	272	73	160
	Magnesium, dissolved	mg/L	11	112.818182	258	30.2	130
	Potassium, dissolved	mg/L	11	7.96090909	11	5.15	8.6
	Sodium, dissolved	mg/L	11	172.790909	442	33.2	210
	Silica	mg/L	4	15.05	21	8	15.6
	Silica, as SiO2	mg/L	8	23.5625	40.6	11.3	18.4
Nutrients	Nitrate, as N	mg/L	10	0.233	1	0.05	0.05
	Nitrite, as N	mg/L	10	0.08	0.2	0.05	0.05
	Orthophosphate, as P	mg/L	11	0.25454545	0.5	0.05	0.05
Trace Metals	Arsenic, dissolved	mg/L	11	0.00135455	0.0022	0.001	0.0011
	Barium, dissolved	mg/L	11	0.03945364	0.06	0.0228	0.039
	Cadmium, dissolved	mg/L	11	0.00054545	0.001	0.0005	0.0005
	Chromium, dissolved	mg/L	11	0.00106364	0.0017	0.001	0.001
	Cyanide, Total	mg/L	11	0.01	0.01	0.01	0.01
	Fluoride	mg/L	11	0.56563636	0.85	0.212	0.55
	Lead, dissolved	mg/L	11	0.00054545	0.001	0.0005	0.0005
	Lead-210	pCi/L	2	1.2	3.7	-1.3	1.2
	Manganese, dissolved	mg/L	11	0.05679091	0.127	0.0089	0.06
	Mercury	mg/L	11	0.01839091	0.2	0.0002	0.0002
	Molybdenum, dissolved	mg/L	11	0.00427273	0.0058	0.0019	0.0048
	Selenium, dissolved	mg/L	11	0.00479091	0.0099	0.0013	0.005
	Silver, dissolved	mg/L	11	0.00140909	0.01	0.0005	0.0005
	Vanadium, dissolved	mg/L	11	0.00135455	0.003	0.001	0.001
	Zinc, dissolvec	mg/L	10	0.00595455	0.011	0.001	0.005
Radiation	Gross Alpha	pCi/L					
	Gross Beta	pCi/L					
	Polonium 210	pCi/L					
	Radium-226	pCi/L					
	Total Uranium	mg/L					

SURFACE WATER LRP (Lower Rio Paguate)

	Analyte	Units	April 19,2007	June 6, 2006	May 17,2005	May 17, 2004	May 20, 2003	May 10, 2002	May 15, 2001	May 2, 2000	April 21, 1999	May 1, 1998	June 19, 1997
Field Measurements	sample temperature @	deg C		16	10.3	18.6	15						
	Conductivity	umhos/cm	910	848	773	1230	1420	1210	709	2370	1680	2300	2850
	pH	units	8.4	8.44	8.35	8.2	8	8.1	8.1	8.3	8.2	8.3	8.2
Major Cations and Anions	Total Dissolved Solids	mg/L	680	605	553	1060	1140	868	534	1990	1300	1670	2100
	Alkalinity, Bicarbonate	mg/L	240	226	265	259	195	253	182	222	323	249	231
	Alkalinity, Carbonate	mg/L	< 5	4	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
	Alkalinity, Total	mg/L	240	230	265	259	195	253	182	222	323	249	231
	Chloride	mg/L	7	7.03	6.62	13	11.2	13.2	7.83	19.3	23.9	18	20.9
	Sulfate	mg/L	280	ND	197	434	595	416	200	1060	656	961	1250
	Calcium, dissolved	mg/L	110	87.4	74.8	113	148	173	83.9	172	146	154	182
	Magnesium, dissolved	mg/L	43	39.4	30.2	65.5	76.1	129	34.4	141	99.6	120	147
	Potassium, dissolved	mg/L	6.1	5.52	5.15	6	6.17	7.49	7.1	9.04	7.6	7.7	9
	Sodium, dissolved	mg/L	44	45.7	33.2	68.8	78.3	198	38.2	237	120	178	224
	Silica	mg/L	39	15.9								9.6	8
	Silica, as SiO2	mg/L	NA	34	37	25.9	25.2	26.5	37.4	23.3	23.8		
Nutrients	Nitrate, as N	mg/L	0.096B	< 0.05	< 0.05	0.5	0.53	< 0.05	< 0.05	< 0.1	0.3	< 0.1	< 0.1
	Nitrite, as N	mg/L	0.086B	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1
	Orthophosphate, as P	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5
Trace Metals	Arsenic, dissolved	mg/L	0.0018	0.0022	< 0.001	0.0015	0.002	0.0013	0.0016	0.0011	< 0.001	< 0.001	< 0.001
	Barium, dissolved	mg/L	0.048	0.0495	0.042	0.0552	0.0688	0.046	0.0485	0.0355	0.04	0.03	0.04
	Cadmium, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Chromium, dissolved	mg/L	0.0016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001
	Cyanide, Total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Fluoride	mg/L	0.27	0.285	0.212	< 0.05	0.7	< 0.05	< 0.05	0.8	< 0.05	0.6	0.6
	Lead, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< ND	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Lead-210	pCi/L	0.3		-0.25+/-0.35	-9.320+/-0.2900	-0.50+/-0.15	0.58+/-0.29	3.66+/-0.27	-1.77+/-0.17	ND	4.8	1
	Manganese, dissolved	mg/L	0.048	0.0497	0.0396	0.13	0.0618	0.0809	0.0444	0.0357	0.07	0.083	0.078
	Mercury	mg/L	< 0.0002	< 0.2	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004	< 0.0002	< 0.0002	< 0.0002
	Molybdenum, dissolved	mg/L	0.0016	< 0.005	0.0058	< 0.005	0.002	0.0028	0.0024	0.0036	0.004	< 0.005	< 0.005
	Selenium, dissolved	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	0.001	0.0036	0.0016	0.0054	< 0.005	< 0.005	< 0.005
	Silver, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.02	< 0.0005	< 0.0005
	Vanadium, dissolved	mg/L	0.003	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Zinc, dissolvec	mg/L	0.0035	< 0.005	0.0085	0.01	< 0.005	< 0.005	0.006	0.007	< 0.005	< 0.005	< 0.005
Radiation	Gross Alpha	pCi/L	8.487		2.24+/-1.18	25.920+/-3.797	15.07+/-2.11	32.13+/-2.17	11.49+/-1.32	5.34+/-2.23	106.22+/-4.66	29.82	42.32
	Gross Beta	pCi/L	8.884		10.45+/-1.14	15.770+/-3.212	15.77+/-2.02	32.29+/-1.52	22.92+/-1.37	20.45+/-2.28	48.95+/-2.67	27.68	22.88
	Polonium 210	pCi/L	0.098		0.040+/-0.0356	-0.199+/--0.03	0.11+/-0.09	0.04+/-0.02	0.27+/-0.18	0.03+/-0.03	ND	ND	0.26
	Radium-226	pCi/L	0.341			0.350+/-0.5200	0.30+/-0.12	0.33+/-0.13	1.35+/-0.22	0.21+/-0.10	2.00+/-0.50	ND	1.3
	Total Uranium (KPA)	mg/L	163.251		0.016+/-0.0012	0.202+/-0.006	149.62+/-19.61	0.04+/-0.003	0.03+/-0.003	0.05+/-0.0035	57.93+/-0.53	16.54	10.83

1997 Data: "E" - Analyte concentration (result) is an estimated value or exceeds analysis calibration range
1997 Comments: Samples analyzed for ortho-phosphate were received outside of EPA recommended holding time & the results were estimated.
Total Phosphorus was performed on the samples. The ortho-phosphate content will not be greater than the total phosphorus result.

Light blue = Exceedances of MCL concentrations
Light gray = Exceedances of Secondary Standards

National Maximum Contaminate Levels (USEPA 2002)

Inorganic Chemical	Standard
Arsenic	0.01 mg/L
Barium	2 mg/L
Cadmium	0.005 mg/L
Chromium (total)	0.1 mg/L
Copper	Action Level = 1.3
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4 mg/L
Lead	0.015 mg/L
Mercury (inorganic)	0.002 mg/L
Nitrate (measured as Nitrogen)	10 mg/L
Nitrite (measured as Nitrogen)	1 mg/L
Selenium	0.05 mg/L
Alpha particles	15 (pCi/L)
Beta particles and photon emitters	4 millirems/yr
Radium 226 & 228 (combined)	5 pCi/L
Uranium	30 ug/L

National Secondary Drinking Water Standards (USEPA 2002)

Contaminant	Standard
Aluminum	0.02 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor #
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Zinc	5 mg/L

Salinity Hazard (USDA)

Salinity	Conductivity (umhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	< 250	< 200
Medium salinity, detrimental effects to sensitive crops	250-750	200-500
High Salinity, adverse effects on many crops	750-2250	500-1500
Very high salinity, suitable only for salt tolerant plants	2250-5000	1500-3000

SURFACE WATER LRP

	Analyte	Units	Number	Mean	Maximum	Minimum	Median
Field Measurements	sample temperature @	deg C					
	Conductivity	umhos/cm	11	1481.81818	2850	709	1230
	pH	units	11	8.23545455	8.44	8	8.2
Major Cations and Anions	Total Dissolved Solids	mg/L	11	1136.36364	2100	534	1060
	Alkalinity, Bicarbonate	mg/L	11	240.454545	323	182	240
	Alkalinity, Carbonate	mg/L	11	2.45454545	5	2	2
	Alkalinity, Total	mg/L	11	240.818182	323	182	240
	Chloride	mg/L	11	13.4527273	23.9	6.62	13
	Sulfate	mg/L	10	604.9	1250	197	514.5
	Calcium, dissolved	mg/L	11	131.281818	182	74.8	146
	Magnesium, dissolved	mg/L	11	84.1090909	147	30.2	76.1
	Potassium, dissolved	mg/L	11	6.98818182	9.04	5.15	7.1
	Sodium, dissolved	mg/L	11	115.018182	237	33.2	78.3
	Silica	mg/L	4	18.125	39	8	12.75
	Silica, as SiO2	mg/L	8	29.1375	37.4	23.3	26.2
Nutrients	Nitrate, as N	mg/L	10	0.183	0.53	0.05	0.1
	Nitrite, as N	mg/L	10	0.07	0.1	0.05	0.05
	Orthophosphate, as P	mg/L	11	0.21363636	0.5	0.05	0.05
Trace Metals	Arsenic, dissolved	mg/L	11	0.00140909	0.0022	0.001	0.0013
	Barium, dissolved	mg/L	11	0.04577273	0.0688	0.03	0.046
	Cadmium, dissolved	mg/L	11	0.00054545	0.001	0.0005	0.0005
	Chromium, dissolved	mg/L	11	0.00105455	0.0016	0.001	0.001
	Cyanide, Total	mg/L	11	0.01	0.01	0.01	0.01
	Fluoride	mg/L	11	0.33336364	0.8	0.05	0.27
	Lead, dissolved	mg/L	10	0.00055	0.001	0.0005	0.0005
	Lead-210	pCi/L	3	2.03333333	4.8	0.3	1
	Manganese, dissolved	mg/L	11	0.06555455	0.13	0.0357	0.0618
	Mercury	mg/L	11	0.01840909	0.2	0.0002	0.0002
	Molybdenum, dissolved	mg/L	11	0.00383636	0.0058	0.0016	0.004
	Selenium, dissolved	mg/L	11	0.00423636	0.0054	0.001	0.005
	Silver, dissolved	mg/L	11	0.00231818	0.02	0.0005	0.0005
	Vanadium, dissolved	mg/L	11	0.00127273	0.003	0.001	0.001
	Zinc, dissolvec	mg/L	11	0.00590909	0.01	0.0035	0.005
Radiation	Gross Alpha	pCi/L					
	Gross Beta	pCi/L					
	Polonium 210	pCi/L					
	Radium-226	pCi/L					
	Total Uranium	mg/L					

SURFACE WATER PM (Paguate-Moquino Confluence)

	Analyte	Units	April 19,2007	June 6, 2006	May 17,2005	May 17, 2004	May 20, 2003	May 10, 2002	May 15, 2001	May 2, 2000	April 21, 1999	May 1, 1998	June 19, 1997
Field Measurements	sample temperature @	deg C		16.6	10.3	18.2	14.4						
	Conductivity	umhos/cm	1800	1960	2110	1260	1948	1440	1170	1600	2970	786	2540
	pH	units	8.3	8.4	8.23	8.1	8.1	8.2	8	8.3	8.2	8.5	8.2
Major Cations and Anions	Total Dissolved Solids	mg/L	1400	1620	868	1090	1590	1070	958	1260	2630	528	2130
	Alkalinity, Bicarbonate	mg/L	240	267	288	259	311	255	213	212	304	223	242
	Alkalinity, Carbonate	mg/L	< 5	4	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
	Alkalinity, Total	mg/L	240	ND	288	259	311	255	213	212	304	223	242
	Chloride	mg/L	13	16.1	17.6	12.4	15.6	14.3	11.5	13.7	29	10	21.8
	Sulfate	mg/L	860	ND	892	441	831	535	462	623	1580	196	1270
	Calcium, dissolved	mg/L	130	154	128	124	166	146	119	101	224	80.5	182
	Magnesium, dissolved	mg/L	99	114	101	67.6	100	76.6	65	69	196	41.3	149
	Potassium, dissolved	mg/L	9.6	9.53	7.74	5.9	6.88	6.66	8.1	6.84	9.6	5.6	9
	Sodium, dissolved	mg/L	160	173	183	67.8	131	100	93.6	102	278	48.7	214
	Silica	mg/L	27	13.2								16.3	8.1
	Silica, as SiO2	mg/L	NA	28.2	22.5	30.4	24	25.7	33.4	31.2	16.7		
Nutrients	Nitrate, as N	mg/L	0.093B	< 0.05	< 0.05	< 0.05	0.52	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1
	Nitrite, as N	mg/L	0.082B	< 0.05	0.387	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1
	Orthophosphate, as P	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5
Trace Metals	Arsenic, dissolved	mg/L	0.0016	0.002	< 0.001	0.0017	0.002	0.0014	0.0016	0.0018	< 0.001	< 0.001	< 0.001
	Barium, dissolved	mg/L	0.042	0.0445	0.0337	0.0574	0.059	0.0551	0.054	0.04	0.02	0.04	0.04
	Cadmium, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Chromium, dissolved	mg/L	0.0018	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Cyanide, Total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Fluoride	mg/L	0.00049	0.32	0.491	< 0.05	0.78	< 0.05	< 0.05	0.6	0.7	< 0.05	0.6
	Lead, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Lead-210	pCi/L	-1		-0.28+/-0.32	0.320+/-0.2900	-0.42+/-0.16	0.99+/-0.29	1.77+/-0.23	-0.55+/-0.17	1.88+/-0.26	ND	2.31
	Manganese, dissolved	mg/L	0.019	0.0112	0.052	0.13	0.0604	0.0866	0.0486	0.0407	0.14	0.051	0.128
	Mercury	mg/L	< 0.0002	< 0.2	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
	Molybdenum, dissolved	mg/L	0.0037	< 0.005	< 0.005	< 0.005	0.0027	0.0023	0.0028	0.0025	0.004	< 0.005	< 0.005
	Selenium, dissolved	mg/L	0.0025	< 0.005	< 0.023	< 0.005	0.0027	0.0029	0.0022	0.0028	< 0.005	< 0.005	< 0.005
	Silver, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.01	< 0.0005	< 0.0005
	Vanadium, dissolved	mg/L	0.0019B	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.003	< 0.001	< 0.001	< 0.001
	Zinc, dissolvec	mg/L	0.002B	< 0.005	< 0.001	0.008	0.009	< 0.005	0.009	0.012	< 0.005	< 0.005	< 0.005
Radiation	Gross Alpha	pCi/L	14.201		-21.98+/-2.41	33.030+/-4.836	32.02+/-3.17	39.73+/-2.88	15.64+/-2.08	11.19+/-1.55	94.03+/-6.84	19.07	69.37
	Gross Beta	pCi/L	10.872		4.04+/-2.49	18.630+/-3.710	13.51+/-2.53	36.89+/-1.99	21.95+/-1.70	13.91+/-1.49	53.12+/-4.47	14.25	67.12
	Polonium 210	pCi/L	0.035		0.179+/-0.0748	-0.398+/--0.03	0.04+/-0.05	0.006+/-0.01	0.12+/-0.09	0.008+/-0.015	ND	1.52	0.11
	Radium-226	pCi/L	0.37			0.990+/-0.9000	0.66+/-0.15	0.51+/-0.17	0.76+/-0.22	-0.17+/-0.14	0.60+/-0.30	1.28	1.89
	Total Uranium (KPA)	mg/L	577.196		0.029+/-0.0022	0.211+/-0.007	252.59+/-25.40	0.09+/-0.004	0.06+/-0.004	0.04+/-0.0027	48.60+/-0.48	13.49	23.62

1997 Data: "E" - Analyte concentration (result) is an estimated value or exceeds analysis calibration range
1997 Comments: Samples analyzed for ortho-phosphate were received outside of EPA recommended holding time & the results were estimated.
Total Phosphorus was performed on the samples. The ortho-phosphate content will not be greater than the total phosphorus result.

Light blue = Exceedances of MCL concentrations
Light gray = Exceedances of Secondary Standards

National Maximum Contaminate Levels (USEPA 2002)

Inorganic Chemical	Standard
Arsenic	0.01 mg/L
Barium	2 mg/L
Cadmium	0.005 mg/L
Chromium (total)	0.1 mg/L
Copper	Action Level = 1.3
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4 mg/L
Lead	0.015 mg/L
Mercury (inorganic)	0.002 mg/L
Nitrate (measured as Nitrogen)	10 mg/L
Nitrite (measured as Nitrogen)	1 mg/L
Selenium	0.05 mg/L
Alpha particles	15 (pCi/L)
Beta particles and photon emitters	4 millirems/yr
Radium 226 & 228 (combined)	5 pCi/L
Uranium	30 ug/L

National Secondary Drinking Water Standards (USEPA 2002)

Contaminant	Standard
Aluminum	0.02 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor #
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Zinc	5 mg/L

Salinity Hazard (USDA)

Salinity	Conductivity (umhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	< 250	< 200
Medium salinity, detrimental effects to sensitive crops	250-750	200-500
High Salinity, adverse effects on many crops	750-2250	500-1500
Very high salinity, suitable only for salt tolerant plants	2250-5000	1500-3000

SURFACE WATER PM

	Analyte	Units	Number	Mean	Maximum	Minimum	Median
Field Measurements	sample temperature @	deg C					
	Conductivity	umhos/cm	11	1779.63636	2970	786	1770
	pH	units	11	8.23	8.5	8	8.2
Major Cations and Anions	Total Dissolved Solids	mg/L	11	1376.72727	2630	528	1175
	Alkalinity, Bicarbonate	mg/L	11	255.818182	311	212	257
	Alkalinity, Carbonate	mg/L	11	2.45454545	5	2	2
	Alkalinity, Total	mg/L	10	254.7	311	212	255
	Chloride	mg/L	11	15.9090909	29	10	14.95
	Sulfate	mg/L	10	769	1580	196	623
	Calcium, dissolved	mg/L	11	141.318182	224	80.5	137
	Magnesium, dissolved	mg/L	11	98.0454545	196	41.3	88.3
	Potassium, dissolved	mg/L	11	7.76818182	9.6	5.6	7.31
	Sodium, dissolved	mg/L	11	141.009091	278	48.7	116.5
	Silica	mg/L	4	16.15	27	8.1	13.2
	Silica, as SiO2	mg/L	8	26.5125	33.4	16.7	26.95
Nutrients	Nitrate, as N	mg/L	10	0.117	0.52	0.05	0.075
	Nitrite, as N	mg/L	10	0.1037	0.387	0.05	0.075
	Orthophosphate, as P	mg/L	11	0.21363636	0.5	0.05	0.05
Trace Metals	Arsenic, dissolved	mg/L	11	0.00146364	0.002	0.001	0.0015
	Barium, dissolved	mg/L	11	0.04415455	0.059	0.02	0.04225
	Cadmium, dissolved	mg/L	11	0.00054545	0.001	0.0005	0.0005
	Chromium, dissolved	mg/L	11	0.00107273	0.0018	0.001	0.001
	Cyanide, Total	mg/L	11	0.01	0.01	0.01	0.01
	Fluoride	mg/L	11	0.33559	0.78	0.05	0.4055
	Lead, dissolved	mg/L	11	0.00054545	0.001	0.0005	0.0005
	Lead-210	pCi/L	2	0.655	2.31	2.31	2.31
	Manganese, dissolved	mg/L	11	0.06977273	0.14	0.0112	0.0562
	Mercury	mg/L	11	0.01839091	0.2	0.0002	0.0002
	Molybdenum, dissolved	mg/L	11	0.00390909	0.005	0.0023	0.0045
	Selenium, dissolved	mg/L	11	0.00555455	0.023	0.0022	0.005
	Silver, dissolved	mg/L	11	0.00140909	0.01	0.0005	0.0005
	Vanadium, dissolved	mg/L	10	0.0013	0.003	0.001	0.001
	Zinc, dissolvec	mg/L	10	0.0064	0.012	0.001	0.005
Radiation	Gross Alpha	pCi/L					
	Gross Beta	pCi/L					
	Polonium 210	pCi/L					
	Radium-226	pCi/L					
	Total Uranium	mg/L					

SURFACE WATER URM (Upper Rio Moquino)

	Analyte	Units	April 19,2007	June 6, 2006	May 17,2005	May 17, 2004	May 20, 2003	May 10, 2002	May 15, 2001	May 2, 2000	April 21, 1999	May 1, 1998	June 19, 1997
Field Measurements	sample temperature @	deg C		15.1	11	18.3	15.3						
	Conductivity	umhos/cm	1800	3490	2350	1960	2780	2680	1840	1950	2320	1870	1910
	pH	units	8.3	8.57	8.28	8.4	8.4	8.3	8.1	8.3	8.4	8.2	8.1
Major Cations and Anions	Total Dissolved Solids	mg/L	1500	2910	947	1700	2340	2650	1740	1480	1880	1460	1510
	Alkalinity, Bicarbonate	mg/L	270	315	334	253	309	298	236	213	274	235	224
	Alkalinity, Carbonate	mg/L	< 5	14	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
	Alkalinity, Total	mg/L	270	ND	334	253	309	298	236	213	274	235	224
	Chloride	mg/L	13	36.1	18.8	21.9	28.1	27.8	17.7	14.1	21.6	15.4	14.5
	Sulfate	mg/L	850	ND	1010	865	1300	1500	817	823	1080	892	878
	Calcium, dissolved	mg/L	130	140	134	116	134	192	153	142	154	145	134
	Magnesium, dissolved	mg/L	99	213	117	95.8	138	186	113	97.4	112	96.4	90.5
	Potassium, dissolved	mg/L	11	19.6	9.42	8.4	10	15	9.4	8.41	8.5	7.4	7.6
	Sodium, dissolved	mg/L	190	478	232	153	329	392	210	195	227	173	167
	Silica	mg/L	33	4.18								8.6	9.3
	Silica, as SiO2	mg/L	NA	8.94	10.7	14.3	13.7	13.4	21.6	19.7	15		
Nutrients	Nitrate, as N	mg/L	0.094B	< 0.05	< 0.05	1.29	0.64	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1
	Nitrite, as N	mg/L	0.082B	< 0.05	0.388	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1
	Orthophosphate, as P	mg/L	< 0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5
Trace Metals	Arsenic, dissolved	mg/L	0.0014	0.0018	0.001	0.001	0.0018	0.0012	0.0012	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium, dissolved	mg/L	0.041	0.0378	0.0388	0.035	0.036	0.0489	0.0385	0.038	0.04	0.04	0.03
	Cadmium, dissolved	mg/L	ND	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Chromium, dissolved	mg/L	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Cyanide, Total	mg/L	ND	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Fluoride	mg/L	0.44	0.765	0.594	0.63	1.1	0.68	0.54	0.6	0.6	0.5	0.5
	Lead, dissolved	mg/L	ND	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Lead-210	pCi/L	3		-0.08+/-0.39	-0.160+/-0.2500	-0.52+/-0.16	0.21+/-0.27	1.19+/-0.23	231.29+/-0.72	ND	3.83	1.43
	Manganese, dissolved	mg/L	0.003	0.0089	0.036	< 0.01	0.0018	0.0174	0.0119	0.0029	< 0.01	0.01	< 0.01
	Mercury	mg/L	< 0.0002	< 0.2	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004	< 0.0002	< 0.0002	< 0.0002
	Molybdenum, dissolved	mg/L	0.0037	0.0068	< 0.005	< 0.005	0.0051	0.0048	0.0031	0.0026	0.004	< 0.005	< 0.005
	Selenium, dissolved	mg/L	0.0023	< 0.005	0.025	< 0.005	0.0027	0.0026	0.002	0.0024	0.007	< 0.005	< 0.005
	Silver, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.01	< 0.0005	< 0.0005
	Vanadium, dissolved	mg/L	0.0016	< 0.002	< 0.001	0.001	0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001
	Zinc, dissolvec	mg/L	< 0.001	< 0.005	< 0.001	0.011	0.005	< 0.005	0.006	< 0.005	< 0.005	< 0.005	< 0.005
Radiation	Gross Alpha	pCi/L	6.06		-12.46+/-2.73	5.680+/-3.714	-6.67+/-2.71	20.85+/-3.75	12.90+/-2.91	-0.33+/-1.46	6.78+/-1.95	7.74	35.11
	Gross Beta	pCi/L	11.878		9.34+/-3.67	9.984+/-3.979	4.75+/-3.69	23.28+/-3.35	19.16+/-2.77	9.28+/-1.81	10.96+/-2.71	8.39	12.88
	Polonium 210	pCi/L	0.06		2.439+/-2.7604	1.225+/-0.07	0.04+/-0.05	0.01+/-0.01	0.18+/-0.09	0.038+/-0.025	ND	0.64	0.09
	Radium-226	pCi/L	0.784			0.120+/-0.4300	0.05+/-0.08	0.48+/-0.15	0.35+/-0.12	0.07+/-0.12	ND	ND	1.73
	Total Uranium (KPA)	mg/L	6.476		0.008+/-0.006	1.397+/-0.043	52.89+/-11.93	0.02+/-0.002	0.01+/-0.002	0.0134+/-0.0018	2.30+/-0.10	6.66	1.41

1997 Data: "E" - Analyte concentration (result) is an estimated value or exceeds analysis calibration range
1997 Comments: Samples analyzed for ortho-phosphate were received outside of EPA recommended holding time & the results were estimated.
Total Phosphorus was performed on the samples. The ortho-phosphate content will not be greater than the total phosphorus result.

Light blue = Exceedances of MCL concentrations
Light gray = Exceedances of Secondary Standards

SURFACE WATER URM

	Analyte	Units	Number	Mean	Maximum	Minimum	Median
Field Measurements	sample temperature @	deg C					
	Conductivity	umhos/cm	11	2268.18182	3490	1800	1960
	pH	units	11	8.30454545	8.57	8.1	8.3
Major Cations and Anions	Total Dissolved Solids	mg/L	11	1828.81818	2910	947	1700
	Alkalinity, Bicarbonate	mg/L	11	269.181818	334	213	270
	Alkalinity, Carbonate	mg/L	11	3.36363636	14	2	2
	Alkalinity, Total	mg/L	10	264.6	334	213	261.5
	Chloride	mg/L	11	20.8181818	36.1	13	18.8
	Sulfate	mg/L	10	1001.5	1500	817	885
	Calcium, dissolved	mg/L	11	143.090909	192	116	140
	Magnesium, dissolved	mg/L	11	123.190909	213	90.5	112
	Potassium, dissolved	mg/L	11	10.43	19.6	7.4	9.4
	Sodium, dissolved	mg/L	11	249.636364	478	153	210
	Silica	mg/L	4	13.77	33	4.18	8.95
	Silica, as SiO2	mg/L	8	14.6675	21.6	8.94	14
Nutrients	Nitrate, as N	mg/L	10	0.253	1.29	0.05	0.1
	Nitrite, as N	mg/L	10	0.1038	0.388	0.05	0.075
	Orthophosphate, as P	mg/L	11	0.25454545	0.5	0.05	0.05
Trace Metals	Arsenic, dissolved	mg/L	11	0.00103636	0.0018	0.0005	0.001
	Barium, dissolved	mg/L	11	0.03854545	0.0489	0.03	0.0385
	Cadmium, dissolved	mg/L	10	0.0005	0.0005	0.0005	0.0005
	Chromium, dissolved	mg/L	11	0.00109091	0.002	0.001	0.001
	Cyanide, Total	mg/L	10	0.01	0.01	0.01	0.01
	Fluoride	mg/L	11	0.63172727	1.1	0.44	0.6
	Lead, dissolved	mg/L	10	0.0005	0.0005	0.0005	0.0005
	Lead-210	pCi/L	3	2.75333333	3.83	1.43	3
	Manganese, dissolved	mg/L	11	0.01108182	0.036	0.0018	0.01
	Mercury	mg/L	11	0.01840909	0.2	0.0002	0.0002
	Molybdenum, dissolved	mg/L	11	0.00455455	0.0068	0.0026	0.005
	Selenium, dissolved	mg/L	11	0.00581818	0.025	0.002	0.005
	Silver, dissolved	mg/L	11	0.00140909	0.01	0.0005	0.0005
	Vanadium, dissolved	mg/L	11	0.00114545	0.002	0.001	0.001
	Zinc, dissolvec	mg/L	11	0.00490909	0.011	0.001	0.005
Radiation	Gross Alpha	pCi/L					
	Gross Beta	pCi/L					
	Polonium 210	pCi/L					
	Radium-226	pCi/L					
	Total Uranium	mg/L					

National Maximum Contaminate Levels (USEPA 2002)

Inorganic Chemical	Standard
Arsenic	0.01 mg/L
Barium	2 mg/L
Cadmium	0.005 mg/L
Chromium (total)	0.1 mg/L
Copper	Action Level = 1.3
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4 mg/L
Lead	0.015 mg/L
Mercury (inorganic)	0.002 mg/L
Nitrate (measured as Nitrogen)	10 mg/L
Nitrite (measured as Nitrogen)	1 mg/L
Selenium	0.05 mg/L
Alpha particles	15 (pCi/L)
Beta particles and photon emitters	4 millirems/yr
Radium 226 & 228 (combined)	5 pCi/L
Uranium	30 ug/L

National Secondary Drinking Water Standards (USEPA 2002)

Contaminant	Standard
Aluminum	0.02 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor #
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Zinc	5 mg/L

Salinity Hazard (USDA)

Salinity	Conductivity (umhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	< 250	< 200
Medium salinity, detrimental effects to sensitive crops	250-750	200-500
High Salinity, adverse effects on many crops	750-2250	500-1500
Very high salinity, suitable only for salt tolerant plants	2250-5000	1500-3000

SURFACE WATER URP (Upper Rio Paguate)

	Analyte	Units	April 19,2007	June 6, 2006	May 17,2005	May 17, 2004	May 20, 2003	May 10, 2002	May 15, 2001	May 2, 2000	April 21, 1999	May 1, 1998	June 19, 1997
Field Measurements	sample temperature @	deg C		15.4	10.7	18.4	15.5						
	Conductivity	umhos/cm	830	754	735	1220	1440	1120	498	426	804	578	608
	pH	units	8.2	8.03	8.01	8.1	8	8	7.7	8.3	8.2	8.3	8.2
Major Cations and Anions	Total Dissolved Solids	mg/L	600	532	506	1000	1190	785	362	326	543	388	400
	Alkalinity, Bicarbonate	mg/L	220	218	260	298	316	279	173	183	328	223	216
	Alkalinity, Carbonate	mg/L	< 5	< 2	< 2	< 2	< 2	< 2	< 2	4	< 2	< 2	< 2
	Alkalinity, Total	mg/L	220	ND	260	298	316	279	173	187	328	223	216
	Chloride	mg/L	6.2	5.33	5.78	9.61	9.86	9.61	5.58	6.2	11	7.6	8.8
	Sulfate	mg/L	230	ND	177	482	596	316	84.8	65.4	167	93.8	95.1
	Calcium, dissolved	mg/L	97	85.5	71.2	142	185	140	62.1	59.2	88.2	67.6	67
	Magnesium, dissolved	mg/L	39	30.8	27	55.4	65.1	50.1	21.5	22.3	33.2	26.3	23.7
	Potassium, dissolved	mg/L	5.5	5.68	5.03	5.9	5.86	6.47	5.8	4.73	5.5	4.9	5.5
	Sodium, dissolved	mg/L	37	33.1	28.6	51	209	54.1	24.4	26.1	36.9	30	30.9
	Silica	mg/L	40	25.1								17.6	17.6
	Silica, as SiO2	mg/L	NA	ND	38.9	31.4	32.1	34.4	43.2	46.6	33.2		
Nutrients	Nitrate, as N	mg/L	0.097B	< 0.05	< 0.05	< 0.05	0.53	< 0.05	< 0.05	< 0.1	1	< 0.1	< 0.1
	Nitrite, as N	mg/L	0.084B	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1
	Orthophosphate, as P	mg/L	< 0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5
Trace Metals	Arsenic, dissolved	mg/L	0.0017	0.0022	< 0.0021	0.0016	0.0021	0.0018	0.0017	0.0015	< 0.0021	< 0.0021	< 0.0021
	Barium, dissolved	mg/L	0.048	0.0658	0.0474	0.0793	0.0982	0.0853	0.0574	0.0446	0.06	0.05	0.05
	Cadmium, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Chromium, dissolved	mg/L	0.0014	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.01	< 0.001	< 0.001
	Cyanide, Total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Fluoride	mg/L	0.25	< 0.05	0.201	< 0.05	0.69	< 0.05	< 0.05	0.6	< 0.05	< 0.05	< 0.05
	Lead, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Lead-210	pCi/L	-1		-0.37+/-0.35	-0.570+/-0.2800	-0.25+/-0.17	1.00+/-0.30	1.56+/-0.23	-1.92+/-0.22	< 0.82	1.93	2.93
	Manganese, dissolved	mg/L	0.072	0.0942	0.0904	0.09	0.108	0.146	0.0496	0.0396	0.07	0.146	0.1
	Mercury	mg/L	< 0.0002	< 0.2	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0003	< 0.0002	< 0.0002	< 0.0002
	Molybdenum, dissolved	mg/L	0.0015	< 0.005	< 0.005	< 0.005	0.002	0.0018	0.0018	0.0015	0.002	< 0.005	< 0.005
	Selenium, dissolved	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	0.001	0.0009	< 0.0005	0.0015	< 0.0005	< 0.0005	< 0.0005
	Silver, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.02	< 0.0005	< 0.0005
	Vanadium, dissolved	mg/L	0.0032	0.0022	0.0056	0.001	< 0.001	< 0.001	0.003	0.003	< 0.001	< 0.001	< 0.001
	Zinc, dissolvec	mg/L	0.0022	< 0.005	< 0.001	0.006	< 0.005	< 0.005	0.006	< 0.005	0.02	< 0.005	< 0.005
Radiation	Gross Alpha	pCi/L	3.156		25.53+/-4.21	3.966+/-2.115	1.25+/-1.69	5.57+/-1.36	-0.13+/-0.49	-0.46+/-0.31	ND	ND	12.28
	Gross Beta	pCi/L	4.619		-1.274+/-8.04	4.785+/-3.282	3.67+/-1.89	14.17+/-1.27	8.85+/-0.74	0.61+/-0.46	8.01+/-0.92	ND	0.32
	Polonium 210	pCi/L	0.07		0.203+/-0.797	0.133+/-0.04	0.03+/-0.04	0.004+/-0.008	0.05+/-0.06	0.01+/-0.01	0.10+/-0.03	ND	0.17
	Radium-226	pCi/L	0.152			0.100+/-0.3000	0.77+/-0.17	0.23+/-0.10	-0.14+/-0.13	-0.11+/-0.12	ND	ND	2.63
	Total Uranium (KPA)	mg/L	30.887		0.003+/-0.0003	0.069+/-0.002	32.21+/-9.38	0.009+/-0.001	0.002+/-0.0007	0.004+/-0.001	0.36+/-0.05	0.44	0.43

1997 Data: "E" - Analyte concentration (result) is an estimated value or exceeds analysis calibration range
1997 Comments: Samples analyzed for ortho-phosphate were received outside of EPA recommended holding time & the results were estimated.
Total Phosphorus was performed on the samples. The ortho-phosphate content will not be greater than the total phosphorus result.

Light blue = Exceedances of MCL concentrations
Light gray = Exceedances of Secondary Standards

National Maximum Contaminate Levels (USEPA 2002)

Inorganic Chemical	Standard
Arsenic	0.01 mg/L
Barium	2 mg/L
Cadmium	0.005 mg/L
Chromium (total)	0.1 mg/L
Copper	Action Level = 1.3
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4 mg/L
Lead	0.015 mg/L
Mercury (inorganic)	0.002 mg/L
Nitrate (measured as Nitrogen)	10 mg/L
Nitrite (measured as Nitrogen)	1 mg/L
Selenium	0.05 mg/L
Alpha particles	15 (pCi/L)
Beta particles and photon emitters	4 millirems/yr
Radium 226 & 228 (combined)	5 pCi/L
Uranium	30 ug/L

National Secondary Drinking Water Standards (USEPA 2002)

Contaminant	Standard
Aluminum	0.02 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor #
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Zinc	5 mg/L

Salinity Hazard (USDA)

Salinity	Conductivity (umhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	< 250	< 200
Medium salinity, detrimental effects to sensitive crops	250-750	200-500
High Salinity, adverse effects on many crops	750-2250	500-1500
Very high salinity, suitable only for salt tolerant plants	2250-5000	1500-3000

SURFACE WATER URP

	Analyte	Units	Number	Mean	Maximum	Minimum	Median
Field Measurements	sample temperature @	deg C					
	Conductivity	umhos/cm	11	819.363636	1440	426	754
	pH	units	11	8.09454545	8.3	7.7	8.1
Major Cations and Anions	Total Dissolved Solids	mg/L	11	602.909091	1190	326	532
	Alkalinity, Bicarbonate	mg/L	11	246.727273	328	173	223
	Alkalinity, Carbonate	mg/L	11	2.45454545	5	2	2
	Alkalinity, Total	mg/L	10	250	328	173	241.5
	Chloride	mg/L	11	7.77909091	11	5.33	7.6
	Sulfate	mg/L	10	230.71	596	65.4	172
	Calcium, dissolved	mg/L	11	96.8	185	59.2	85.5
	Magnesium, dissolved	mg/L	11	35.5818182	65.1	21.5	30.8
	Potassium, dissolved	mg/L	11	5.53363636	6.47	4.73	5.5
	Sodium, dissolved	mg/L	11	51.0090909	209	24.4	33.1
	Silica	mg/L	4	25.075	40	17.6	21.35
	Silica, as SiO2	mg/L	7	37.1142857	46.6	31.4	34.4
Nutrients	Nitrate, as N	mg/L	10	0.208	1	0.05	0.075
	Nitrite, as N	mg/L	10	0.07	0.1	0.05	0.05
	Orthophosphate, as P	mg/L	11	0.25454545	0.5	0.05	0.05
Trace Metals	Arsenic, dissolved	mg/L	11	0.00190909	0.0022	0.0015	0.0021
	Barium, dissolved	mg/L	11	0.06236364	0.0982	0.0446	0.0574
	Cadmium, dissolved	mg/L	11	0.00054545	0.001	0.0005	0.0005
	Chromium, dissolved	mg/L	11	0.00185455	0.01	0.001	0.001
	Cyanide, Total	mg/L	11	0.01	0.01	0.01	0.01
	Fluoride	mg/L	11	0.19009091	0.69	0.05	0.05
	Lead, dissolved	mg/L	11	0.00054545	0.001	0.0005	0.0005
	Lead-210	pCi/L	4	1.17	2.93	-1	1.375
	Manganese, dissolved	mg/L	11	0.09143636	0.146	0.0396	0.0904
	Mercury	mg/L	11	0.0184	0.2	0.0002	0.0002
	Molybdenum, dissolved	mg/L	11	0.00323636	0.005	0.0015	0.002
	Selenium, dissolved	mg/L	11	0.00230909	0.005	0.0005	0.001
	Silver, dissolved	mg/L	11	0.00231818	0.02	0.0005	0.0005
	Vanadium, dissolved	mg/L	11	0.00209091	0.0056	0.001	0.001
	Zinc, dissolvec	mg/L	11	0.00592727	0.02	0.001	0.005
Radiation	Gross Alpha	pCi/L					
	Gross Beta	pCi/L					
	Polonium 210	pCi/L					
	Radium-226	pCi/L					
	Total Uranium	mg/L					

SURFACE WATER LAKE

	Analyte	Units	April 19,2007	June 6, 2006	May 17,2005	May 17, 2004	May 20, 2003	May 10, 2002	May 15, 2001	May 2, 2000	April 21, 1999	May 1, 1998	June 19, 1997
Field Measurements	sample temperature @	deg C		16.4	13.1	18	16.8			No Data	No Data	No Data	No Data
	Conductivity	umhos/cm	3501	262	314	243	240	282	362				
	pH	units	8.6	8.47	8.95	9.1	8.9	8.8	8.5				
Major Cations and Anions	Total Dissolved Solids	mg/L	250	182	199	199	171	206	241				
	Alkalinity, Bicarbonate	mg/L	140	126	123	89	86.4	117	153				
	Alkalinity, Carbonate	mg/L	5.1	2	< 2	20.7	31.6	13.4	8.2				
	Alkalinity, Total	mg/L	145	ND	159	110	118	131	161				
	Chloride	mg/L	4.5	3.48	4.93	4.63	5.31	5.45	4.98				
	Sulfate	mg/L	32J	ND	26.9	22	21.6	23.7	26.4				
	Calcium, dissolved	mg/L	30	25.6	20	21.7	16.9	24.8	43.9				
	Magnesium, dissolved	mg/L	14	10	12.6	11.9	12.6	15.8	16.3				
	Potassium, dissolved	mg/L	5.3	4.52	4.74	4.7	8.38	5.18	4.7				
	Sodium, dissolved	mg/L	21	13.9	18.7	19.2	33.1	23.4	20.3				
	Silica	mg/L	32	27.3									
	Silica, as SiO2	mg/L	NA	ND	29.5	33.2	35.7	35.5	46				
Nutrients	Nitrate, as N	mg/L	< 0.5	< 0.05	< 0.05	< 0.05	1.43	< 0.05	< 0.05				
	Nitrite, as N	mg/L	< 0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05				
	Orthophosphate, as P	mg/L	< 0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05				
Trace Metals	Arsenic, dissolved	mg/L	0.0026	0.0017	0.001	0.0018	0.0022	0.0019	0.0015				
	Barium, dissolved	mg/L	0.044	0.0253	0.0263	0.0247	0.0199	0.0267	0.0419				
	Cadmium, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005				
	Chromium, dissolved	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001				
	Cyanide, Total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01				
	Fluoride	mg/L	0.31	< 0.05	0.222	< 0.05	0.67	< 0.05	< 0.05				
	Lead, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005				
	Lead-210	pCi/L	-3		0.51+/-0.30	-0.390+/-0.2400	-0.47+/-0.15	0.68+/-0.27	1.02+/-0.23				
	Manganese, dissolved	mg/L	0.00068	0.0006	0.004	< 0.01	0.0008	0.0031	0.002				
	Mercury	mg/L	< 0.0002	< 0.2	0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002				
	Molybdenum, dissolved	mg/L	0.0018	< 0.005	0.0055	< 0.005	0.0016	0.0014	0.0016				
	Selenium, dissolved	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0005	< 0.0005	< 0.0005				
	Silver, dissolved	mg/L	< 0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005				
	Vanadium, dissolved	mg/L	0.0049	0.0074	< 0.001	0.005	0.006	0.004	0.004				
	Zinc, dissolvec	mg/L	< 0.001	< 0.005	0.0065	0.009	0.024	< 0.005	0.006				
Radiation	Gross Alpha	pCi/L	2.042		1.31+/-1.28	0.000+/--17.789	-0.25+/-0.41	3.04+/-0.55	-0.23+/-0.49				
	Gross Beta	pCi/L	4.012		0.70+/-0.69	2.953+/-12.604	4.29+/-0.61	8.50+/-0.66	5.45+/-0.59				
	Polonium 210	pCi/L	0.209		0.130+/-0.0637	0.392+/-0.04	0.28+/-0.13	0.02+/-0.02	0.01+/-0.02				
	Radium-226	pCi/L	0.159			0.010+/-0.3100	0.20+/-0.12	0.66+/-0.16	0.02+/-0.08				
	Total Uranium (KPA)	mg/L	76.939		0.002+/-0.0001	0.267+/-0.008	17.42+/-7.28	0.006+/-0.001	0.002+/-0.001				

1997 Data: "E" - Analyte concentration (result) is an estimated value or exceeds analysis calibration range
1997 Comments: Samples analyzed for ortho-phosphate were received outside of EPA recommended holding time & the results were estimated.
Total Phosphorus was performed on the samples. The ortho-phosphate content will not be greater than the total phosphorus result.

Light blue = Exceedances of MCL concentrations
Light gray = Exceedances of Secondary Standards

National Maximum Contaminate Levels (USEPA 2002)

Inorganic Chemical	Standard
Arsenic	0.01 mg/L
Barium	2 mg/L
Cadmium	0.005 mg/L
Chromium (total)	0.1 mg/L
Copper	Action Level = 1.3
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4 mg/L
Lead	0.015 mg/L
Mercury (inorganic)	0.002 mg/L
Nitrate (measured as Nitrogen)	10 mg/L
Nitrite (measured as Nitrogen)	1 mg/L
Selenium	0.05 mg/L
Alpha particles	15 (pCi/L)
Beta particles and photon emitters	4 millirems/yr
Radium 226 & 228 (combined)	5 pCi/L
Uranium	30 ug/L

National Secondary Drinking Water Standards (USEPA 2002)

Contaminant	Standard
Aluminum	0.02 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor #
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Zinc	5 mg/L

Salinity Hazard (USDA)

Salinity	Conductivity (umhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	< 250	< 200
Medium salinity, detrimental effects to sensitive crops	250-750	200-500
High Salinity, adverse effects on many crops	750-2250	500-1500
Very high salinity, suitable only for salt tolerant plants	2250-5000	1500-3000

SURFACE WATER LAKE

	Analyte	Units	Number	Mean	Maximum	Minimum	Median
Field Measurements	sample temperature @	deg C					
	Conductivity	umhos/cm	6	283.833333	362	240	272
	pH	units	7	8.76	9.1	8.47	8.8
Major Cations and Anions	Total Dissolved Solids	mg/L	7	206.857143	250	171	199
	Alkalinity, Bicarbonate	mg/L	7	119.2	153	86.4	123
	Alkalinity, Carbonate	mg/L	7	11.8571429	31.6	2	8.2
	Alkalinity, Total	mg/L	6	137.333333	161	110	138
	Chloride	mg/L	7	4.75428571	5.45	3.48	4.93
	Sulfate	mg/L	5	24.12	26.9	21.6	23.7
	Calcium, dissolved	mg/L	7	26.1285714	43.9	16.9	24.8
	Magnesium, dissolved	mg/L	7	13.3142857	16.3	10	12.6
	Potassium, dissolved	mg/L	7	5.36	8.38	4.52	4.74
	Sodium, dissolved	mg/L	7	21.3714286	33.1	13.9	20.3
	Silica	mg/L	2	29.65	32	27.3	29.65
	Silica, as SiO2	mg/L	5	35.98	46	29.5	35.5
Nutrients	Nitrate, as N	mg/L	7	0.31142857	1.43	0.05	0.05
	Nitrite, as N	mg/L	7	0.11428571	0.5	0.05	0.05
	Orthophosphate, as P	mg/L	7	0.11428571	0.5	0.05	0.05
Trace Metals	Arsenic, dissolved	mg/L	7	0.00181429	0.0026	0.001	0.0018
	Barium, dissolved	mg/L	7	0.02982857	0.044	0.0199	0.0263
	Cadmium, dissolved	mg/L	7	0.00057143	0.001	0.0005	0.0005
	Chromium, dissolved	mg/L	7	0.001	0.001	0.001	0.001
	Cyanide, Total	mg/L	7	0.01	0.01	0.01	0.01
	Fluoride	mg/L	7	0.20028571	0.67	0.05	0.05
	Lead, dissolved	mg/L	7	0.00057143	0.001	0.0005	0.0005
	Lead-210	pCi/L	1	-3	-3	-3	-3
	Manganese, dissolved	mg/L	7	0.00302571	0.01	0.0006	0.002
	Mercury	mg/L	7	0.02878571	0.2	0.0002	0.0002
	Molybdenum, dissolved	mg/L	7	0.00312857	0.0055	0.0014	0.0018
	Selenium, dissolved	mg/L	7	0.00307143	0.005	0.0005	0.005
	Silver, dissolved	mg/L	7	0.00057143	0.001	0.0005	0.0005
	Vanadium, dissolved	mg/L	7	0.00461429	0.0074	0.001	0.0049
	Zinc, dissolvec	mg/L	7	0.00807143	0.024	0.001	0.006
Radiation	Gross Alpha	pCi/L					
	Gross Beta	pCi/L					
	Polonium 210	pCi/L					
	Radium-226	pCi/L					
	Total Uranium	mg/L					

SURFACE WATER BD (BLOCKED DRAINAGE)				
	Analyte	Units		April 19, 2007
Field Measurements	sample temperature @	deg C		
	Conductivity	umhos/cm		810.1
	pH	units		8.1
Major Cations and Anions	Total Dissolved Solids	mg/L		640
	Alkalinity, Bicarbonate	mg/L		61
	Alkalinity, Carbonate	mg/L		ND
	Alkalinity, Total	mg/L		61
	Chloride	mg/L		3.5
	Sulfate	mg/L		340
	Calcium, dissolved	mg/L		120
	Magnesium, dissolved	mg/L		20
	Potassium, dissolved	mg/L		7.7
	Sodium, dissolved	mg/L		7.7
	Silica	mg/L		3.2
	Silica, as SiO2	mg/L		NA
Nutrients	Nitrate, as N	mg/L	<	0.92
	Nitrite, as N	mg/L	<	0.12
	Orthophosphate, as P	mg/L	<	ND
Trace Metals	Arsenic, dissolved	mg/L		0.0013
	Barium, dissolved	mg/L		0.11
	Cadmium, dissolved	mg/L	<	ND
	Chromium, dissolved	mg/L	<	ND
	Cyanide, Total	mg/L	<	NA
	Fluoride	mg/L	<	0.34
	Lead, dissolved	mg/L	<	ND
	Lead-210	pCi/L		-0.5
	Manganese, dissolved	mg/L		0.0036
	Mercury	mg/L	<	ND
	Molybdenum, dissolved	mg/L	<	0.0014
	Selenium, dissolved	mg/L	<	ND
	Silver, dissolved	mg/L	<	0.00002
	Vanadium, dissolved	mg/L		ND
	Zinc, dissolve€	mg/L	<	0.0032
Radiation	Gross Alpha	pCi/L		2.76
	Gross Beta	pCi/L		7.178
	Polonium 210	pCi/L		0.644
	Radium-226	pCi/L		0.599
	Total Uranium (KPA)	mg/L		-0.299

Light blue = Exceedances of MCL concentrations
Light gray = Exceedances of Secondary Standards

National Maximum Contaminate Levels (USEPA 2002)

Inorganic Chemical	Standard
Arsenic	0.01 mg/L
Barium	2 mg/L
Cadmium	0.005 mg/L
Chromium (total)	0.1 mg/L
Copper	Action Level = 1.3
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4 mg/L
Lead	0.015 mg/L
Mercury (inorganic)	0.002 mg/L
Nitrate (measured as Nitrogen)	10 mg/L
Nitrite (measured as Nitrogen)	1 mg/L
Selenium	0.05 mg/L
Alpha particles	15 (pCi/L)
Beta particles and photon emitters	4 millirems/yr
Radium 226 & 228 (combined)	5 pCi/L
Uranium	30 ug/L

National Secondary Drinking Water Standards (USEPA 2002)

Contaminant	Standard
Aluminum	0.02 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor #
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Zinc	5 mg/L

Salinity Hazard (USDA)

Salinity	Conductivity (umhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	< 250	< 200
Medium salinity, detrimental effects to sensitive crops	250-750	200-500
High Salinity, adverse effects on many crops	750-2250	500-1500
Very high salinity, suitable only for salt tolerant plants	2250-5000	1500-3000

NP POND				
	Analyte	Units		April 19, 2007
Field Measurements	sample temperature @	deg C		16.4
	Conductivity	umhos/cm		262
	pH	units		8.47
Major Cations and Anions	Total Dissolved Solids	mg/L		182
	Alkalinity, Bicarbonate	mg/L		126
	Alkalinity, Carbonate	mg/L		2
	Alkalinity, Total	mg/L		128
	Chloride	mg/L		3.48
	Sulfate	mg/L		47000
	Calcium, dissolved	mg/L		25.6
	Magnesium, dissolved	mg/L		10
	Potassium, dissolved	mg/L		4.52
	Sodium, dissolved	mg/L		13.9
	Silica	mg/L		27.3
	Silica, as SiO2	mg/L		NA
Nutrients	Nitrate, as N	mg/L	<	0.05
	Nitrite, as N	mg/L	<	0.05
	Orthophosphate, as P	mg/L	<	0.05
Trace Metals	Arsenic, dissolved	mg/L		0.0017
	Barium, dissolved	mg/L		0.0253
	Cadmium, dissolved	mg/L	<	0.0005
	Chromium, dissolved	mg/L	<	0.001
	Cyanide, Total	mg/L	<	0.01
	Fluoride	mg/L	<	0.05
	Lead, dissolved	mg/L	<	0.0005
	Lead-210	pCi/L		0.9
	Manganese, dissolved	mg/L		0.0006
	Mercury	mg/L	<	0.0002
	Molybdenum, dissolved	mg/L	<	0.005
	Selenium, dissolved	mg/L	<	0.005
	Silver, dissolved	mg/L	<	0.0005
	Vanadium, dissolved	mg/L		0.0074
	Zinc, dissolvec	mg/L	<	0.005
Radiation	Gross Alpha	pCi/L		1468.045
	Gross Beta	pCi/L		427.891
	Polonium 210	pCi/L		0.245
	Radium-226	pCi/L		0.693
	Total Uranium (KPA)	mg/L		3043.646

Light blue = Exceedances of MCL concentrations
Light gray = Exceedances of Secondary Standards

National Maximum Contaminate Levels (USEPA 2002)

Inorganic Chemical	Standard
Arsenic	0.01 mg/L
Barium	2 mg/L
Cadmium	0.005 mg/L
Chromium (total)	0.1 mg/L
Copper	Action Level = 1.3
Cyanide (as free cyanide)	0.2 mg/L
Fluoride	4 mg/L
Lead	0.015 mg/L
Mercury (inorganic)	0.002 mg/L
Nitrate (measured as Nitrogen)	10 mg/L
Nitrite (measured as Nitrogen)	1 mg/L
Selenium	0.05 mg/L
Alpha particles	15 (pCi/L)
Beta particles and photon emitters	4 millirems/yr
Radium 226 & 228 (combined)	5 pCi/L
Uranium	30 ug/L

National Secondary Drinking Water Standards (USEPA 2002)

Contaminant	Standard
Aluminum	0.02 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor #
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids (TDS)	500 mg/L
Zinc	5 mg/L

Salinity Hazard (USDA)

Salinity	Conductivity (umhos/cm)	Dissolved solids (mg/L)
Low salinity, no detrimental effects expected	< 250	< 200
Medium salinity, detrimental effects to sensitive crops	250-750	200-500
High Salinity, adverse effects on many crops	750-2250	500-1500
Very high salinity, suitable only for salt tolerant plants	2250-5000	1500-3000

PROJECT NOTE

TO: Project File

SUBJECT: Jackpile-Paguate Uranium Mine
Paguate, Cibola County, New Mexico
CERCLIS ID No. NMN00607033

TASK DESCRIPTION: Calculating the average annual flow of Rio Paguate and Rio San Jose

W.O. NO.: 20406.012.019.0514.01

DATE: June 25, 2010

PREPARED BY: Michelle Brown, Weston Solutions, Inc.

TITLE: Senior Project Leader

WESTON utilized the information provided by the USGS Surface-Water Annual Statistics for New Mexico for USGS 08349800 (Rio Paguate below Jackpile Mine near Laguna, NM) and USGS 08343000 (Rio San Jose at Grants, NM) gauging stations (see attached). Average annual flow was calculated by adding the annual discharges reported and averaging the total.

News - updated March 17, 2010

USGS Surface-Water Annual Statistics for New Mexico

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, click here.

USGS 08349800 RIO PAGUATE BELOW JACKPILE MINE NEAR LAGUNA, NM

Available data for this site: Time-series: Annual statistics | GO

Cibola County, New Mexico
Hydrologic Unit Code 13020207
Latitude 35°07'09", Longitude 107°19'57" NAD27
Drainage area 107.00 square miles
Gage datum 5,820 feet above sea level NGVD29

Output formats
HTML table of all data
Tab-separated data
Reselect output format

Water Year	00060, Discharge, cubic feet per second
1977	1.48
1978	1.08
1979	1.33
1980	0.865
1981	1.25
1982	3.06
1983	2.06
1984	1.58
1985	2.55
1986	0.684
1987	3.90
1988	15.5
1989	1.50

150002

Water Year	00060, Discharge, cubic feet per second
1990	2.14
1991	2.16
1992	1.35
1993	8.85

** No Incomplete data have been used for statistical calculation

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2.38 2.33 nadww01

150003

USGS Surface-Water Annual Statistics for the Nation

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Cibola County, New Mexico Hydrologic Unit Code 13020207 Latitude 35°09'16", Longitude 107°52'11" NAD27 Drainage area 1,020 square miles Gage datum 6,468.34 feet above sea level NGVD29	**Output formats** HTML table of all data Tab-separated data Reselect output format

Water Year	00060, Discharge, cubic feet per second
1969	0.014
1970	0.213
1971	0.058
1972	0.544
1973	0.099
1974	0.035
1975	0.123
1976	0.040
1977	0.015
1978	0.000
1979	0.127
1980	8.10
1981	0.106
1982	0.094

150004

Water Year	00060, Discharge, cubic feet per second
1983	7.23
1984	0.110
1985	3.58
1986	0.004
1987	0.040
1988	0.002
1989	0.003
1990	0.067
1991	0.027
1992	0.001
1993	0.683
1994	0.065
1995	0.000
1996	0.164
1997	0.093
1998	0.100
1999	0.365
2000	0.016
2001	0.029
2002	0.054
2003	0.000
2004	0.188
2008	0.009
2009	0.129

** No Incomplete data have been used for statistical calculation

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Help

Top
Explanation of terms
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MCDC Demographic Profile 3, 2000 Census

PAGUATE , NM ,87040

Usage Notes

Subject	Number	Percent	SF3 Table
1. Population Basics			
Universe: Total Population			
Total Persons (Sample Est)	**492**		P1
Unweighted Sample Count of Persons	**108**		P2
Total Persons (100% Count)	**515**		P3
Pct Persons Sampled	**21.0**		P4
Urban Population	0	0.0	P5
In Urbanized Areas	0	0.0	
In Urban Clusters	0	0.0	
Rural Population	492	100.0	
Persons on Farms	0	0.0	
Persons Per Sq Mile	**16.1**		
2. Age			
Universe: Total Population			
Under 5	19	3.9	P8
Age 5 to 9	57	11.6	
10 to 14	41	8.3	
15 to 17	29	5.9	
18 to 19	2	0.4	
20 to 24	12	2.4	
25 to 34	87	17.7	
35 to 44	58	11.8	
45 to 54	64	13.0	
55 to 59	14	2.8	
60 to 64	35	7.1	
65 to 74	49	10.0	
75 to 84	21	4.3	
Over 85	4	0.8	
Under 18	146	29.7	
Over 18	346	70.3	
18 to 64	272	55.3	
Over 21	344	69.9	
Over 62	91	18.5	
Over 65	74	15.0	
3. Race and Hispanic			
Universe: Total Population			
White alone	0	0.0	P6
Black alone	0	0.0	

Subject	Number	Percent	SF3 Table
16. Employment Status			
Universe: Persons over 16			
Over 16 Yrs of Age	**354**	**72.0**	P43
Civilian Labor Force	112	31.6	
Unemployed Persons	10	8.9	
Civ. Labor Force, Female	53	47.3	
Unemployed Females	10	18.9	
Over 16 Not in Labor Force	242	68.4	
Married Couples who Both Work	**37**	**64.9**	P48
Married Couples, One Worker	**16**	**28.1**	
17. Work Force by Industry			
Universe: Employed Civilian Labor Force			
Employed Persons in CLF	**102**	**91.1**	P49
Employed in Manufacturing	16	15.7	
Employed in Retail Trade	5	4.9	
Employed in Education	0	0.0	
Employed In Health Care & Social Assistance	11	10.8	
Employed in Other Industries	70	68.6	
Unemployed Persons in CLF	**10**	**8.9**	
18. Work Force by Occupation			
Universe: Employed Persons in CLF			
Management, professional & related occupations	25	24.5	P50
Service occupations	26	25.5	
Sales and Office occupations	4	3.9	
Farming, Fishing & Forestry occupations	0	0.0	
Construction, extractions & maintenance occupations	34	33.3	
Production, Transportation + material moving occupations	13	12.7	
19. Household Income in 1999			
Universe: Households			
Total Households	**171**		P52
Less than $10,000	50	29.2	
$10,000 to $14,999	8	4.7	
$15,000 to $24,999	39	22.8	
$25,000 to $34,999	32	18.7	
$35,000 to $49,999	18	10.5	
$50,000 to $74,999	16	9.4	

160001

Subject	Number	Percent	SF3 Table
Amer Indian Alaska Native alone	487	99.0	
Asian alone	0	0.0	
Hawaiian and Other Pac Islander alone	0	0.0	
Other race alone	0	0.0	
Two or More Races	5	1.0	
Hispanic	0	0.0	P7
White Alone Not Hispanic	0	0.0	
Minority Pop	492	100.0	
4. Relationship of Persons in Households			
Universe: Persons in Households			
Persons in Households	**492**	**100.0**	P9
Householder	171	34.8	
Spouse	56	11.4	
Child of Householder	150	30.5	
Other Relative	93	18.9	
NonRelative	22	4.5	
5. Households by Type			
Universe: Households			
Total Households	**171**		P10
Families	121	70.8	
Married Couples	57	33.3	
Married Couples w Own Children < 18	30	17.5	
Single Parent Families	20	11.7	
Single Mothers	15	8.8	
Other Families	44	25.7	
Non-Family HHs	50	29.2	
Persons Living Alone	50	29.2	
6. Marital Status			
Universe: Persons Over 15			
Over 15 Yrs of Age	**375**	**76.2**	P18
Never Married	125	33.3	
Now Married Not Separated	136	36.3	
Separated	24	6.4	
Widowed	56	14.9	
Divorced	34	9.1	
7. Language Spoken at Home			
Universe: Persons Over 5			
Over 5 Yrs of Age	**473**	**96.1**	P19
Speak English Only	173	36.6	
Speak Eng less than very well	109	23.0	
Do Not Speak English	6	1.3	
8. Foreign Born Persons			

Subject	Number	Percent	SF3 Table
$75,000 to $99,999	4	2.3	
$100,000 to $149,999	4	2.3	
$150,000 to $199,999	0	0.0	
$200,000 or more	0	0.0	
Median HH Income	**22,788**		P53
Average Household Income	**27,230**		P54
HHs W Income < $200,000	**171**	**100.0**	
Avg HH Income of HHs < $200k	27,230		
Avg HH Income of HHs $200k or more			
20. Income Percentages by Source			
Universe: Households			
Aggregate Income in 1999	$4,656,400		
Pct Wage or Salary Income	78.7		P68
Pct Soc Security Income	6.5		P71
Pct SSI Income	1.5		P72
Pct Public Assistance Income	0.2		P73
Pct Retirement Income	8.5		P74
21. Other Income Measures			
Universe: Families or Persons			
Median Family Income	**24,904**		P77
Average Family Income	**32,129**		P78
Per Capita Income	**9,514**		P82
Males 16+ with Earnings in 1999	**100**		
Avg Earnings of Males with Earnings	$19,630		P84 P86
Females 16+ with Earnings in 1999	**89**		P84
Avg Earnings of Females with Earnings	$20,388		P84 P86
22. Poverty			
Universe: Persons for whom poverty status is determined			
Persons for whom poverty status determined	**492**	**100.0**	P87
Poor Persons	154	31.3	
Persons below 50% of poverty level	47	9.6	P88
Persons below 185% of poverty level	324	65.9	
Persons Between 100 & 200% of poverty level	170	34.6	
Mean Poverty Ratio	1.694		
Poor Persons in Families	**129**	**29.2**	P89
Families Below Poverty	**33**	**27.3**	P92
Non Family Households Below Poverty	**25**	**50.0**	
23. Miscellaneous Population			160002
Universe: Total Population			

Subject	Number	Percent	SF3 Table
Universe: Foreign Born Persons			
Foreign Born, exc native	**0**	**0.0**	P21
Naturalized US Citizen	0	0.0	
Not a Citizen	0	0.0	
Foreign Born Entered US in 1990 or Later	0	0.0	P22
Born in Europe	0		PCT19
Born in Asia	0		
Born in Latin America	0		
Born in Mexico	0		
Born somewhere else	0		
9. Residence in 1995			
Universe: Persons Over 5			
Lived in Same House 5 Yrs Ago	358	75.7	P24
Lived in Same County 5 Yrs Ago	419	88.6	
Lived in Same State 5 Yrs Ago	463	97.9	
10. Place of Work			
Universe: Workers over 16			
Workers 16 and Over	**83**		P26
Work in County of Residence	66	79.5	
Workers Living in a Place	83	100.0	P27
Work in Place of Residence	0	0.0	
11. Commuting			
Universe: Workers over 16			
Drive Alone to Work	67	80.7	P30
Carpool	16	19.3	
Public Transportation or Taxi to Work	0	0.0	
Cycle or Walk to Work	0	0.0	
Work at Home	0	0.0	
Mean Travel Time to Work	29.9		P32 P33
12. School Enrollment			
Universe: Persons Over 3			
Over 3 Yrs of Age	**479**	**97.4**	P36
Enrolled in grades K-12	122	25.5	
Enrolled in Private Schools K-12	4	3.3	
Enrolled in College	23	4.8	
13. Educational Attainment			
Universe: Persons Over 25			
Over 25 Yrs of Age	**332**	**67.5**	P37
Less Than 9th Grade	16	4.8	
9th thru 12th grade, No Diploma	62	18.7	
High School Grad or GED	147	44.3	
Did Not Attend College	225	67.8	
Some College, no degree	77	23.2	

Subject	Number	Percent	SF3 Table
Female	285	57.9	P8
Group Quarters Population	0	0.0	P9
Institutionalized Population	0	0.0	
Grandparents Caring for Own Grandchildren	7	1.4	PCT8
24. Housing Unit Basics			
Universe: Total Housing Units			
Total Housing Units	**197**		H1
Unweighted Sample HU Count	**45**		H2
Total Housing Units (100% Count)	**196**		H3
Est Occupied Housing Units (100% Count)	**160**		
Est Vacant Housing Units (100% Count)	**36**		
Pct of Occupied HUs in Sample	**24.4**		
Pct of Vacant HUs in Sample	**16.7**		
Urban Housing Units	0	0.0	H5
Rural Housing Units	197	100.0	
Occupied Housing Units	155	78.7	H6
Owner occupied units	140	90.3	H7
Renter occupied units	15	9.7	
Vacant Housing Units	42	21.3	
25. Selected Housing Characteristics			
Universe: Occupied housing units			
With 1.5+ persons per room	6	3.9	H20
Lacking complete plumbing facilities	7	4.5	H22
Lacking telephone service	11	7.1	H43
No vehicles available	27	17.4	H44
Average Household Size	3.17		H18
Moved in last 5 Yrs	35	22.6	H38
Median Year Moved In	1980		H39
26. Units in Structure			
Universe: Housing Units			
Single Family Units	177	89.8	H30
2 to 4 Units	0	0.0	
5 to 19 Units	0	0.0	
In Buildings with 20+ Units	0	0.0	
Mobile Homes	20	10.2	
Boat, RV, Van, etc.	0	0.0	
27. Age of Structure			
Universe: Housing Units			
Units < 5 Yrs Old	12	6.1	H34
Units > 50 Yrs Old	72	36.5	
Units Built Before 1940	55	27.9	
Average Age of Units	41.3		

160003

Subject	Number	Percent	SF3 Table
Bachelors	27	8.1	
Masters	3	0.9	
Prof School Degree or PhD	0	0.0	
Graduate or Professional Degree	3	0.9	
14. Veteran and Armed Forces Status			
Universe: Persons Over 18			
Over 18 Yrs of Age	**346**	**70.3**	P39
Currently in Armed Forces	0	0.0	
Civilian Population > 18	346	100.0	
Veteran	60	17.3	
15. Disability			
Universe: Civilian Non-Institutionalized Persons			
Civilian Non-Inst Pop Over 5	**473**		P42
Persons With 1 or more disabilities	92	19.5	
Civilian Non-Inst. Pop Over 65	**74**		
Persons Over 65 With a Disability	50	67.6	
Civilian Non-Inst. Pop 16-64	**280**		
Persons 16-64 with a Work Disability	14	5.0	P41

Subject	Number	Percent	SF3 Table
28. Gross Rents			
Universe: Specified Renter Occupied Units			
Units Paying Cash Rent	**15**	**100.0**	H62
Cash Rent < $300	10	66.7	
Rent $300 to $599	5	33.3	
Rent $600 to $999	0	0.0	
Rent $1000 or more	0	0.0	
Median Gross Rent	$169		H63
Average Gross Rent	$213		H64
No Cash Rent	0	0.0	
29. Housing Values			
Universe: Specified Owner Occupied Housing Units			
House Value < $50,000	48	40.0	H74
Value $50,000 to $99,999	52	43.3	
Value $100,000 to $149,999	14	11.7	
Value $150,000 to $199,999	0	0.0	
Value $200,000 to $299,999	0	0.0	
Value $300,000 to $499,999	3	2.5	
Value $500,000 to $999,999	0	0.0	
Value $1 million or more	3	2.5	
Median House Value	$61,600		H76
Average House Value	$96,708		H78 H14

Related Applications | Updated profiles (ACS) | Extract Data via Dexter | Complete metadata(pdf) | SF3 Definitions (pdf)

Report by the Office of Social and Economic Data Analysis, Univ. of Missouri Outreach & Extension
Under a contract with the Missouri Census Data Center
SOURCE: U.S. Bureau of the Census, Summary File 3, 2000 Decennial Census

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160004

Effects of Uranium Mining and Milling on Ground Water in the Grants Mineral Belt, New Mexico

by Robert F. Kaufmann, Gregory G. Eadie, and Charles R. Russell[a]

ABSTRACT

Ground-water contamination from uranium mining and milling results from the infiltration of mine, mill, and ion-exchange plant effluents containing elevated concentrations of radium, selenium, and nitrate. Available data indicate that radium concentrations in the discharge waters of a producing mine tend to increase substantially as the ore body is developed. Whereas natural background radium concentrations are generally about several picocuries/liter (pCi/l), 100 to 150 pCi/l appear in the effluents of operating mines. The discharge of such highly contaminated mine effluents to streams and seepage from tailings ponds, creates a long-lived source of ground-water contamination. Seepage of mill tailings at two active mills ranges from 126,000 to 491,000 m^3/yr and, to date, has contributed an estimated 2400 Curies of uranium, radium, and thorium to the ground-water reservoir. The shallow aquifer in use and downgradient from another mill has been grossly contaminated with selenium, attributable to excessive seepage from a nearby tailings pond.

Radium, selenium, nitrate and, to a lesser extent, uranium, are of most value as indicators of ground-water contamination. Gross alpha results are not consistent indicators of radium or uranium in water, although uranium does appear to be the principal contributor of alpha activity. Accurate radium-226 analyses yield the most information for radiological evaluation of drinking water.

To date, no adverse impacts on municipal ground-water supplies have been observed. However, industry-sponsored environmental monitoring programs are inadequately designed and implemented, and may not define the full, long-term impact of mining and milling operations on the ground-water quality of the study area.

[a]Hydrogeologist, Health Physicist, and Geologist, respectively, Office of Radiation Programs—Las Vegas Facility, U.S. Environmental Protection Agency, P.O. Box 15027, Las Vegas, Nevada 89114.

Discussion open until February 1, 1977.

INTRODUCTION

At the request of the New Mexico Environmental Improvement Agency (NMEIA), Region VI of the U.S. Environmental Protection Agency (USEPA) arranged for a water quality survey in the Grants Mineral Belt in northwestern New Mexico. As of 1974, this area contained about 42 percent of the U.S. reserves, and in 1975 produced 5,500 tons of uranium concentrate, or approximately 45 percent of U.S. production. The following mining districts dominate the Grants Mineral Belt: Churchrock on the west, Grants-Ambrosia Lake in the center, and Paguate-Jackpile on the east (Figure 1).

Whereas the influence of uranium mining and milling on surface-water quality and stream biota has been documented (Anderson *et al.*, 1963; Sigler *et al.*, 1966; Tsivoglou *et al.*, 1956, 1959, 1960; and Wruble *et al.*, 1964), the effects on ground water are rather poorly understood. With the passage of the Safe Drinking Water Act and increased interest in the preservation of water quality, there is a continuing need for reassessment of mining and mineral-processing operations because of their intimate association with ground water. Mention of ground-water contamination in New Mexico from uranium milling is contained in studies by Tsivoglou and O'Connell (1962) and Clark (1974) and site specific, unpublished studies in the study area were conducted some years ago by the New Mexico Department of Public Health (1957) and by Chavez (1961).

Ground-water and surface-water data were collected in February-March, 1975 by the Office of Radiation Programs—Las Vegas Facility and the National Enforcement Investigations Center,

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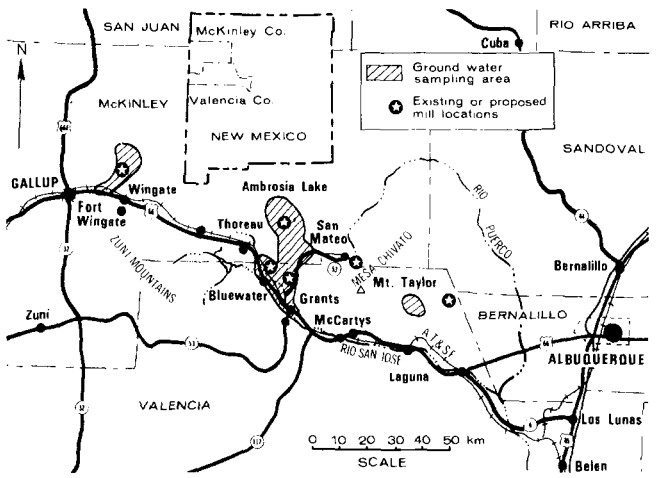

Fig. 1. Location of study areas in the Grants Mineral Belt.

respectively. This paper is a condensed version of an extensive report submitted to Region VI (Kaufmann *et al.*, 1975) which, in turn, reported the entire study results to the State (U.S. Environmental Protection Agency, 1975b).

GEOLOGY AND HYDROLOGY

The principal bedrock and alluvial stratigraphic units in the Grants Mineral Belt range in age from Pennsylvanian to Recent (Hilpert, 1963). Figure 2, which is a generalized geologic cross section through the Grants and Ambrosia Lake areas, portrays these units and the dominant structural feature which is the Chaco slope developed on the north flank of the Zuni uplift. Conditions in the Churchrock area are essentially the same.

Due to the scarcity of perennial surface-water bodies, ground water is the principal source of water in the study area. Industrial, municipal, stock, and private domestic wells tap both bedrock and alluvial aquifers. In general, wells of low to moderate productivity are possible in the unconsolidated valley fill which constitutes an aquifer, primarily along the broad valleys of the Rio San Jose and the Rio Puerco. Numerous shallow domestic wells south and southwest of the United Nuclear-Homestake Partners mill north of Milan also tap the shallow, unconfined aquifer. The principal bedrock aquifers are the San Andres Limestone and the Westwater Canyon Member of the Morrison Formation.

GROUND-WATER QUALITY

For about the last 20 years, uranium mining and milling activities in the Grants Mineral Belt consisted of underground and open-pit mining and alkaline or acid-leach milling. Active tailings piles are present in close association with three active mills run by the Kermac Nuclear Fuels Corporation (Kerr-McGee), the United Nuclear-Homestake Partners Corporation, and the Anaconda Company. Inactive tailings piles are related to the now inoperative United Nuclear-New Mexico Partners and Phillips mills located just north of Milan and in Ambrosia Lake, respectively. In recent years, increasing use has been made of ion exchange plants to recover uranium from mine drainage water and from injected fluids introduced for solution mining.

The variety of mining and milling operations in the study area and the paucity of hydrogeologic and water quality data necessitate that the following discussion be regarded as a preliminary assessment. For example, the hydraulic and water quality effects of solution mining and dewatering of ore bodies are scarcely known outside industry circles. Similarly unknown is the extent of dewatering of the ore-bearing formations, chief of which is the Westwater Canyon Member of the Morrision Formation. To a lesser extent, the overlying strata such as the Dakota Formation are also affected. In the Churchrock area, the static water level in an

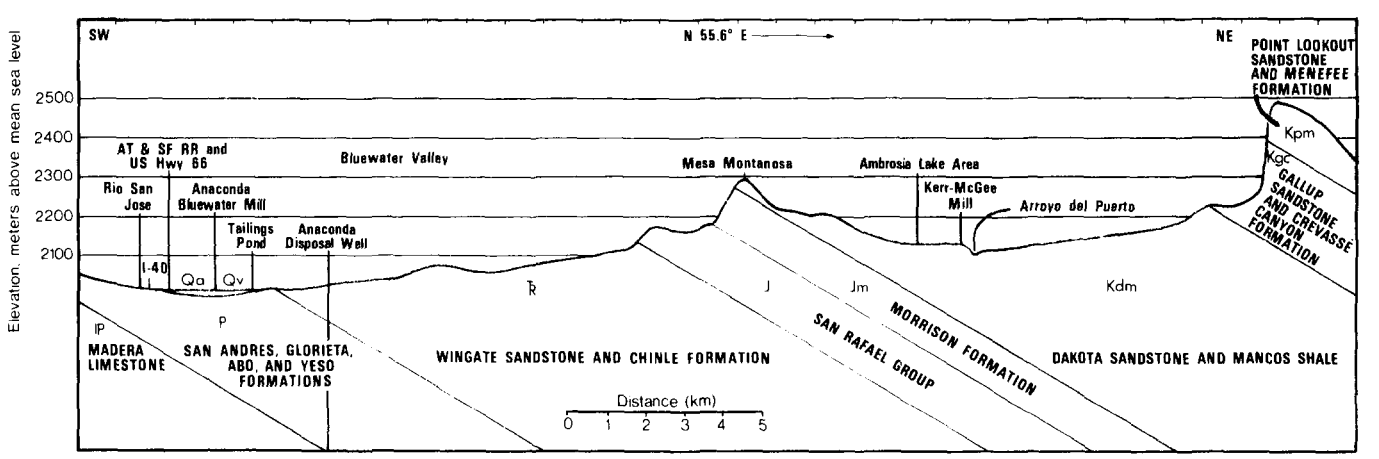

Fig. 2. Generalized geologic section from Bluewater to Ambrosia Lake.

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inactive mine is declining about 0.3 meter per month due to dewatering at the nearby United Nuclear and Kerr-McGee mines.

Discharge of the mine water transforms nearby dry washes and ephemeral streams (Rio Puerco, Arroyo del Puerto, and San Mateo Creek) into perennial ones. Water introduced to these channels persists until the losses due to bed infiltration, evapotranspiration, and diversion equal inflow. Infiltration of such waters to shallow alluvial aquifers may be adverse, depending on the quality of infiltrating water relative to ambient water quality in the aquifer, and the use to which shallow ground water is or will be put.

Concentrations of selected radionuclides, as well as gross and trace chemical constituents, were determined for 71 wells in the study area. The data plus inventory information concerning well locations, static water levels, well depths, and water use are contained in Kaufmann *et al.* (1975). Unequivocal bases for distinguishing truly background water quality conditions in an area of uranium mineralization do not exist. Variability in radionuclide concentrations is particularly pronounced in areas underlain by mid to late Mesozoic clastics. However, distinctions can be drawn between such units and Paleozoic or early Mesozoic strata. By comparing gross, trace, and radiochemical parameters in conjunction with hydrogeologic conditions and land/water use patterns, reasonable inferences can be made concerning natural and contaminated water quality. Selected radiochemical data, which were of chief concern in the ground-water portion of the study, are shown in Tables 1 and 2. The data are discussed by study area and by the principal uranium mining/milling activities therein. Concentrations are shown in picocuries (pCi) per liter, with a picocurie equal to 10^{-12} Curies. A Curie equals 37×10^9 disintegrations per second or approximately the activity of one gram of radium.

Bluewater-Milan-Grants

Acidic uranium milling wastes from the Anaconda Company tailings ponds and injection well enter both shallow and deep ground-water bodies in the Bluewater-Milan-Grants area. The southeastward flow gradient in the unconfined aquifer (Figure 3) would cause contaminants to move toward points of withdrawal for irrigation, domestic, and municipal use. In the use of the injection well, there is concern whether contaminants continue to remain confined to the deep injection zone, as originally projected.

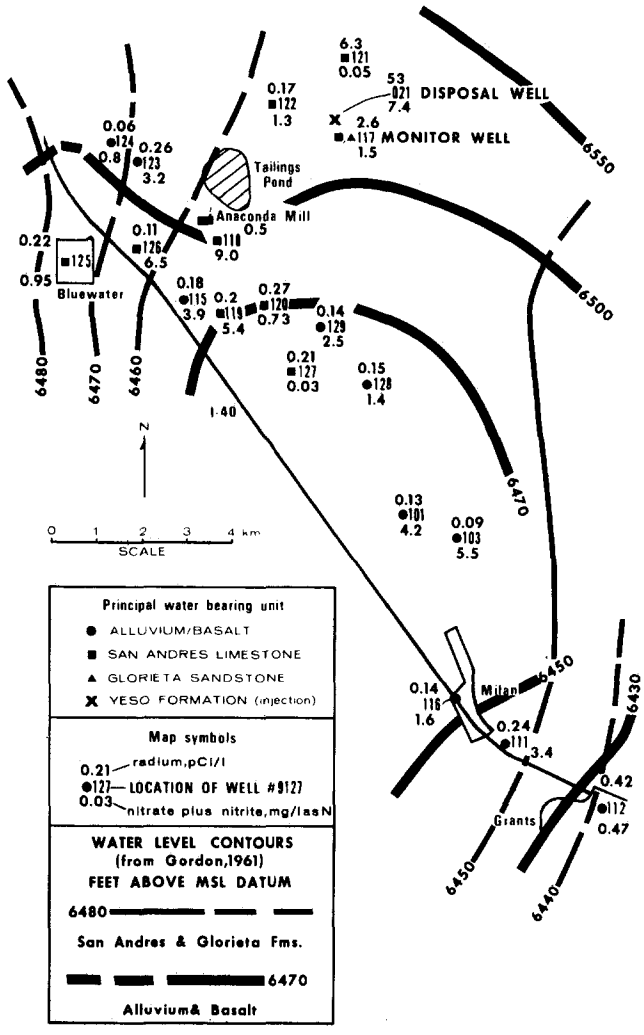

Fig. 3. Radium and nitrate concentrations in ground water—Bluewater-Grants area.

The New Mexico Department of Public Health (1957) noted that extensive migration of nitrate from the tailings ponds was contaminating the shallow aquifer. West (1972) stated that excessive leakage in the period 1953-1960 necessitated adoption of the injection well alternative for effluent disposal. The ponds are underlain by highly permeable basalt flows covered in places with a veneer of carbonate-rich silt and clay. Direct contact of the tailings with the basalt and dissolution of the silt and clay layer increase seepage.

In 1973 and 1974, the average seepage rate was 180,000 cubic meters per year (m^3/yr) compared to an average injection rate of 348,000 m^3/yr (Gray, 1975); thus, the ratio of seepage to injection is 0.52. Using this ratio and the injection volume (Gray, 1975; West, 1972) total seepage from 1960 through 1973 is estimated to have been 1.97 million m^3. Alternately, if seepage is calculated as a percentage of inflow to the ponds, approximately 8 percent (174,000 m^3) infiltrated

Table 1. Radiological Data for Selected Ground-Water Samples (Concentrations, pCi/l) Grants Mineral Belt, New Mexico

Location Number	Description	Gross Alpha	Ra-226 NEIC	Ra-226 EMSL	Th-230	Th-232	Po-210
Paguate-Jackpile							
9230	Well #4	<2 ± 6	0.31 ± .02	0.23 ± .095	<0.029	<0.012	0.31 ± .11
9231	Well P-10	10 ± 10	1.7 ± .05		<0.016	<0.016	0.29 ± .11
9232	New Shop Well	18 ± 13	3.7 ± .08		<0.016	<0.011	0.69 ± .20
9233	Paguate Municipal Well	2 ± 4	0.18 ± .02	0.10 ± .072	<0.018	<0.010	0.39 ± .18
Grants--Bluewater Area							
9021	Injection Well Anaconda Company	62,500 ±1,300	53 ± 1	61 ± 1.4	82,000±1,200	51 ± 30	3,100±250
9101	Mt. Taylor Mill Works Old Rt. 66	9 ± 11	0.13 ± .01				
9103	Private Well	7 ± 10	0.09 ± .01				
9111	C & E Concrete	7 ± 9	0.24 ± .01		<0.028	<0.012	0.55 ±.15
9112	Grants City Hall	19 ± 13	0.42 ± .02	0.10 ± .098	0.046 ± .038	0.0094 ± .021	0.26 ±.16
9115	Private Well	7 ± 12	0.18 ± .01				
9116	Milan Well No. 1	12 ± 10	0.14 ± .01	0.14 ± .081	<0.0072	<0.013	0.30 ±.12
9117	Monitor Well Anaconda Company	180 ± 40	2.6 ± .1	2.6 ± .30	<0.016	<0.0097	2.3 ±.90
9118	Well No. 2 Anaconda Company	290 ± 50	0.50 ± .02	0.21 ± .09	0.52 ± .093	0.54 ± .094	1.1 ±.37
9119	Well No. 4 Anaconda Company	12 ± 11	0.20 ± .01	0.18 ± .089	<0.030	<0.019	0.26 ±.19
9120	Mexican Camp	21 ± 12	0.27 ± .02		<0.017	<0.0053	0.66 ±.25
9121	Private Well	12 ± 14	6.3 ± .1		<0.008	<0.0081	0.28 ±.17
9122	North Well	30 ± 17	0.17 ± .01	0.33 ± .12	0.034 ± .024	<0.0084	0.51 ±.17
9123	Engineer's Well	20 ± 13	0.26 ± .01	0.36 ± .11	0.033 ± .026	<0.016	0.48 ±.26
9124	Private Well	16 ± 12	0.06 ± .01				
9125	LDS Church--Bluewater	8 ± 10	0.22 ± .01	0.91 ± .18	<0.034	<0.012	<0.070
9126	Private Well	5 ± 9	0.11 ± .01	0.44 ± .13	0.040 ± .031	<0.015	<0.10
9127	Private Well	10 ± 10	0.21 ± .01	0.28 ± .11	<0.034	<0.029	0.39 ± .14
9128	Private Well	11 ± 11	0.15 ± .01				
9129	Private Well	<1.6 ± 7	0.14 ± .01	0.87 ± .29	<0.018	<0.012	0.31 ± .16
United Nuclear - Homestake Partners							
9102	Private Well	<3 ± 13	0.19 ± .01	0.22 ±.091	<0.021	<0.012	1.0 ± .95
9104	Private Well	13 ± 14	0.08 ± .01		0.048 ± .029	<0.021	0.31 ± .14
9105	Private Well	140 ± 30	0.05 ± .01				
9106	Private Well	12 ± 11	0.05 ± .01	0.19 ±.087	<0.017	<0.010	0.40 ± .26
9107	Private Well	2500 ± 200	0.72 ± .02	0.78 ±.17	0.99 ± .13	0.034 ± .031	1.2 ± .52
9108	Private Well	47 ± 23	0.34 ± .02		0.026 ± .023	<0.013	0.31 ± .14
9109	Private Well	39 ± 17	0.13 ± .01				
9113	Private Well	31 ± 17	0.17 ± .02	<0.072	<0.037	<0.042	2.3 ± .69
9114	Private Well	42 ± 18	0.26 ± .01	0.46 ± .13			
9133	Private Well	10 ± 12	0.61 ± .03	0.65 ± .15	0.36 ± .078	<0.016	0.95 ± .24
9134	Well #2 UNHP	8 ± 11	0.24 ± .01		0.045 ± .039	<0.026	0.76 ± .41
9135	Well D UNHP	400 ± 70	1.92 ± .04	2.8 ± .31	0.13	< 0.18	2.3 ± 2.1
9136	Well #1 UNHP	22 ± 16	0.27 ± .02				
Ambrosia Lake							
9130	Private Well	3 ± 8	0.11 ± .01				
9131	Private Well	18 ± 13	0.05 ± .01	0.22 ± .10	0.036 ± .025	<0.021	<0.55
9132	Private Well	<1.0 ± 9	0.31 ± .02	0.47 ± .14	<0.018	<0.012	0.79 ± .43
9201	Private Well	110 ± 40	3.6 ± .1	3.3 ± .34	0.03 ± .027	<0.014	0.52 ± .16
9202	County Line Stock Tank	86 ± 31	0.30 ± .02		<0.028	<0.011	0.22 ± .10
9203	Navajo Windmill	33 ± 15	0.07 ± .01				
9204	Ingersoll Rand	8 ± 13	0.14 ± .01	0.30 ± .11	<0.015	<0.012	0.61 ± .21
9205	Private Well	170 ± 40	0.18 ± .01				
9206	Private Well	56 ± 25	0.60 ± .02				
9207	KM-S-12	410 ± 120	1.15 ± .03		0.27 ± .066	0.23 ± .062	<0.13
9208	KM-43	49 ± 35	4.0 ± .1	4.7 ± .40	0.021 ± .019	<.014	< 2.9
9209	KM-44	<2.0 ± 10	1.95 ± .04		<0.028	<.020	0.68 ± .53
9210	KM-51	45 ± 29	0.26 ± .02	0.35 ± .12	<0.023	<.0068	0.24 ± .16
9211	KM-48	<3.0 ± 15	0.20 ± .01	0.76 ± .17	<0.013	<.0080	2.7 ± .83
9212	KM-Seepage Return	112,000 ±3,000	4.9 ± .1	10.0 ± .65	160,000±1,600	170 ± 53	160 ± 130
9213	KM-B-2	8 ± 32	6.6 ± .1	6.4 ± .47	<0.018	<0.011	<0.94
9214	KM-36-2	14 ± 34	1.18 ± .03	1.5 ± .23	<0.015	<0.014	0.70 ± .26
9215	KM-46	104 ± 37	2.5 ± .2	2.7 ± .30	0.17 ±.057	<0.016	<0.38
9216	KM-47	45 ± 25	0.64 ± .02	1.4 ± .22	0.079 ±.038	<0.013	0.29 ± .20
9217	KM-50	70 ± 38	0.94 ± .03	0.72 ± .16	0.055 ±.035	<0.018	1.2 ± .84
9218	KM-5-1	20 ± 24	0.34 ± .02	0.34 ± .11	<0.021	<0.016	3.8 ± 2.6
9219	KM-5-2	67 ± 42	0.59 ± .02	0.78 ± .17	<0.039	<0.031	0.96 ± .64
Gallup-Churchrock							
9137	Private Well	10 ± 9	0.68 ± .03	1.4 ± .22			
9138	Private Well	6 ± 8	0.64 ± .02		0.088 ±.038	<0.019	0.27 ± .20
9139	Private Well	14 ± 11	0.22 ± .01				
9140	Private Well	6 ± 10	0.10 ± .01	0.15 ± .082	<0.030	<0.016	0.50 ± .20
9141	Churchrock Village	3 ± 7	0.12 ± .01	0.26 ± .10	<0.028	<0.016	0.23 ± .11
9142	Private Well	9 ± 9	0.16 ± .01	0.42 ± .13	0.073 ±.035	<0.011	<0.083
9143	(same as 9221)	14 ± 9	0.83 ± .04	0.38 ± .12	<0.044	<0.034	0.42 ± .17
9220	Hardground Flats Well-CRKM-2	12 ± 10	0.12 ± .01				
9221	E. Puerco River Well-CRKM-11	17 ± 10	0.56 ± .02	0.21 ± .093	<0.029	<0.016	0.19 ± .16
9222	Puerco Well CRKM-16	2 ± 9	0.57 ± .02				
9223	Pipeline Road Well-CRKM-5	4 ± 9	0.37 ± .02		0.037 ±.029	<0.012	0.52 ± .15
9224	Nose Rock Well CRKM-3	24 ± 12	0.13 ± .01	0.34 ± .12	0.053 ±.049	<0.036	0.23 ± .10
9225	N. E. Pipeline Well CRKM-10	12 ± 15	0.29 ± .01	0.50 ± .14	<0.015	<0.011	0.56 ± .33

[1] Concentrations ± two sigma counting error, in pCi/l. Sources of analyses: Environmental Monitoring and Support Laboratory, USEPA: Ra-226, Th-230, Th-232, Po-210. National Enforcement Investigations Center, USEPA: Gross alpha, Ra-226. All analyses are on the filtered sample and therefore represent the concentrations actually in solution.

Table 2. Uranium Concentration in Selected Ground-Water Samples[1] (Concentrations, pCi/l)[2]

LOCATION NUMBER	DESCRIPTION	U-234	U-235	U-238	U-NAT.
9021	Injection Well Anaconda Company	10,000 ± 750	420 ± 67	11,000 ± 770	88,000
9117	Monitor Well Anaconda Company	100 ± 7.7	3.0 ± .58	74 ± 5.7	379
9102	Private Well	10 ± .73	0.22 ± .048	7.7 ± .57	47
9133	Private Well	5.1 ± .41	0.15 ± .04	3.8 ± .31	-
9135	Well D-UNHP	240 ± 16	9.8 ± 1.1	240 ± 16	1,760
9132	Private Well Windmill	81 ± 5.1	2.8 ± .23	74 ± 4.7	68
9212	KM-Seepage Return	3100 ± 280	110 ± 35	3100 ± 280	-
9214	KM-36-2	11 ± .78	0.31 ± .058	6.8 ± .52	-
9219	KM-5-2	12 ± .63	0.27 ± .039	6.7 ± .37	-
9140	Private Well	1.8 ± .16	0.053 ± .022	1.4 ± .14	-
9232	New Shop Well-Jackpile	-	-	-	14
9233	Paquate Municipal Supply	-	-	-	27
9118	Well #2-Anaconda Company	-	-	-	880
9107	Private Well	-	-	-	9,478
9113	Private Well	-	-	-	54
9134	Well #2-UNHP	-	-	-	27
9201	Private Well	-	-	-	677
9141	Churchrock Village	-	-	-	14

1. Concentrations ± two sigma counting error, in pCi/l.
2. Sources of analyses: Isotopic uranium-Environmental Monitoring Support Laboratory (USEPA)
Uranium-natural by National Enforcement Investigations Center (USEPA), Denver, Colorado.

in 1973 and 1974 (from data supplied by Gray, 1975). Assuming 8 percent infiltration, and using inflow data from Beck (1975), seepage from 1960-1973 is estimated to have been 1.59 million m^3. Averaging both estimates, seepage from 1960-1973 is estimated to have been 127,000 m^3/yr. From mill startup in 1953 through 1959, pond inflow equaled 13.01 million m^3. Assuming 8 percent seepage loss, 1.04 million m^3 entered the shallow potable aquifer in Bluewater Valley. In summary, total seepage for the period 1953-1973 is estimated at 2.82 million m^3. Considering that from 1960 through 1973 the volume injected was 3.7 million m^3, the seepage to injection ratio was 0.76. In effect, there is almost as much water seeping into the shallow potable aquifer as there is being injected, thereby casting doubt on the efficiency of the tailings ponds for waste retention.

Because of excessive seepage from the tailings ponds in the period 1953-1960, the Anaconda Company developed an injection well for effluent disposal. Anaconda and U.S. Geological Survey reports (Fitch, 1959; West, 1972) showed that geologic, hydraulic, and water quality conditions justified this disposal method. However, subsequent evaluation of the monitoring data and inadequacies in the number and location of monitoring wells necessitate that this conclusion be reconsidered.

The disposal well was drilled in the period January-May 1959. Continuous core samples from 136 meters to total depth (765 meters) were tested for porosity, permeability, and ion exchange characteristics. Geophysical logs were taken for comparison with other lithologic and reservoir data. The thickness and character of the geologic units penetrated, as well as the construction features of the well, are summarized in Kaufmann *et al.* (1975). Detailed descriptions of the geologic formations and their transmissive properties are available (West, 1972).

From 1960 to date, injection has been into the Yeso and Abo formations at depths of 289 to 433 meters. Injection pressures of about 9 kg/cm^2 are developed from gravity head alone. The average injection rate from 1960 through 1973 was 504 l/min (0.5 m^3/min). Pretreatment of the injected waste consists of settling, filtration, and addition of chemicals to retard precipitation and plugging with organics (Clark, 1974).

From January 1960 through December 1965, 1.9 million m^3 of wastes with the following characteristics were injected (West, 1972):

	mg/l	*other*	*pCi/l*	*total Curies*
chloride	2,010			
nitrate	105			
sodium	1,390			
TDS	13,200			
pH		2.5		
uranium (natural)			7,340	13.89
Th-230			166,000	312.6
Ra-226			292	0.062

Although only intermittent data were available for the period from 1966 through 1973, they provide some indication of variations in the quality of water injected and (or) seeping from the tailings ponds. Clark (1974) reported that the mean radium content from 1960-1969 was 221 pCi/l. In 1972 and in the first half of 1974, respective concentrations of 41.1 and 156 pCi/l were observed. At the time of the field survey in February 1975, the average for two samples was 40 pCi/l. Thorium-230 is less variable. West (1972) reported 166,000 pCi/l of Th-230 for 1960-1965 versus 294,000 pCi/l in 1972 and 192,000 pCi/l in 1974.

Reported uranium values vary from 7,340 pCi/l for 1960-1965 (West, 1972) to 21,400 pCi/l in February 1975 (Table 2). Company data for 1972 and 1974 average 13,450 pCi/l.

Despite the volume of seepage from the ponds, contamination is not evident and the conclusion reached by the New Mexico Department of Public Health (1957) concerning the spread of a nitrate front is not borne out. Radium and nitrate

180005

concentrations in potable ground water that could be affected by seepage from the tailings are depicted in Figure 3. With the exception of the Berryhill Section 5 well (station no. 9121) and the Anaconda injection well (no. 9021), radium-226 in both the alluvial/basalt aquifer and in the underlying San Andres Limestone ranges from 0.06 to 0.42 pCi/l, and is well below the proposed drinking water standard of 5 pCi/l (U.S. Environmental Protection Agency, 1975a). If well no. 9124 is considered as a background, radium in the alluvial aquifer decreases as a function of distance from the tailings ponds. The elevated radium level in well no. 9123 is possible if there is a local radial flow pattern centered on the tailings ponds and superimposed on the natural, southeastward flow gradient. Trends for nitrate, TDS, chloride, sulfate, and gross alpha data from the foregoing study, from the Anaconda Company (Gray, 1975), and from the present investigation, were plotted to determine changes in ground-water quality with respect to distance from the tailings ponds and with time. Well no. 9127, completed in alluvium, and the Mexican Camp well (no. 9120), which taps the San Andres Limestone, show essentially no change in TDS, sulfate, chloride, or nitrate for the period 1956 to 1975. The slight decline in TDS in well no. 9127 is contrary to what would be expected if gross contamination was present. However, the similarity between gross alpha and sulfate fluctuations for the Mexican Camp well suggests that wastes may be within the area of influence of the well.

With respect to upward leakage associated with the injection well, concentrations of chloride and uranium through time are shown in Figure 4 for two observation wells. The Monitor well, located 91 meters northeast of the disposal well, is 191 meters deep. It fully penetrates and is open to the San Andres Limestone-Glorieta Sandstone fresh-water aquifer. North well, 1.5 kilometers northwest from the disposal well, is 76 meters deep and completed in the San Andres Limestone. The increasing concentrations of uranium and chloride in the Monitor well may indicate leakage out of the injection zone. Uranium serves as a tracer because it is not precipitated like thorium and radium when the carbonate reservoir strata neutralize the acidic waste. The concentration of polonium-210 exceeds that in all other wells in the Bluewater-Grants area and is well above the average of 0.33 pCi/l for six wells tapping bedrock.

North well is fairly stable, which may reflect the shallower completion depth and an upgradient location. Another well (no. 9121), located one kilometer to the north and completed in the Chinle Formation-San Andres Limestone sequence, also shows essentially stable TDS and sulfate from 1969 on and stable gross alpha from 1962 to present.

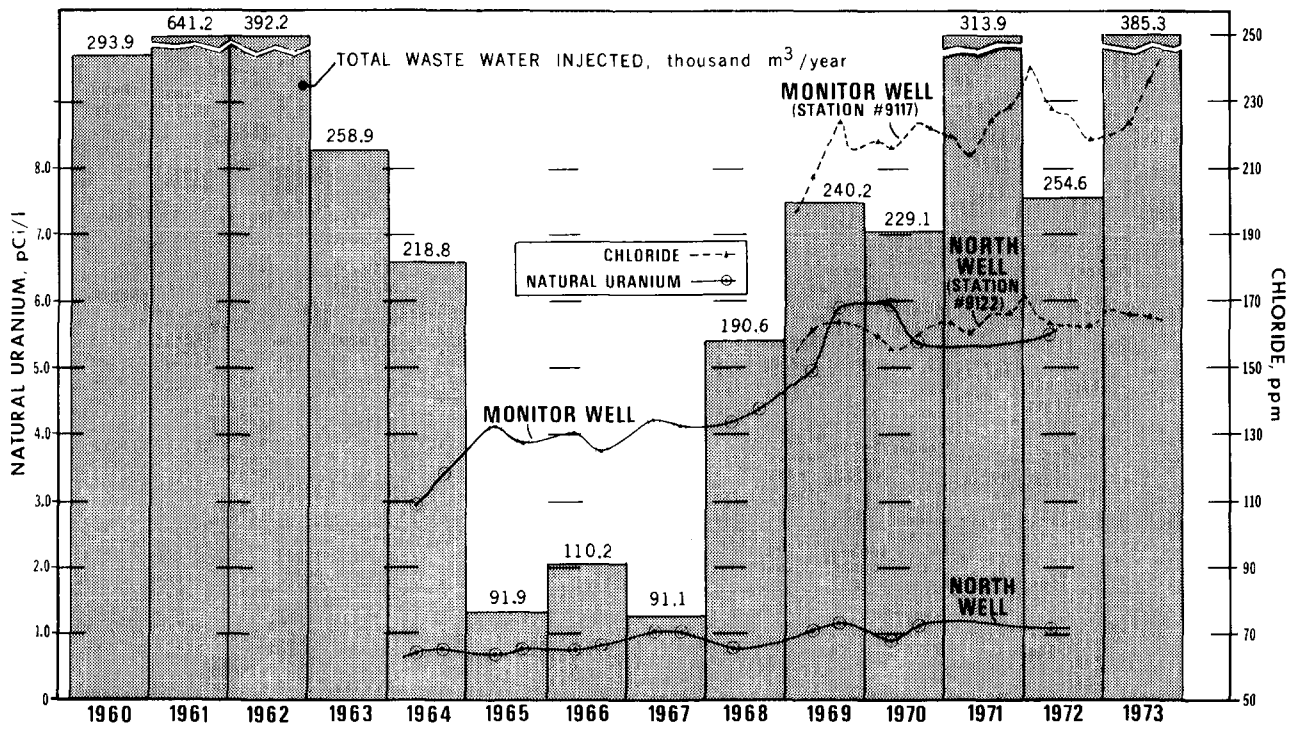

Fig. 4. Anaconda Company injection volumes and monitoring well water quality.

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There are major deficiencies in the monitoring programs associated with the Anaconda Company waste disposal operations. These include the lack of water quality data from the top of the zone of saturation in close proximity to the tailings ponds and the lack of monitoring wells completed in the injection zone. In effect, reliance is placed on detecting contaminants after they have escaped from a restricted area/zone.

In summary, widespread adverse water quality effects are not apparent as a result of the Anaconda Company disposal practices. This conclusion is based on analyses for seven offsite wells (nos. 9118, 9119, 9124, 9125, 9126, 9127, 9129) completed in alluvium and in bedrock and generally located peripheral to and within 4 kilometers of the tailings ponds. However, onsite Anaconda water-supply wells no. 2 and no. 4, located closer to the waste ponds, are 69-118 meters deep and are completed in the San Andres Limestone and possibly in the alluvium. Both wells show slightly increasing trends for TDS, chloride, or sulfate. Monitoring of the waste front in the injection zone is not underway, yet there is evidence of leakage into overlying, potable aquifers. Positive steps to define contaminant fronts associated with both the seepage and the injection operation are recommended.

United Nuclear-Homestake Partners (UNHP) Mill and Surrounding Area

The UNHP mill is flanked on the southwest or downgradient side by housing developments and irrigated farm lands, both of which depend on local ground-water supplies. Seepage from the pile proper and from the encircling moat enters the ground-water reservoir. Adjacent to the mill buildings is an inactive tailings pile that was formerly part of the Homestake-New Mexico Partners mill (Figure 5). In all likelihood, seepage from this pile also resulted in contamination.

Three distinct aquifers are present in the area of the mill and surrounding developments. In ascending order, these include the San Andres Limestone, the Chinle Formation, and the alluvium. Water-table conditions and a southwestward flow gradient prevail in the latter, with static water levels about 15 meters below land surface. The San Andres Limestone originally was under artesian head, but heavy pumping for irrigation and for industry has removed much of the head once present. Data presented by Gordon (1961) indicate a downward flow gradient, but the permeability of the Chinle

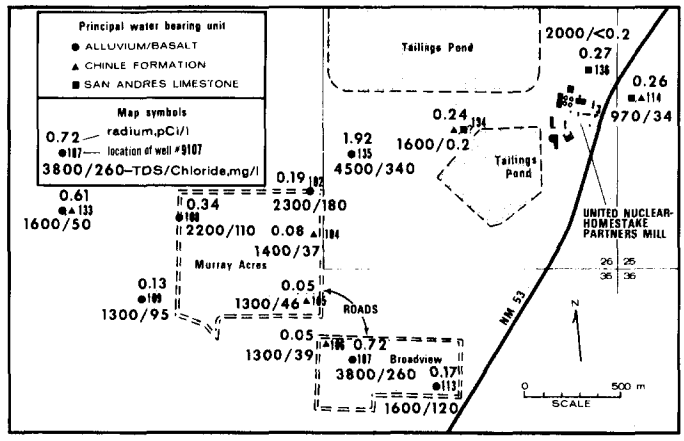

Fig. 5. Radium, TDS, and chloride in ground water—United Nuclear-Homestake Partners mill area.

Formation is low, and actual vertical water transfer is probably minimal.

Geologic and hydrologic conditions are not suitable for land disposal of milling wastes in that sandy soils and a relatively shallow water table are present. Contamination of the shallow aquifer is indicated by several chemical and radiochemical parameters.

The possibility of ground-water contamination due to the United Nuclear-Homestake Partners tailings pond was noted in the early 1960's by Chavez (1961). Samples from on-site monitoring wells completed in the alluvium contained from 0.8 to 9.5 pCi/l radium less than two years after the start of milling. The normal range was 0.1 to 0.4 pCi/l in wells several miles west of the mill and from wells in the alluvium between San Rafael and Grants.

Radium concentrations in ground water (Figure 5) from the San Andres and Chinle range from 0.05 to 0.27 pCi/l, with a mean of 0.16 pCi/l for six determinations. The peak value from shallow wells tapping the water-table aquifer in the alluvium is 1.92 pCi/l in well D, the single active monitoring well (no. 9135). Although below the EPA drinking water standard of 5 pCi/l, this value does indicate movement of contaminants away from the tailings pond. Attenuation due to sorption may mask a very sharp concentration gradient between this well and the pond. At a distance of approximately 0.6 kilometers from the ponds, radium in the shallow aquifer reverts to levels of 0.13 to 0.72 pCi/l and averages 0.36 pCi/l, or about twice that present in the bedrock reservoirs at depth. Relatively high concentrations (0.72, 0.61 pCi/l) in nearby wells (nos. 9107, 9133) may reflect plumes or fronts of contaminants that have

advanced ahead of the main body through highly permeable zones in the alluvium.

Total uranium in well D is about 500 pCi/l, compared to 10-20 pCi/l in wells of comparable depth but located about twice the distance downgradient from the mill. For comparison, seepage from the mill tailings pile contains 52 pCi/l radium-226 and 101,000 pCi/l (150 mg/l) U-natural.

Elevated levels of polonium-210 are also present in well D (no. 9135) and in other wells (nos. 9102, 9106, 9107, and 9113) downgradient from the mill tailings ponds. Background for polonium-210 is approximately 0.34 pCi/l (Table 1) in wells tapping either the Chinle Formation or the alluvium, whereas concentrations range from 1.0 to 2.3 pCi/l in wells suspected to be contaminated. The highest value (2.3 ± 2.1 pCi/l) for polonium-210 was from well D.

The most significant contaminant is selenium. As shown in Figure 6, downgradient domestic wells contain up to 3.4 mg/l selenium or 340 times the recommended maximum for drinking water (National Academy of Sciences-Engineering, 1972). Concentrations are greatest in shallow wells and in wells closer to the mill. Although the background level for selenium is not fully defined, the deeper aquifers (Chinle, San Andres) contain < 0.01 mg/l, whereas the seepage collection ditches and the monitor well contain 0.92 and 3.5 mg/l, respectively. Data collected in the course of the study showed that selenium concentrations in ground water throughout the Grants Mineral Belt were generally 0.01 mg/l or less. Prominent exceptions include the foregoing wells and seepage adjacent to the United Nuclear-Homestake Partners mill. Elsewhere, mine and ion exchange plant effluents averaged 0.027 and 0.15 mg/l, respectively at the

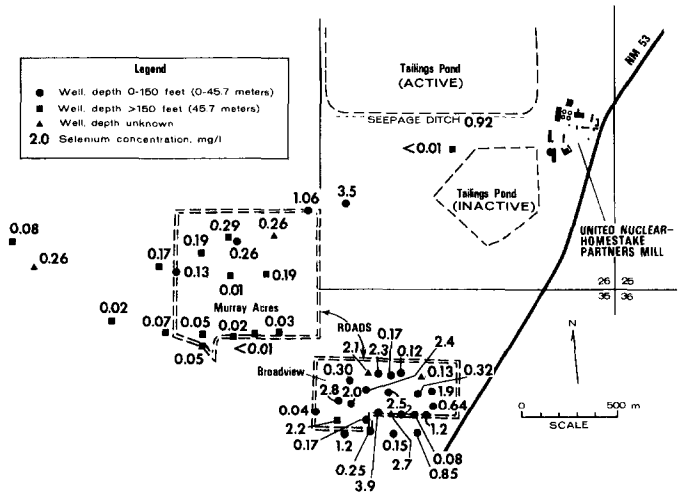

Fig. 6. Selenium in ground water—United Nuclear-Homestake Partners mill area.

time of sampling. As a result of widespread selenium contamination, a cooperative State-industry program is underway to provide alternate potable water supplies for the local populace.

Ambrosia Lake Area

In the Ambrosia Lake area, contamination of shallow ground water results from infiltration of (1) effluents from the tailings ponds at the Kerr-McGee mill, (2) mine drainage water that is introduced to settling lagoons and natural water courses, and (3) discharges from ion exchange plants. Seepage from the now inactive United Nuclear, Inc. (formerly Phillips) mill tailings pile is also undoubtedly present in the shallow subsurface. The ultimate effect of these waste waters on ground-water quality is unknown, but probably of consequence only to the shallow, alluvial aquifer. It is unlikely that seepage will reach the bedrock aquifer (Westwater Canyon Member) because of depth and due to intervening thick clay shales between the alluvium and the aquifer.

The Kerr-McGee mill is located on the dip slope of a southeast-facing cuesta in an area underlain by a veneer of silt and clay alluvium over Mancos Shale. A large network of tailings ponds and water storage reservoirs was built by excavation and by selectively sorting the coarse tailings for retention dams. Seepage from the ponds plus discharge from mines and ion exchange plants now causes perennial flow in the southward flowing Arroyo del Puerto.

Ground-water sampling in the Ambrosia Lake area focused on the Kerr-McGee tailings disposal operation and on the effects of various ion exchange plant and mine water discharges on ground water beneath San Mateo Creek and Arroyo del Puerto. The streams represent line sources of recharge to the shallow ground-water reservoir. Of the 22 wells sampled in the area (see Figure 7), all but 3 were part of the Kerr-McGee environmental monitoring network. The results of other ground-water monitoring programs, if any, associated with mining in the area are not reported to regulatory agencies.

Several parameters clearly indicate the infiltration of wastewater. Whereas shallow ground water beneath San Mateo Creek contains about 700 mg/l TDS in the reach above Arroyo del Puerto, the reach below has about 2000 mg/l. Ammonia increases four-fold from 0.05 to 0.22 mg/l, and nitrate plus nitrite (as N) increases from less than 1 mg/l to 24 mg/l. Nitrate, derived from very high concentrations of ammonia in the mill

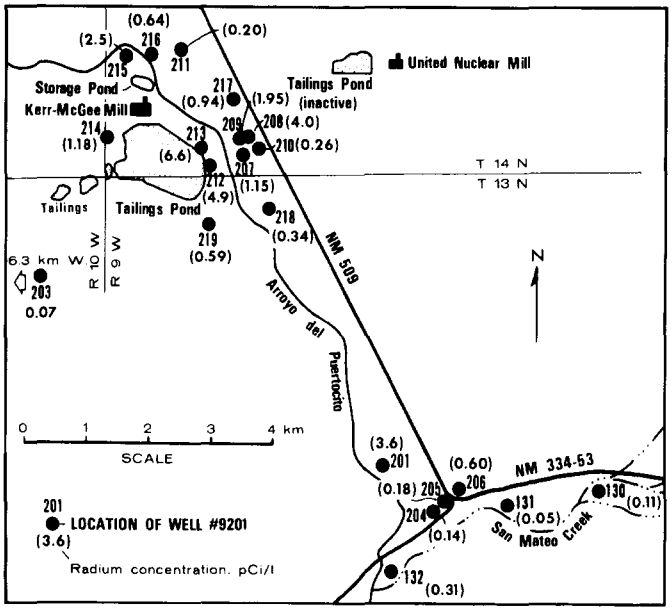

Fig. 7. Radium concentrations in ground water—southern part of the Ambrosia Lake area.

effluents, persists in shallow ground water. This is particularly true for shallow wells located east of the ponds and along San Mateo Creek, both above and below the county line. Selenium and vanadium concentrations in ground water do not markedly increase near the tailings ponds. One exception is well KM-43 (no. 9208) which contains 0.29 mg/l selenium as well as high radium and TDS. A nearby well (no. 9132) is also enriched in selenium which further substantiates the TDS, chloride, ammonia, and nitrate data results indicating contamination of the shallow aquifer.

The concentration of radium in ground water in the vicinity of the tailings piles at the Kerr-McGee mill averages 1.7 pCi/l for the 12 wells sampled. The highest concentration, 6.6 pCi/l, occurs at station no. 9213 near the base of the seepage catchment basin. Although contamination is relatively local, water in the basin, per se, contains 65 pCi/l radium.

As in the case of the Anaconda Company tailings ponds, there is question whether the Kerr-McGee tailings ponds are an adequate means of waste disposal. Company data for 1973 and 1974 reveal that seepage from the ponds averaged 491,400 m^3/yr. Influent averaged 1.67 million m^3/yr. Therefore, 29 percent of the wastes entered the ground water and the balance evaporated. The company data indicate that the seepage rate was fairly constant and averaged 1,348 m^3/day for 1973 and 1974.

Churchrock Area

Hydrogeologic conditions in the vicinity of the Churchrock mines basically resemble those in Ambrosia Lake with respect to potential impacts of mining and milling on ground water. The potential for contamination of shallow ground-water resources is greatest along the channel of the Rio Puerco. Unfortunately, wells specifically located for monitoring are nonexistent and full reliance is placed on existing stock and water-supply wells. Although monitoring data can detect whether contaminated water is being put to beneficial use, the program is markedly deficient in delineating the extent of contamination in aquifers not in use but likely to be receiving waste-water.

The Puerco River at Gallup was ephemeral until mining reached a scale such that wastewater discharge was sufficient to cause perennial flow. At present the combined discharge from the United Nuclear and Kerr-McGee mines, located as shown in Figure 8, is about 16,000 m^3/day and characterized by 8 to 23 pCi/l radium, 700 to 4900 pCi/l uranium, 0.01 to 0.04 mg/l selenium, and 0.4 to 0.8 mg/l vanadium. In terms of radium, selenium, and vanadium, the drainage water is unfit for stock or potable uses and not recommended for irrigation. Infiltration of the mine wastewater represents a threat to potable ground water in the vicinity of the Puerco River and possibly part of the Gallup municipal supply. At the present time, approximately 0.046 to 0.13 Curies per year of radium are discharged to the river. The radium is sorbed onto stream bed sediments and (or) infiltrates to the shallow water table. Because shallow ground water most commonly occurs in valley fill deposits recharged by ephemeral streams,

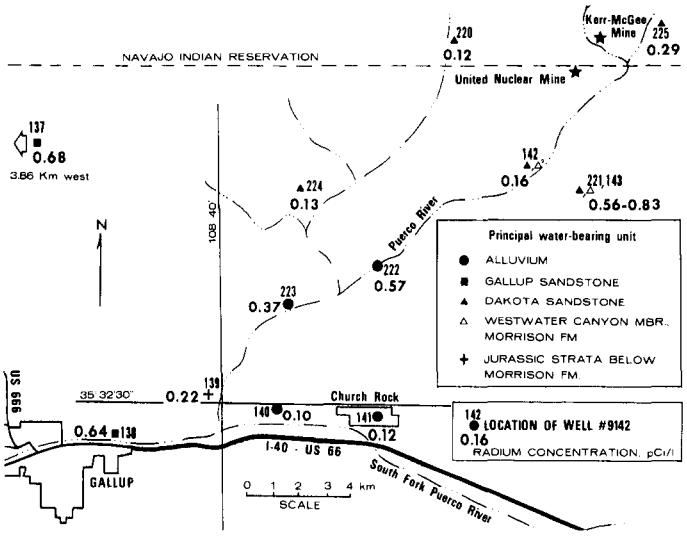

Fig. 8. Radium concentrations in ground water—Churchrock area.

there is a potential conflict between mine water discharge and development of shallow supplies for stock and domestic use. Declining water levels in some of the deeper wells completed in the Dakota and Morrison Formations also result from dewatering of the ore bodies.

To ascertain whether noticeable ground-water quality deterioration has occurred to date, sampling in the Churchrock area involved 13 wells located along the Puerco River and South Fork Puerco River. Essentially all of the known available wells were sampled in the upper reach of the Rio Puerco. For control purposes, ground water in an adjacent watershed tributary to the Rio Puerco was also sampled as was a new high-capacity well completely removed from the mining influences and serving the Gallup area. The sampling points included water used for stock, domestic use, and for public drinking water supplies. Alluvial and bedrock aquifers were sampled in an area of 200 km^2 located generally east and northeast of Gallup.

At present, none of the ground-water samples contain sufficient radionuclides to constitute a health problem. The radiochemical, trace element, and gross chemical data do not indicate that contamination of ground water is occurring as a result of the mining operations underway. Two of the wells (nos. 9139 and 9221) contain 119.6 and 62 mg/l nitrate, respectively. However, mine drainage contains less than 4 mg/l and is not believed to be the source.

By comparison, the effects of mining on the concentration of radium in ground water removed from the mines is marked. Discharge from the Kerr-McGee mine averages 7.9 pCi/l as compared to 23.3 pCi/l for the United Nuclear mine. The latter is producing ore, whereas the former is still in the development stage and the ore bodies are not yet well exposed. In both cases, elevated radium concentrations are present. In large part, these are attributable to mining operations and practices and do not represent natural water quality, evident from samples of ground water collected from 4 wells and 3 long holes, all in the Westwater Canyon Member (Hiss and Kelley, 1975). Radium varied from 0.05 to 0.62 pCi/l compared to 0.28 to 184.8 pCi/l uranium. An additional sample collected in November 1973 from the settling pond discharge at the United Nuclear mine contained 8.1 pCi/l radium and 847 pCi/l natural uranium. Thus, initial penetration and dewatering of the ore body increased radium at least 13-fold (8 ÷ 0.62) and subsequent mine development work over a two-year period resulted in another three-fold

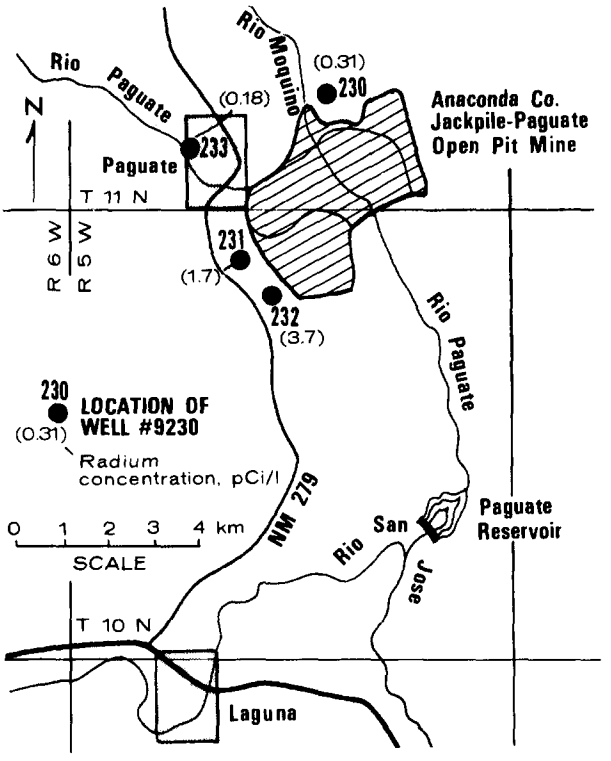

Fig. 9. Radium concentrations in ground water–Jackpile-Paguate area.

(23.3 ÷ 8.1) increase. Compared to natural concentrations, radium increased some 38 times. If a trend similar to that seen in the Ambrosia Lake area prevails, the ultimate radium concentrations should approach 50 to 150 pCi/l. Initial stages of the trend are tentatively confirmed by company, self-monitoring data.

Jackpile-Paguate Area

Sampling in the vicinity of the Jackpile-Paguate open pit uranium mine included four wells located as shown in Figure 9. One of these (no. 9233) is the Paguate municipal supply which is a flowing well located upgradient from the mine and completed in alluvium at a depth of 22.9 meters. The remaining three were former exploration holes that were developed into supply wells. Water quality for the latter three wells is probably representative of the Jackpile Sandstone Member of the Morrison Formation, the principal ore body in the Laguna mining district. With the exception of another nearby municipal well for Paguate, there were no other wells available for sampling in the area.

Dissolved radium in water from the Jackpile Sandstone aquifer ranges from 0.31 to 3.7 pCi/l. The latter value is from the new shop well which is a source of potable and nonpotable water for the facility.

Slightly elevated levels of radium in the P-10

well (no. 9231) and the new shop well (no. 9232) are possibly related to mining operations which tend to increase levels of uranium and radium in ground water. Widespread disruption of the Jackpile Sandstone and overburden, combined with leaching by ground water, undoubtedly increase radium and uranium concentrations. Influent ground-water conditions characterize the area insofar as the water-table gradient slopes southward and the water-level contour pattern indicates recharge by the Rio Paguate and Rio Moquino.

Although the mine floor is generally above the water table, there are local areas where water is encountered. In the South Paguate pit, ponded water derived from dewatering of the pit faces and drainage from the angled drift mines now in development contained 190 pCi/l radium and 170 pCi/l uranium in August of 1970. At that time, water from the pond was being pumped into the Rio Paguate which flows southward into Paguate Reservoir and the Rio San Jose. The absence of downstream wells precluded assessment of the effects of mine drainage on ground-water quality. It is recommended that additional shallow well points be installed and that sediment cores from Paguate Reservoir be taken for analysis of radionuclide content. These data may provide a record of the long-term effects of mining on sediment yield and water quality.

SIGNIFICANCE OF RADIONUCLIDES IN GROUND WATER

Of the 71 ground-water samples collected, only one showed radium-226 in excess of the 5 pCi/l drinking water standard (U.S. Environmental Protection Agency, 1975a). This location is in a restricted area downgradient from the Kerr-McGee tailings ponds at Ambrosia Lake. At five other locations, the former U.S. Public Health Service guide of 3 pCi/l radium is exceeded but quality is within the present EPA standard of 5 pCi/l. Furthermore, the locations are monitor wells in restricted areas or are irrigation or stock watering wells. Radium concentrations in municipal supplies in the study area ranged from 0.12 to 0.68 pCi/l and are well below the drinking water standard.

With respect to the use of 15 pCi/l gross alpha as an indication of radium in excess of 5 pCi/l (U.S. Environmental Protection Agency, 1975a), only one location would meet this criterion. Location no. 9021 had a gross alpha activity (including uranium isotopes) of 62,500 pCi/l and a radium-226 content of 53 pCi/l. At 33 locations (excluding no. 9021) where gross alpha activity exceeded 15 pCi/l, radium-226 contents ranged from 0.05 to 4.9 pCi/l. The two highest radium-226 results (locations no. 9213 and 9121) of 6.6 and 6.3 pCi/l have corresponding gross alpha determinations of 8 and 12 pCi/l. Furthermore, gross alpha activity determinations have large error terms which make data interpretation rather difficult. For this study, the gross alpha determination does not appear to have any correlation to radium-226 content. The reason for the poor correlation between the sum of isotopic uranium concentration and total uranium (natural uranium) is unknown. For ground-water samples, suspended solids are absent or very low, thereby eliminating the importance of sample filtration.

Since uranium, thorium and polonium-210 contents fluctuate about background levels, routine radiological monitoring of potable water supplies might best be limited to analysis for radium-226. The use of gross alpha determinations for routine surveillance of a water supply may not necessarily provide reliable data on which to base accurate radiological assessments of the supply.

Analysis of the flow and water quality data to ascertain radionuclide release to ground water is shown in Table 3. Approximately 2,000 to 3,000 Curies of radioactivity have been introduced to the subsurface by waste disposal operations at two of the three mills now operating in the Grants Mineral Belt. Not included in the data is the much greater activity in the solids fraction. Estimation of this is a separate problem which is currently being addressed in another study by the Office of Radiation Programs. Although essentially all of the activity released to the subsurface to date appears to be confined to presently restricted areas, there is an implicit and grave assumption that the same will be

Table 3. Dissolved Radioactivity in Effluents from the Kerr McGee and Anaconda Company Uranium Mills

Mill	Radionuclide	Source	Total Flow(1)	Concentration (pCi/l)	Radioactivity (Curies)
Anaconda	Radium-226	seepage	2.817	125	0.352
Company	(1622)[3]	injection	3.712	125	0.464
	Thorium-230	seepage	2.817	150,000	423
	(80,000)	injection	3.712	150,000	557
	Uranium (nat.)[4]	seepage	2.817	15,000	42.3
		injection	3.712	15,000 (88,010)[2]	55.7 (327)
Kerr-McGee	Radium-226	seepage	7.863	10 (65)[2]	0.079 (0.514)
	Thorium-230	seepage	7.863	160,000	1,258
	Uranium	seepage	7.863	5,310 (108,320)[2]	49.6 (851)
				Total	2,386 (3,459)[5]

(1). Million cubic meters, from start of operation through 1973

(2). Values reported by National Enforcement Investigations Center (USEPA), for seepage below the tailings ponds; analysis was for natural uranium on an unfiltered sample.

(3). Half life, years

(4). Half lives range from 2.48×10^5 for U-234 to 4.51×10^9 years for U-238

(5). Alternate estimate based on uranium and radium data from National Enforcement Investigations Center.

true for many hundreds of years to come.

Estimation of the seepage rates in Table 3 involves several basic assumptions. For the Anaconda mill, it was assumed that seepage has the same quality as the injected waste. The average concentration data shown are simply reasonable estimates based on the 1975 measurements and various company dating from 1960. In the case of Kerr-McGee, seepage for 1973 and 1974 is assumed to be representative of past conditions as are the 1975 water quality data. Obviously seepage rates have not been constant and seepage quality at the toe of the main retention dam may not be typical of area-wide conditions. Nevertheless, the calculations are believed to provide at least an approximation of the magnitude of radionuclide release. Because of sorption, not all of the activity is necessarily dispersed in the ground-water reservoir.

It is apparent that the largest amount of activity consists of thorium-230. The half-lives for the three elements shown provide some idea of the temporal significance of the hazard presented by uranium mining and milling wastes. As for waste toxicity, a recent report (Midwest Research Institute, 1975) of waste generation, treatment, and disposal in the metals mining industry stated that "wastes produced and land-disposal by the uranium mining industry . . . have the highest toxic hazardous rating of the . . . industries studied."

Because of the extremely long period over which such wastes are toxic, it is fundamental that detailed ground-water monitoring data be able to determine and predict the extent of contamination. The stark contrast between a typical 20-year mill life and an 80,000-year half life for the dominant radionuclide (thorium-230) necessitates a much greater forward look than is now evident in waste disposal practices and preservation of ground-water quality. As of 1972, some 99×10^6 metric tons of tailings containing 60,000 Curies of radium-226 were stockpiled in the western States from Texas to Washington.

For the period 1960-1973, waste disposal practices of the Kerr-McGee and Anaconda Company mills introduced an estimated 200,000 kilograms of dissolved uranium to the subsurface via seepage and direct injection. Although it may be uneconomical to effect recovery at the historic prices of \$10 to \$20/kg of yellowcake (U_3O_8), recent contracts for delivery over the next 5 years involve prices of \$88/kg (Anonymous, 1976). For reasons of mineral conservation, if not economic advantage, recovery of uranium from wastes associated with present and future milling operations should perhaps be more closely examined.

RECOMMENDATIONS

Several areas necessitating additional research are apparent from this study. These include: (a) delineating the effects on water resources of solution, shaft and open pit mining practices and dewatering of ore bodies, (b) thorough reevaluation of the injection method of waste disposal, (c) determining the adequacy of tailings ponds as a means of waste disposal, (d) assessment of the validity of gross alpha as an indication of the presence of other alpha emitters, (e) further research on the adequacy of geologic media for the sorption and retention of radionuclides, and (f) recovery of uranium from mill effluents.

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02/17/10 TO-0019-10-02-02

0950 EPA and ASTDR arrives at Old Gulton to pick up START-3 Michelle Brown. Begin trip to Jackpile-Paguate Uranium Mine for site reconnasance.

1050 Arrive at Laguna Health Service Center. Have Patrick Young with ASTDR, Brenda Nixon Cook, LaDonna Walker ~~+ Steve Nash~~ Mg with EPA. Meeting with Barbara Cywinska-Bernacik Manager of Pueblo of Laguna Environmental and Natural Resources Department. Need permit to enter the tribal land. Once we have a permit we do not need an escort.

1110 Tracing isotopic uranium to Rio Puerco.

1120 ~~Cut~~ Mg Curtis + Dorthy also with Pueblo of Laguna.

1125 Irrigation major use with Village of Mesita. Cattle use the water as well as

Michelle Brown

02/17/10 TO-0019-10-02-02

wild animals. Want to know effects of contaminated water. Adam Ringia has questions for Patrick Young.

1130 Marvin concerned with access to mine. Oak Canyon is an arroyo with no regular flow. Just run-off. No way to access Oak Canyon. Saint Anthony Mine goes down Arroyo Conchas. Don't need that background, or the sample at the TDL. Access problems at Arroyo Moquino - may be able to have access further north but need access from Spanish Land Grant. No PPE I access. Curtis has photos of fishing in reservoir. Currently the Reservoir is dry. Rio Paguate + ~~the~~ Oak Canyon go together before the Reservoir - its been moved. Observed

Michelle Brown

190003

02/17/10 TO-0019-10-02-02

in field - no ROC. Curtis can provide ROC. Rio San Jose has fish. Mesita uses water. Pecos Sunflower on Rio San Jose + Federally Listed plant. Coming out of drought + everything very dry. Tribes using HALL environmental labs for their sampling. Person able to help with locations - Curtis Francisco - Environmental-Natural Resources Dept. for Pueblo of Laguna. Former construction crew was taking water from RPG-03 (around PPE-2) for dust suppression + construction work around the reservation. (will be addressed during RIFS). Stopped using water ~ 2yrs ago. Curtis has approved QAPP for all the sampling he has conducted, QTRACK-10-095. Approved 12/18/09.

Michele

2/17/10 TO-0019-10-02-02

Older copy should be with Nicole from EPA water dept. Have hardcopy raw data + some pdfs. ARS was doing all the data. Round 1 - March-April. Round 2 - April-May Round 3 - June/July - Aug. 2008 - Round 4 + 2009 Round 1 RAW data. Have data for April 2009 sampling. Assaigai subbed to Eberline. ——

1400 Meet with Marvin Sarracino - he has information on the mine. Moved ~ 33 mil. cubic yards of material during reclamation. Marvin has Reclamation Reports + GW samples, quarterly on 11 wells within mine. None of the results have been "hot". Arroyo Moquino no longer converges with Rio Paguate. No need to take a background there. Sample 3 points w/in

Michele

02/17/10 TO-0019-10-02-02

Rio Moquino, Rio Paguate at each branch + when they come together OWL + Sediment SS. Source samples at South Paguate Pit and North Pit where water pools to SE of Paguate Village. Catfish are present in Rios Moquino + Paguate at the mine. Can get source samples along river banks - they were not reclaimed. Marvin will supply reclamation reports + lab data when we return for sampling. Received several maps, reports and historical data from Marvin. ——

~~03~~ 1545 Arrive at Tribal Secretary Esther Antonio for Trespassing permission paperwork for sampling. Paper good from 1 March to 31 May 2010. —

1633 Receive Trespassing letter and depart Laguna Tribal Building, Leave to Grants to see San Mateo ——

02/17/10 TO-0019-10-02-02

Mateo command post + evaluate whether it will be useful to borrow space for Jackpile site work. ——

1730 Arrive in Grants at San Mateo command post. Discuss plans for Jackpile. ——

1830 Depart Grants for Albuquerque End of Log Day. ——

190005

02/18/10 TO-0019-10-02-02

0815 EPA/ASTDR picks up START M. Brown at Old Gulton site. Depart to Pueblo of Laguna.
0915 Arrive at Laguna Health Service Center for meeting. Meet with ~~Brent~~ Barbara, Curtis, Mike Lewis, ASTDR + Adam.
0920 Patrick Young talks about ASTDR and their funtion. — Fact Sheet on Uranium.
0925 Adam Ringia w/ the Pueblo of Laguna Natural Resource Program + Dorthy Beecher also w/ POL-~~NRP~~ ENR also in meeting. P. Young talking about providing urine testing for free to residents concerned w/ uranium contamination. ASTDR working w/ local Health Depts. to provide this. ———
0930 Barbara asking about if water OK for cattle to drink and for use of irrigation. Levels shouldn't be toxic For cattle or crops ——— Michik Brown ———

02/18/10 TO-0019-10-02-02

According to Patrick due to the expletion of the uranium from the cattle and the realatively low uptake into crops. There is a method to test concs. in the cattle. Can also collect samples from wildlife to test for concs.
0945 Region 9 - Navajo Tribes ahead of Region 6 on all this. There has ~~also~~ already been health testing. ———
0947 Due to drought only water available to livestock is the surface water. ———
0950 ~1500 total cattle pop. on reservation. Cattle used for meat. ~800 cow elk, antelope, himayla tahr (goats), ~100 mule deer, turkey The elk + mule deer forage on Jackpile. Tribal tradition to eat liver raw from hunt kill. ~50 residential ——— Michik Brown ———

190006

02/18/10 TO-0019-10-02-02

population of elk in Paguate.
0955 Boiling water increases uranium concentration. A lot of the tribal population gets water from Encinal. Water very brine in area. ——
1005 Each village has sepeate meetings on Thursday nights. Best time to try + conduct a community meeting. No cell or internet access in Paguate. No spanish - its considered offensive. ——
1030 Depart for tour of Jackpile.
1044 Mesita Divesion wetland. Pick sample point just north of Mesita. Look into renting a couple of 4 wheel ~~whms~~. Use EPAs? 4x4 truck + 4 wheelers. ——
10:50 Arrive at Mesita Dam. Rio Paguate currently dry. Cattle in area. There is water in pools. 35.06583, -107.32698. ——

— Michele Brown

02/18/10 TO-0019-10-02-02

Large Pool at 35.06554, -107.32688, Possible sampling point at ponds created by BIA for cattle drinking - water from ground water flowing under the dam. 35.06775, -107.32720. May or may not be part of SW Pathway, but if tribe wants us to sample, we will. This is the same water source. Both feed into Rio San Jose. Correction — this area is Paguate Reservoir now known as Mesita Dam. Topo map have is not indicative of current conditions. ——
1122 Bob Money - tribal (Robert) clerk - would have agreement btwn Laguna + Anacona. Grab sediment on north side of Mesita Dam. Grab core btwn 9-12 ft. at this

— Michele Brown

190007

02/18/10 TO-0019-10-02-02

location only. Approximately every 3 feet. This will show more historical deposit. Adam has the sampler, + will let us know if we need to order sleeves.

1134 35.12275, -107.38709 Location of PPE - Marvin has keys to gate. Curtis' location 3. The area of the mine not reclaimed, just south of the village.

1150 35.12000, -107.38383 Area or un-reclaimed South pit high walls.

~~We~~ mg START will have Curtis Dorthy + Adam show locations for sampling. ———

End of log day. ———

Michelle

03/01/10 TO-0019-10-02-02

0730 Depart Dallas for Albuquerque-

0900 Arrive in Albuquerque, get rental car and depart to Weston Albuquerque office to receive radiation awareness training.

1000 Bob Schoenfelder conducts radiation awareness training. In attendance. START-3, Michelle Brown, Tori Gomez, James Beavis, Lori Kalich + Mindy Leuke. EPA SAMs - LaDonna Turner + Brenda Cook.

11:30 Depart Weston office - break for lunch. ———

1400 Arrive at Laguna Health Service Center, met with Barbara and Curtis, discuss sampling plan. Move all mine samples to ~~Thurs. 3/4~~ Weds 3/3 mg so Marvin is available to show locations. Move RP samples upstream of Paguate Reservior to Thurs. 3/4. ———

Michelle

190008

03/02/10 TO-0019-10-02-02

0700 START and EPA depart hotel and head for Laguna Health Service Center.

0740 Conduct Health + Safety Meeting. Temperatures starting in 20s and rising to mid-50's. Wear layers! Slips, trips, falls. Keep awareness of tribal sensitive areas. If see feathers, bones, stacked rocks, food - stay away from + no photos. Wear safety belts for all off-road driving. Use buddy system at all times. Each team has 4-people, - 1 tribal, 1-EPA, 2-Weston (START). Each team has 1st aid kit, BBP kit fire estinguisher. Command Post is Laguna Health Service Center. Nearest hospital is located off I-40, head west + take 102 exit (Acoma/Sky City Casino). No drug allergies for any team members.

Michele Brown

03/02/10 TO-0019-10-02-02

Level D PPE, use radiation equipment for screening. Each team will keep a seperate logbook of field activities.

0800 START begins preparing equipment for field activities.

0900 Both START teams depart command post to begin field activities. Team 1 - C. Francisco, J. Beavis, L. Kalich + B. Cook to begin sampling SW background locations. Team 2 - A. Ringo, T. Gomez, M. Lueke, L. Turner, to begin sampling on Rio San Jose at Mesita diversion/ wetland.

1100 Team 1 returns to CP to drop off samples RP-SED-BG, RP-SW-BG, RP-SED-BGD, RP-SW-BGD, RM-SED-BG and RM-SW-BG.

1115 Team 1 departs CP to collect RSJ-SED-BG and RSJ-SW-BG.

Michele Brown

190009

03/02/10 mg TO-0019-10-02-02

Late Entry - on 03/01/10 START + EPA join tribal officials Curtis + Marvin to check accessability of proposed sample locations. At 1600 STARTS Beavis + Kalich go to hotel in Grants, NM to check equipment, while STARTS Brown, Gomez + Locke remain in Laguna to tour sample locations. At 1830 START + EPA depart Laguna for Grants hotel. At 1900 arrive in Grants. START meets at 2100 hours to review use of Trimble Unit- 2130 - end of log day for 3/1/10.
1200 Team 2 back at CP. Collected RSJ-SED-03 + RSJ-SW-03. Also collected a location for Adam, not part of SW pathway, but part of his wetland reclaimation project.
1220 Both mg Teams back at CP.
1240 Depart for lunch.

Michelle Gomez

03/02/10 mg TO-0019-10-02-02

1430 Arrive at CP after lunch. Prepare for sampling activities for the afternoon.
1450 START, EPA depart CP. Team 1 to collect RSJ-SED/SW-02, RSJ-SED/SW-01 and RP-SED/SW-04. Team 2 to collect PR-SED/SW-01 and MD-SED-0-2', 2-4', 4-6' + 6-8'.
1730 Teams return to CP. Begin organizing samples and equipment. Total of 10 SW and 15 sediment samples collected for day.
1930 Depart Laguna CP for hotel in Grants. Will ship samples tomorrow.
2000 Arrive in Grants. End of log day.

Michelle Gomez

1900010

03/03/10 TO-0019-10-02-02

0710 Depart Grants hotel for San Mateo CP to package samples and prepare them for shipping.

0730 Arrive at Mateo CP. START completes Scribe Chain of Custodies + Fed Ex shipping labels and packages samples into 3 coolers for shipment. Leave cooles at Mateo CP for START R. Sherman to ship.

0840 Depart Grants for Pueblo Laguna.

0910 Arrive at Laguna Health Service Center CP. Prepare equipment for daily activities- Team 1 to pick up Marvin and begin collecting samples at Jackpile Mine. Team 2 to go with Dorthy and collect samples 01 and 02 on Rio Paguate.

0940 Daily H+S meeting. Temperatures to reach 80°F

Michelle Brown

mg

03/04/13/10 TO-0019-10-02-02

today r sunny. Stay hydrated wear sunscreen. Slips, trips + falls. Be aware of wildlife + cattle in area. Don't disturb anything that looks like tribal rituals. Use CB radios for communication between teams. Always use Buddy System. 4 people per team! Team 1 - STARTs - Beavis + Kalich, EPA - Turner, Tribal - M. Sarracino. Team 2 - ~~Gomez~~ mg STARTs - Gomez + Lueke, EPA - Cook + Tribal - D. Beecher. Hospital off I-40 west, exit 102 + south. ACL. Level D PPE. No allergies.

Michelle Brown Michelle Brown

Tori Gomez

Mindy Lueke Melinda Lueke

Lori Kalich

James Beavis

0950 Teams depart to begin field activities.

Michelle Brown

1900011

03/03/10 TO-0019-10-02-02

1219 Teams return to CP with samples collected from morning. Team 1 collected JM-SS-03, JM-SS-04 + JM-SS-05. Team 2 collected RP-02 and RP-01 and -02 MS/MSD and -01D.

1230 Depart CP for lunch.

1330 Arrive back at CP + prepare for afternoon sampling activities.

1350 Teams depart CP for Field.

1630 Team 1 returns with samples RP-JM, RP-JM-01 and RM-JM.

1719 START Beavis + EPA Turner depart CP for locations Team 2 did not collect GPS points from, MD and PR from 030210. GPS battery had failed. START Kalich remains at CP w/ START Brown to organize samples.

Late Entry - START Brown has remained at CP to work on data management and the HRS

Michelle Brown

03/03/10 TO-0019-10-02-02

Doc. Record and has not gone out into the field. on either 030210 or 030310.

1700 Team 2 locks keys in car. Awaiting to see if On-Star can assit.

1800 Team 2 returns to CP. Unable to get car unlocked. Call tribal police, see if they can assit. Police will be able to assit at 2000.

2100 Unable to unlock car. M. Brown calls AAA.

2130 AAA arrives.

2230 Car unlocked and START and EPA depart to hotel.

2300 Arrive at hotel. End of log day.

Michelle Brown

1900012

03/04/10 TO-0019-10-02-02

0800 Depart hotel for Laguna CP.

0830 Arrive at Laguna CP. Prepare for daily activities.

0900 Conduct daily H+S meeting. Slips, trips + Falls. Only collecting one sample, do not get complacent with safety. Seat belts for all off roading. Weather - highs upper 80s. Wear sunscreen / chapstick. Site awareness at all times important. Level D.

Team 1- STARTs Beavis + Kalich, EPA-Cook, Tribal-Beecher. Team 2- STARTs - Gomez + Lueke, EPA - Turner. Team 1 to collect sample JM-SED/SW-02. Team 2 to collect GPS point at reservoir. Buddy system at all times-

Michelle Brown Michelle Brown

Tori Gomez

Michelle Brown

03/04/10 TO-0019-10-02-02

Lori Kalich

Mindy Lucke

James Beavis

1005 Team 2 returns to CP after collecting GPS point at Paguate Reservoir.

1025 Team 1 returns to CP with sample JM-SS-01.

1030 START begins preparing equipment and samples.

1115 START + EPA depart Laguna CP. End of sampling.

1200 START arrives at Weston Albuquerque office to prepare samples and equipment for shipping. 3 coolers are prepped for shipment by FedEx to ALS for analysis.

1330 All equipment and samples are packed and awaiting FedEx pick-up. START departs Weston office. START to have lunch + catch flights departing Abuquerque.

Michelle Brown

1900013

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1900014

Jackpile Mine
Sampling Team 1

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No. 391

Jackpile - Paguate
Uranium Mine
TO-0019-10-02-02
WO# 20406.012.019.0514.01
03/02/10 - 03/04/10
Logbook 2 of 3

1900015

"Rite in the Rain®"
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START-3 FTL
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SUITE 850, DALLAS, TX 75254
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Project JACKPILE - PAGUATE URANIUM
MINE HRS
TO-0019-10-07-02
WO# 28406.012/016.019.0514.01

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1900016

CONTENTS

PAGE	REFERENCE	DATE
	Scribe: JAMES BEAVIS, [illegible], JB	
2-8	MARCH 2, 2010 FIELD NOTES	02/MAR/10
9-14	MARCH 3, 2010 FIELD NOTES	03/MAR/10
15-16	MARCH 4, 2010 FIELD NOTES	04/03/10

JACKPILE-PAGUATE URANIUM MINE, CIBOLA Co. NM
2nd MARCH 2010. JAMES BEAVIS & LORI KALICH (TI)
0740 ARRIVE AT: PUEBLO OF LAGUNA, ENVIRONMENTAL
PROGRAM CENTER, LAGUNA, NEW MEXICO 87026
FOR PRESAMPLING MEETING. EPA, EPA-START
AND PUEBLO OF LAGUNA ENVIRONMENTAL PERSONNEL
IN ATTENDANCE. LIST OF CONTACTS CAN BE
LOCATED PAGE 48 OF THIS FIELD LOG
0745 COMMENCE WITH MORNING HEALTH AND
SAFETY BRIEF CONDUCTED BY MYSELF (START
BEAVIS) AND START-3 BROWN. REVIEW & SIGN H.A.S.P.
PHYSICAL HAZARDS DISCUSSED: TERRAIN, UNEVEN
SURFACES AND DEBRIS, OVERHEAD HAZARDS
PRESENT IN CERTAIN AREAS (FALLING ROCKS POSSIBLE)
APPROACH SAMPLE LOCATIONS WITH CAUTION WHICH
EXTENDS TO DRIVING OFF-ROAD. WEATHER TODAY WILL
BE A HIGH OF 50°F, MOSTLY SUNNY, LIGHT WINDS
FROM SOUTH WEST WITH GUSTS UP TO 20mph.
WEATHER ACCORDING TO LOCAL KNOWLEDGE CAN
VERY QUICKLY CHANGE. ENSURE VEHICLES ARE
FILLED WITH WATER AND FIRST AID KITS, ALSO
RADIOS FOR COMMUNICATION.
CHEMICAL HAZARDS / EXPOSURE TO RADIATION:
HAVE THE TRAINING MATERIAL FROM 03/01/10 AT HAND
AS REFERENCE IN FIELD. PROCEEDURE SHOULD
INCLUDE; ESTABLISH BASE LOCATION (VEHICLE) UPWIND

2nd MARCH 2010 JAMES BEAVIS & LORI KALICH (TI)
OR CROSS-WIND: UTILIZING RAD METER APPROACH
SAMPLE LOCATION AND IDENTIFY A MID-LOCATION
(REDUCTION ZONE) BETWEEN BASE AND SAMPLE
LOCATION TO DOFF ANY PPE. AT SAMPLE
LOCATION REDUCE EXPOSURE TO ALPHA, BETA
AND GAMMA RAD BY LIMITING TIME AT A SPECIFIC
LOATION, UTILIZING SHIELDING IF POSSIBLE AND
IF POSSIBLE LIMIT DISTANCE TO IDENTIFIED HIGH
COUNTS ON RAD METER. USE PROVIDED DISPOSABLE
PPE AND SAMPLING SUPPLIES, WASH HANDS
AND ARMS TO REDUCE EXPOSURE BY INGESTION.
BIOLOGICAL HAZARDS: FAUNA INCLUDES WILD
ANIMALS — CATS, BE ALERT FOR SNAKES. FLORA
INCLUDING PUNCTURE HAZARDS, VEGETATION
ALSO AT FACE HEIGHT. PERSONAL HYGIENE DUE
TO LIMITED BATHROOM FACILITIES IN THE FIELD.
ACTION LEVEL FOR GAMMA >1000 uR

SAMPLE LOCATIONS ASSIGNED FOR TEAM ONE
FOR TODAY AS:

RF-SW-BG
RP-SED-BG
RM-SW-BG
RM-SED BG
RSJ-SED-BG

1900017

4 TO-0019-10-02-02 WO#20406.012.019.0514.01
JACKPILE-PAGUATE URANIUM MINE, CIBOLA CO, NM
2 MARCH 2010 JAMES BEAVIS & LORI KALICH (TI)
RP-SED-04
RSJ-SED-01
RSJ-SED-02
IF AVAILABLE COLLECT WATER SAMPLE ALSO (AT SED LOCATIONS)
3 BOTTLES / SW SAMPLE, 1 BOTTLE/SED SAMPLE
WHERE RP= RIO PAGUATE
RM= RIO MOQUINO
RSJ= RIO SAN JOSE
0845 DEPART FOR COLLECTION OF BACKGROUND SAMPLES. TEAM ONE CONSISTS OF START-3 BEAVIS, KALICH. EPA BRENDA COOK AND TRIBE REPRESENTATIVE CURTIS FRANCISCO
0904 ARRIVE AT RP BACKGROUND LOCATION, APPROXIMATELY ½ MILE UPSTREAM OF MAPPED LOCATION EPA OSC COOK AGREES WITH TRIBE REP FRANCISCO THAT THIS LOCATION IS A SUITABLE BACKGROUND. COMMENCE SCREENING WITH RAD METER. LAST CALIBRATION DATE 08/07/2009, CALIBRATION DUE 08/07/2010 ID# RFW 23678 MODEL # 2241-2 SURVEY METER, SERIAL # 4821 K 56155, PANCAKE SERIAL PR257045 (MODEL 44-9). SET UP TRIMBLE UNIT PROXRT. SAMPLE BOTTLES LOT # 01250015

TO-0019-10-02-02 WO#20406.012.019.0514.01 5
JACK PILE - PAGUATE URANIUM MINE CIBOLA, NM
2 MARCH 2010. JAMES BEAVIS & LORI KALICH (TI)
BACKGROUND READING AT RP-SW/SED-BG
22 uR/hr
PHOTO OF SITE LOCATION TAKEN SEE END OF DAY PHOTOLOG (CAMERA: FINEPIX S5200 #1008-1009)
SAMPLE LOCATION CO-ORDINATES AS:
35° 8' 27.54" N 107° 22' 59.69" W
ELEVATION 6,140 FT
BACKGROUND SAMPLE READING 16 uR/hr
0929 COLLECT SAMPLE RP-SW-BG & RP-SED-BG AND DUPLICATES FROM CREEK & BANK
RP-SED-BG 20 uR/h DUPLICATE 18 uR/hr
0950 DEPART SAMPLE LOCATION RP-SW/SED-BG FOR SAMPLE LOCATION RM-SW/SED-BG
1004 ARRIVE AT RM-SW/SED-BG. BACKGROUND 16 uR/hr.
1012 COLLECT SAMPLE RM-SW-BG & RM-SED-BG
COORDINATES AS: 35° 9' 11.085" N 107° 21' 21.054" W
ELEVATION 5,975 feet. BACKGROUND SCREEN FROM SAMPLE 24 uR/hr. PHOTOS 2512-2513 SEE PHOTO LOG AT END OF DAY
1032 DEPART RM-SW/SED-BG FOR COMMAND POST
1057 ARRIVE AT COMMAND POST TO DROP SAMPLES AND RE-SUPPLY
1118 DEPART CP FOR RSJ-SED-BG

1900018

6 TO-0019-10-02-02 WO# 20406.012.019.0514.01
JACKPILE-PAGUATE URANIUM MINE, CIBOLA CO, NM
2 MARCH 2010 JAMES BEARIS & LORI RALICH (T.)
1135: ARRIVE AT PARKING AREA FOR RSJ-SED-BG
BACKGROUND -19 uR/hr (PARKING AREA)
1144 WALK TO SAMPLE LOCATION AS:
35° 03' 30.337" N
107° 20' 43.813" W
5,700 ft Z BACKGROUND 27 uR/hr
1146 COLLECT SAMPLE RSJ-SW-BG AND RSJ-SED-BG
READING FROM SAMPLE 23 uR/hr. PHOTOS TAKEN
ON SITE AS: 2517-19 SEE END OF DAY LOG.
1202 DEPART SAMPLE LOCATION RSJ-SW/SED-BG
FOR COMMAND POST
1220 ARRIVE AT COMMAND POST, BREAK FOR LUNCH.
1430 RETURNED TO COMMAND POST, REVIEW
SAMPLING PLAN FOR AFTERNOON ACTIVITIES.
1453 DEPART ~~FOR CP~~ FOR RSJ-SED-02
1506 ARRIVE AT RSJ-SED-02. BACKGROUND AT
THIS LOCATION: 17 uR/hr. WINDS 2-5 mph FROM
SOUTH-WEST. WALK TO SAMPLE LOCATION.
AT SAMPLE LOCATION, SAMPLE READING 28 uR/hr.
PHOTOS 2520-2521 SEE END OF DAY LOG.
SAMPLE TIME-STAMP 1515
1530 DEPART RSJ-SW/SED-02 FOR RSJ-SW/SED-01
1554 ARRIVE AT PARKING LOCATION & WALK TO
RSJ-SW/SED-01. BACKGROUND 18 uR/hr.

TO-0019-10-02-02 WO# 20406.012.019.0514.01
JACKPILE-PAGUATE URANIUM MINE. NEW MEXICO
2 MAR 2010. JAMES BEARIS & LORI RALICH (T.)
1609 ARRIVE AT SAMPLE LOCATION, APPROXIMATELY 50 FT
DOWNSTREAM OF CONFLUENCE OF RP & RSJ.
BACKGROUND AT SAMPLE LOCATION RSJ-SW/SED-01
IS 16 uR/hr, COORDINATES:
35°03'39.678"N 107°20'00.882"W 5,693 ft Z
PHOTO NUMBERS 2522-2523 (SEE END OF DAY LOG)
1613 COLLECT SAMPLE ID RSJ-SW-01 & RSJ-SED-01
READING AT SAMPLE RSJ-SED-01 IS 23 uR/hr
1636 DEPART LOCATION RSJ-SW/SED-01
1703 ARRIVE AT RP-SED/SW-04. BACKGROUND AT
BASE LOCATION 18 uR/hr, READING AT SAMPLE
LOCATION 18 uR/hr. LOCATION COORDINATES AS:
35°04'44.520"N 107°19'40.322"W 5,751 ft Z
1710 COLLECT SAMPLES RP-SW-04, RP-SW-03 AND
RP-SED-04, RP-SED-04. RADIATION READING
~~AT~~ AT SEDIMENT SAMPLES 22 uR/hr.
PHOTO NUMBERS 2524 AND 2525 (SEE END
OF TODAYS FIELD NOTES FOR PHOTO LOG
1722 DEPART SAMPLE LOCATION FOR COMMAND POST
1745 ARRIVE AT COMMAND POST AND UNLOAD
EQUIPMENT AND SAMPLES
1753 IDW (INCIDENT DERIVED WASTE) SCREENED
BACKGROUND READING AT COMMAND POST
19 uR/hr. READING INSIDE PPE/WASTE

1900019

TO-0019-10-02-02 WO# 20406-012-019-0514-01

JACKPILE-PAGUATE URANIUM MINE, CIBOLA Co. NM

2 MARCH 2010 JAMES BEAVIS & LORI KALICH (TI)

BAG IS 18 MR/hr. ∴ DISPOSE OF TODAYS SAMPLING WASTE AS MUNICIPAL TRASH

1815 DATALOG/TRIMBLE & CAMERA DATA DOWNLOAD AND COMMENCE QC/QA OF TODAYS SAMPLES

END OF FIELD NOTES

PHOTO RECORD:

PHOTO ID#	DATE	TIME	DESCRIPTION	PHOTOGRAPHER WITNESS
03022010-001	03/02/10	0925	PHOTOS AT RP-SW-BG	JB/LK
03022010-002	03/02/10	0925	PHOTOS AT RP-SW-BG	JB/LK
03022010-003	03/02/10	1016	PHOTOS AT RM-SW/SED-BG	JB/LK
03022010-004	03/02/10	1020	PHOTOS AT RM-SW/SED-BG	LK/JB
03022010-005	03/02/10	1023	AREA DOWNSTREAM OF RM-SW/SED-BG	JB/LK
03022010-006	03/02/10	1023	AREA DOWNSTREAM OF RM-SED/SW-BG	JB/LK
03022010-007	03/02/10	1023	AREA DOWNSTREAM OF RM-SED/SW-BG	JB/LK
03022010-008	03/02/10	1154	PHOTOS AT RST-SW/SED-BG	LK/JB
03022010-009	03/02/10	1154	PHOTO AT RST-SW/SED-BG	LK/JB
03022010-010	03/02/10	1155	PHOTO AT RST-SW/SED-BG	LK/JB
03022010-011	03/02/10	1519	PHOTO AT RST-SW/SED-02	LK/JB
03022010-012	03/02/10	1519	PHOTO AT RST-SW/SED-02	LK/JB
03022010-013	03/02/10	1614	PHOTO AT RST-SW/SED-01	LK/JB
03022010-014	03/02/10	1612	PHOTO AT RST-SW/SED-01	LK/JB
03022010-015	03/02/10	1717	PHOTO AT RP-SED/SW-04	LK/JB
03022010-016	03/02/10	1717	PHOTO AT RP-SED/SW-04	LK/JB

JACKPILE-PAGUATE URANIUM MINE, CIBOLA Co. NM

3 MARCH 2010 JAMES BEAVIS & LORI KALICH (TI)

WEATHER TODAY AS: (AM) HIGH 50°Fs, CLEAR SSW WINDS 5-10 mph. MID 60s WINDS SW-9 mph

0720 DEPART HOTEL FOR SM COMMAND POST TO PACK/PREPARE SAMPLES FOR TRANSPORT

0830 DEPART SAN MATEO COMMAND POST FOR THE PUEBLO LAGUNA COMMAND POST.

0915 ARRIVE AT THE PUEBLO LAGUNA COMMAND POST AND PREPARE FOR TODAYS SAMPLING ACTIVITIES. FIELD CREW COMMENCE WITH MORNING TAILGATE SAFETY BRIEF AND EQUIPMENT CHECK

0955 DEPART COMMAND POST TO MEET WITH TRIBE REPRESENTATIVE MARVIN SAMANO (MS) TEAM ONE PERSONNEL: EPA LADONNA TURNER, TRIBE REP MARVIN SAMANO, START-3 BEAVIS AND KALICH. EQUIPMENT LIST SAME AS 03/02/10

1005 ARRIVE AT NATURAL RESOURCES RECLAMATION OFFICE TO FOLLOW MS TO SAMPLING LOCATIONS WITHIN GATED TRACT OF LAND

1027 ARRIVE AT 1027, LOCATION JM-SS-05 BACKGROUND READING 7 MR/hr. DUE TO ELEVATED READINGS START-3 BEAVIS & KALICH ESTABLISH A TEMP REDUCTION AREA TO DOFF PROTECTIVE EQUIPMENT.

1040 COLLECT SAMPLE JM-SS-05. READING AT

1900020

JACKPILE-PAGUATE URANIUM MINE, CABOLA Co. NM
03/MARCH/2010 JAMES BEAVIS & LORI KALICH (TI)
SAMPLE LOCATION IS ~ 760 uR/hr. COORDINATES:
35°07'49.490"N 107°20'07.293"W 5,967.97ft Z
RELOCATE TO ESTABLISHED REDUCTION ZONE TO
OBTAIN READING OF SAMPLE AS 109 uR/hr
DOFF PPE AND PACK SAMPLES INTO COOLER
1049. DEPART JM-SS-05 FOR JM-SS-04
1054. ARRIVE AT JM-SS-04 LOCATION. BACKGROUND
READING AT VEHICLE IS 25 uR/hr
1101 COLLECT SAMPLE AT JM-SS-04, BACKGROUND
READING AT SAMPLE LOCATION 27 uR/hr Co-ords
35°08'32.403"N 107°19'59.457"W 5,751.05ftZ
RELOCATE FROM SAMPLE LOCATION TO OBTAIN
SAMPLE READING AS: 27 uR/hr
1140 ARRIVE AT JM-SS-03. BACKGROUND
AT THIS LOCATION IS 47 uR/hr.
1147 COLLECT SAMPLE JM-SS-03. Coordinates
at sample location as:
35°08'03.192" N 107° 20' 50.598"W 5,889.96Z
BACKGROUND reading at sample
location is 157 uR/hr. Reading off
Sample logged as 80 uR/hr
1157 Depart Sample location for command
post in Laguna
1230 Break for Lunch

JACKPILE-PAGUATE URANIUM MINE, CABOLA Co. NM.
3rd MARCH 2010 JAMES BEAVIS & LORI KALICH (TI.)
1330 ARRIVE AT PUEBLO ~~LAGAE~~ LAGUNA COMMAND
POST TO DISCUSS THIS AFTERNOONS SAMPLING ACTIVITIES.
1400 DEPART COMMAND POST FOR RP-JM-SW/SED
1416 ARRIVE AT SAMPLE LOCATION RP-JM-SW/SED
BACKGROUND RAD READING 17 uR/hr.
COORDINATES AS:
35°07'58.055 N 107°20'46.077"W 5,884.18ft Z
1432 COLLECT SAMPLE RP-JM-SW AND RP-JM-SED
FROM DRAINAGE CULVERT THAT TRAVELS THE
CREEK BENEATH HIGHWAY 279. READING FROM
THE SEDIMENT SAMPLE AS: 27 uR/hr
1508 Arrive at ~~RP~~ ~~RP~~ RP-JM-SW-01.
Background at this location as: 18 uR/hr.
1511 Collect sample RP-JM-SW-01 and
RP-JM-SED-01. Coordinates at this
location are as:
35°07'58.105"N 107°20'47.658"W 5,884.2ft Z
Reading directly from Sediment sample
recorded as 19 uR/hr
1526 ARRIVE AT RM-JM-SW/SED. Background
at vehicle location 22 uR/hr.
Co-ordinates at Sample location as:
35°08'03.010"N 107°20'50.661"W 5,887.99ftZ

4900021

12 TO-0019-10-02-02 WO#20406-012-819-0514-01

JACKPILE-PAGUATE URANIUM MINE, CABOLA Co. NM
3rd MARCH 2010. JAMES BEAVIS & LORI KALICH (TI)
1529 Collect sample RM-JM-SW AND ~~RM-JM-SED~~ RM-JM-SED direct reading at sample as 26 uR/hr.
1535 BACKGROUND READING AT VEHICLE ~17 uR/hr.
START-3 KALICH & BEAVIS SCREEN IDW PRIOR TO DEPARTURE OF SAMPLE LOCATIONS. READING INSIDE IDW COLLECTION BAG AS 17 uR/hr IDW CAN BE DISPOSED OF AS MUNICIPAL WASTE.
1556. DEPART SAMPLE LOCATIONS FOR PUEBLO LAGUNA COMMAND POST.
1605 ARRIVE AT COMMAND POST TO UNLOAD SAMPLES/EQUIP/IDW AND DUMP DATA FROM TRIMBLE RANGER UNIT. COMMENCE QC/QA OF SAMPLES & PREP SAMPLES FOR SHIPPING
PHOTO LOG FOR TODAYS (03/03/10) SAMPLING ACTIVITIES

PHOTO ID	DATE	TIME	DESCRIPTION	PHOTOGRAPHER/WITNESS
03032010-001	03/03/10	1048	SAMPLE LOCATION JM-SS-05	JB/LK
03032010-002	03/03/10	1048	SAMPLE LOCATION JM-SS-05	JB/LK
03032010-003	03/03/10	1048	SAMPLE LOCATION JM-SS-05	JB/LK
03032010-004	03/03/10	1048	SAMPLE LOCATION JM-SS-05	JB/LK
03032010-005	03/03/10	1049	SAMPLE LOCATION JM-SS-05	JB/LK
03032010-006	03/03/10	1102	SAMPLE LOCATION JM-SS-04	JB/LK
03032010-007	03/03/10	1103	SAMPLE LOCATION JM-SS-04	JB/LK
03032010-008	03/03/10	1103	SAMPLE LOCATION JM-SS-04	JB/LK

JACKPILE-PAGUATE URANIUM MINE, CABOLA Co. NM
3 MARCH 2010. JAMES BEAVIS & LORI KALICH (TI)

PHOTO ID	DATE	TIME	DESCRIPTION	PHOTOGRAPHER/WITNESS
03032010-009	03/03/10	1105	SAMPLE LOCATION JM-SS-04	JB/LK
03032010-010	03/03/10	1109	SAMPLE LOCATION JM-SS-04	JB/LK
03032010-011	03/03/10	1123	OVERVIEW OF SURVEY AREA	JB/LK
03032010-012	03/03/10	1123	OVERVIEW OF SURVEY AREA	JB/LK
03032010-013	03/03/10	1123	OVERVIEW OF SURVEY AREA	JB/LK
03032010-014	03/03/10	1124	" " "	JB/LK
03032010-015	03/03/10	1124	" " "	JB/LK
03032010-016	03/03/10	1125	" " "	JB/LK
03032010-017	03/03/10	1126	" " "	JB/LK
03032010-018	03/03/10	1126	" " "	JB/LK
03032010-019	03/03/10	1126	" " "	JB/LK
03032010-020	03/03/10	1128	" " "	JB/LK
03032010-021	03/03/10	1128	" " "	JB/LK
03032010-022	03/03/10	1129	" " "	JB/LK
03032010-023	03/03/10	1150	SAMPLE LOCATION JM-SS-03	JB/LK
03032010-024	03/03/10	1150	SAMPLE LOCATION JM-SS-03	JB/LK
03032010-025	03/03/10	1150	JM-SS-03	JB/LK
03032010-026	03/03/10	1150	JM-SS-03	JB/LK
03032010-027	03/03/10	1153	JM-SS-03	JB/LK
03032010-028	03/03/10	1153	JM-SS-03	JB/LK
03032010-029	03/03/10	1442	~~JM-SS-03~~ RP-JM-SW/SED	JB/LK
03032010-030	03/03/10	1442	RP-JM-SW/SED	JB/LK
03032010-31	03/03/10	1442	RP-JM-SW/SED	JB/LK

1900022

JACKPILE - PAGUATE URANIUM MINE, CABOLA Co. NM
3rd MARCH 2010 - JAMES BEAVIS & LORI KALICH (TI)

PHOTO ID	DATE	TIME	DESCRIPTION	PHOTO/WITNESS
03032010-032	03/03/10	1443	RP-JM-SW/SED	JB/LK
03032010-033	03/03/10	1443	RP-JM-SW/SED	JB/LK
03032010-034	03/03/10	1521	RP-JM-SW/SED-01	JB/LK
03032010-035	03/03/10	1521	RP-JM-SW/SED-01	JB/LK
03032010-036	03/03/10	1521	RP-JM-SW/SED-01	JB/LK
03032010-037	03/03/10	1521	RP-JM-SW/SED-01	JB/LK
03032010-038	03/03/10	1521	RP-JM-SW/SED-01	JB/LK
03032010-039	03/03/10	1536	~~RP-JM-SW/SED~~ RM-JM-SW/SED-JB	
03032010-040	03/03/10	1537	RM-JM-SW/SED	JB/LK
03032010-041	03/03/10	1537	RM-JM-SW/SED	JB/LK

END OF PHOTO LOG

JACKPILE - PAGUATE URANIUM MINE, CABOLA Co. NM
MARCH 4, 2010 - JAMES BEAVIS & LORI KALICH (TI)

0800 DEPART HOTEL FOR LAGUNA COMMAND POST
0835 ARRIVE AT COMMAND POST TO DISCUSS TODAYS ACTIVITIES AND CONDUCT MORNING HEALTH AND SAFETY BRIEF. WEATHER TODAY AS: (AM) 58°F, MOSTLY SUNNY WITH WEST WINDS 3-5 mph (PM) 67°F, CLEAR, WINDS BETWEEN 5-10 mph
0915 DEPART COMMAND POST WITH SUPPLIES AND EQUIPMENT AS LISTED 03/02/2010
0929 ARRIVE AT LAGUNA CONSTRUCTION COMPANY SECURITY CHECK-POINT TO ACCESS SAMPLING LOCATION
0936 ARRIVE AT SAMPLING LOCATION JM-SS-01. BACKGROUND AT THIS LOCATION 23 uR/hr
0950 COLLECT SAMPLE JM-SS-01. BACKGROUND 87 uR/hr. COORDINATES AS:
35° 07' 25.022" N 107° 22' 10.563" W, 6,010ft Z
DIRECT RAD READING FROM SAMPLE 56 uR/hr.
1009 Check out at security office and depart site for command post
1025 ARRIVE AT COMMAND POST, PACK EQUIPMENT AND PREPARE TO HEAD FOR AIRPORT
END OF FIELD LOG
PHOTO LOG PAGE 16

1900023

TD-P019-10-02-02 WO#20406.012.019.0516.01

JACKPILE-PAGUATE URANIUM MINE, CIBOLA Co. NM

MARCH 04, 2010. JAMES BEARIS & LORI RALICH (TI)

PHOTO LOG

PHOTO ID	DATE	TIME	DESCRIPTION	PHOTO/WITNESS
03042010-001	03/04/10	1052	JM-SS-01	JB/LK
03042010-002	03/04/10	1054	JM-SS-01	JB/LK
03042010-003	03/04/10	1055	JM-SS-01	JB LK

END OF PHOTO LOG.

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Jackpile Mine-
Sampling Team 2

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JOURNAL
No. 391

Jackpile - Paguate
Uranium Mine
TO-0019-10-02-02
WO# 20406.012.019.0514.01
03/02/10 - 03/04/10

Logbook 3 of 3

1900026

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1900027

CONTENTS

PAGE	REFERENCE	DATE

Jackpile 20406.012.019.0514.01
TO-0019-10-02-02 03/02/10

0900 START-3 Melinda Luethe, START-3 Tori Gomez, EPA LaDonna Turner, and Pueblo of Laguna Adam Ringia depart ~~from the command post~~ for sampling location RSJ-SED-03. START-3 Luethe, START-3 Gomez, and EPA Turner comprise the "Sampling Team 2". Equipment List is as follows: Fujifilm FinePix Camera (RFW 23610), Ludlum Model 19 micro R meter (RFW 23677) Trimble TSC2 Backpack Unit GPS (Barcode SS60C18604) ——— MLL

0917 Sampling Team 2 and Pueblo of Laguna Ringia arrive at sampling location RSJ-SED-03. Sampling Team 2 assembles Trimble GPS Unit and preps for sampling activities ——— MLL

0920 EPA Turner departs for the command post to obtain additional Sampling supplies ——— MLL

0950 START-3 Luethe collects a GPS point using the Trimble unit.
——— Melinda Luethe

The GPS Point will not save and the unit becomes non-responsive. Rebooted trimble unit. ~~Collect mtt~~
START-3 Luethe collects a GPS point for sample location RSJ-SED-03 and saves the file on the Trimble unit as "RSJ-SED-03 try 2" ——mtt
1030 EPA Turner arrives at sample location RSJ-SED-03 with additional sampling supplies ——————mtt
1037 START-3 Luethe collects samples: RSJ-SED-03 and RSJ-SW-03. Sample RSJ-SED-03 was collected as follows: An unused- single-use ~~plastic~~ mtt plastic scoop was used to brush the organic top covering of the soil away from the sample location. The scoop was then used to transfer sediment from approximately 0-2 inches beneath the

Melinda Luethe

surface of the ground into an un-used, unpreserved sample container. The sample was placed in a plastic bag and placed in a cooler. Prior to sealing the sample container, the sample was screened using a Ludlum Model 19 micro R meter. The result of the screening was 8 uR/hr. Sample RSJ-SW-03 was collected as follows: 2 pre-preserved poly sample bottles (unused, containing HNO_3) and 1 pre-preserved poly sample bottle (unused, containing NaOH) were used to collect a grab sample from the stream. Prior to sealing the sample container, the sample was screened using a Ludlum Model 19 microR meter. The result of the screening was 8 uR/hr. The sample bottles were placed in plastic bags and placed in a cooler. ——————mtt
1050 Pueblo of Laguna Ringia shows

Melinda Luethe

Sampling Team 2 the location of where he would like soil samples collected using an auger. This location will be referred to as the Mesida Diversion Special Project. Pueblo of Laguna Ringia states that this area used to be a swamp/wetlands area and he would like to work on a reclamation project to return it to a wetland area. Pueblo of Laguna Ringia has previously discussed sampling at this location with START-3 Michelle Brown and EPA representatives Pueblo of Laguna Ringia will provide the auger for sampling. All parties discuss the sampling strategy. A surface sample will be collected (0-2 inches). Next, ~~a~~ 2 additional samples of greater depths (~ 3 feet, ~ 6 feet) will be collected). The auger will be placed in a plastic bag and transported to the comand post for decon prior to additional

Melinda Luther

Jackpile 20406.012.019.0514.01 7
TO-0019-10-02-02 03/02/10

sample collection using the auger (START-3 did not bring adequate decon supplies to decon the auger in the field, as all sample collection using the auger was planned for afternoon on 03/02/10.) EPA Turner verbally approves the sampling plan

1100 START-3 ML collects GPS coordinate for Mesida Diversion Special Project sample location. Saved on Trimble Unit as "Special project" ——— MLL

1103 START-3 ML collects sample "Special Project SED 0-2" " Sample was collected using a single use plastic scoop. Clean (new) gloves were worn during sample collection. The single use scoop was used to brush the organic layer off the surface of the sample location. Soil was then collected from the surface of the ground (~0-2 in.). Prior to closing the lid on the sample

Melinda Luther

container (unused, unpreserved), the sample was screened using a Ludlum Model 19 ~~Ro~~ microR Rad Meter. Sample Reading = 9.5 uR/hr. ~~START~~ ~~Pueblo of Laguna Rig~~ ~~used to auger the remove the~~

1110 Sample "Special Project SED 3'" was collected. Pueblo of Laguna Ringia used the auger to remove ~2.5 feet of soil from the sample location. The auger was then used to remove a final 6 in. of soil. START-3 M2 scooped the soil from the auger ~~using~~ wearing a new/clean pair of gloves, using a new single use plasic scoop into an unused, unpreserved sample container. Prior to closing the sample container, the sample was screened using a Ludlum Model 19 microR meter. Screening result = 8 uR/hour

Sample was placed in a plastic

melindaduether

bag.

1115 Collected sample "Special Project SED 5.5'" Sample was collected as previous sample ("special Project SED 3'"), ~~going~~ collecting the final auger of soil from a depth of approx 5.5 ft. The screening result = 9 uR/hr. The sample was placed in a plastic ~~bg~~ bag

1125 All samples collected at sample location "Special Project SED" were sealed in a plastic bag and placed in a cooler

1130 Depart from sample location "Special project SED" to the command post for lunch break and to obtain additional sampling supplies/containers for the afternoon sampling

1447 Sampling Team 2 departs from the command post en route to sample location PR-SW-01

1510 Sampling Team 2 arrives at sample location PR-SW-01

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1900031

1525 START-3 ML collects GPS point for sample location PR-SW-01 (saved as "Location 3" in Trimble Unit) ——— MH

1526 START-3 Tori Gomez collects surface water sample PR-SW-01 in 2 1L poly containers and 1 250 mL poly container using the sampling technique described on page 5 of this book. Screening value = 9 μR/hr

1530 START-3 Tori Gomez collects sediment sample PR-SED-01 using the technique described on page 4 and page 5 of this book. Screening value = 9 μR/hr ——— MH

1540 Sampling Team 2 moves to sample location MD-SED. 4 samples will be collected from 4 depths (0-2', 2-4', 4-6', 6-8') using the previously utilized auger. The surface organic layer will be brushed from the

Melinda Luther

surface of the ground using a single use plastic scoop. The auger will be deconed inbetween collecting each sample as follows: All visible soil will be brushed from the auger. Nox solution will be used to clean the auger. The auger will be rinsed using DI water. The auger will be allowed to dry and wiped/dried with Kim wpes. Each sample will consist of 4 augers deep of soil (each auger end is 6 in.) The soil will be mixed by hand while wearing clean gloves. ~~A mixed~~ MH The mixed soil will be transferred to a single-use, unused, unpreserved poly sample bottle. Prior to closing the lid, the sample will be screened using a Ludlum micro R meter. The sample bottle will be placed in a plasic bag and stored in a cooler ——— MH

Melinda Luther

1900032

TO-0019-10-02-02 03/02/10

1550 Begin collecting sample MD-SED-0-2' as decribed on pg. 10-11 of this book.

1610 Sample MD-SED-0-2' Collected. Screening value = 17-20 uR/hr. ——— mdd

1611 Begin collecting MD-SED-2-4'. Collect 1.5 auger full of soil and hit rock. Unable to auger any deeper. Sample MD-SED-2-2.75' screened = 12 uR/hr. ——— mdd

1635 START-3 and EPA Turner discuss sampling options. All parties agree to try 1 additional location further from the dam ——— mdd

1645 Sample MD-SED-0-2'-02 collected as described on pg. 10-11 of this book. Screening value = 17-20 uR/hr.

1700 Sample MD-SED-2-4'-02 collected as described on pg. 10-11 of this book. Screening ——— Melinda Duette

TO-0019-10-02-02 03/02/10

value = 15-17 uR/hr. ——— mdd

1715 Sample MD-SED-4-6'-02 collected as described on pg. 10-11 of this book. screening value = 15-18 uR/hr

1720 START-3 has hit rock and is unable to auger any deeper. Cannot collect sample MD-SED-4-8'-02 ——— mdd

1745 Depart from sample location MD-SED-02 to return to command post. Sampling team was unable to collect GPS coordinates for MD-SED or MD-SED-02 because the Trimble Unit's batteries died- will return tomorrow - can identify locations by auger holes

START-3 Tori Gomez and START-3 James Beavis prepare rinsate blank for the auger using DI water ——— mdd

* END OF LOG DAY *

mdd ——— mdd

Melinda Duette

mdd ——— mdd

1900033

0715 START-3 departs from the hotel located in Grants, NM for the Weston San Mateo temporary office/command post in Grants, NM ——— mll

0720 START-3 and EPA arrive at the San Mateo Command post to process the samples collected on 2 March 2010 for shipment to the laboratory

0735 START-3 representatives complete sample processing and ~~p~~ depart for the Pueblo of Laguna Comand posst ——— mll

0911 START-3 arrives at the Command Post

~~1030~~ 0930 Sampling Team 2 (START-3 Melinda Luethe, START-3 Tori Gomez, EPA Brenda Cook, and Pueblo of Laguna Dorothy Beecher) depart for sample location RP-SW-02

1030 START-3 Tori Gomez collects samples RP-SW-02 and RP-SED-02 according to the

Melinda Luethe

sampling technique on page 4 and 5 of this book. MS/MSD samples are also collected at this location (Triple sample bottles collected). GPS coordinate recorded by START-3 Luethe: N 35 06 11.10180, W 107 19 29.21544. Screening = 8 uR/hr.

1103 Sample Team 2 departs from Sample location RP-SW-02

1107 Sample Team 2 arrives at sample location RP-SW-01

1135 START-3 Tori Gomez collects Samples RP-SW-01 and RP-SED-01 according to the sampling technique on page 4 and 5 of this book. Duplicate samples are also collected at this location (Double sample bottles collected) GPS coordinates recorded by START-3 Luethe as follows: N 35 07 23.95340, W 107 20 11.51130. Screening value = 18 uR/hr ——— mll

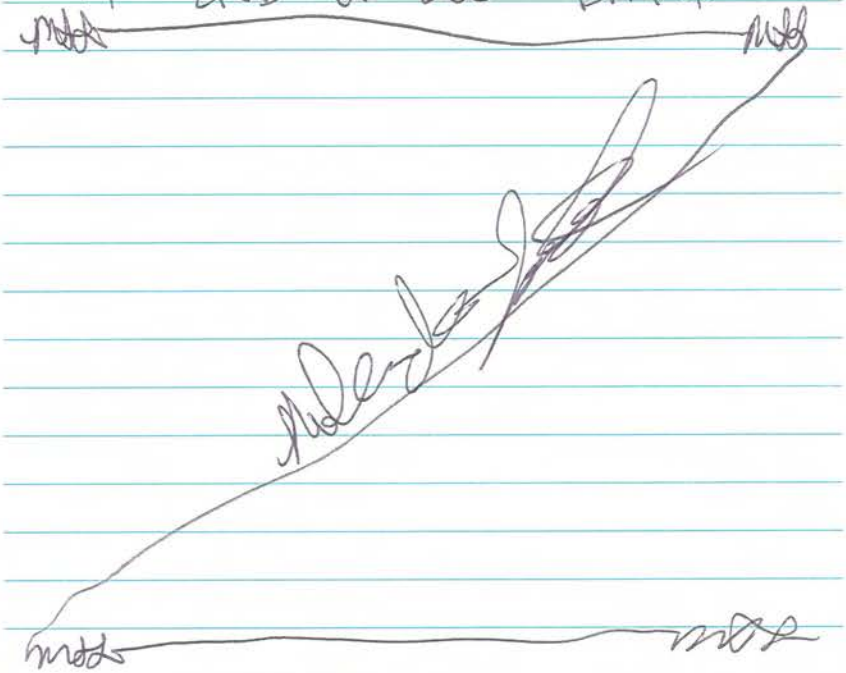
1157 Depart from sample location RP-SW-01 ——— mll

Melinda Luethe

1900034

1213 Sampling Team 2 arrives at command post —— mdd
1225 Depart from the command post for lunch —— mdd
1335 Arrive at the command post —— mdd
1345 Sampling Team 2 leaves from the command post for JM-SED-02 —— mdd
1535 START-3 Tori Gomez collects samples JM-SED-02 and JM-SW-02 according the the sampling procedure described on pages 4 and 5 of this book. START-3 Luethe collects a GPS point (saved on Trimble unit as JM-SW-02) Screening value = 20 uR/hr. The Camera will not take a picture (Error = Focus error). Pictures taken on START-3 Gomez phone —— mdd
1600 Sampling Team 2 leaves sampling location JM-SED-02
—— melinda luethe

1605 Sampling Team 2 arrives at Sample location JM-SS-01
1610 keys are locked in vehicle
- Attempt to have on-star unlock the vehicle 2 times - unsuccessful
- Return to command post - leave rental vehicle behind
2300 AAA successfully unlocked vehicle. All parties leave the site —— mdd
* END OF LOG DAY *
mdd —— mdd



1900035

0800 START-3 and EPA departs from the hotel in Grants, NM to the command post in the Pueblo of Laguna, NM ——— MH
0830 Arrive at the command post ——— MH
0911 START-3 Luethe and Gomez and EPA Turner depart for sampling location PR-SW-01 to obtain a GPS point which had previously not saved due to power issues ——— MH
0925 Sampling Team 2 arrives at sampling location PR-SW-01
0935 START-3 Luethe collects GPS point as follows:
N 35 04 26.22143 ——— MH
W 107 19 38.88973 ——— MH
START-3 Gomez releases samples MD-SED-0-2' and MD-SED-2-2.75' at the sample locations (EPA and START-3 agreed to not analyze these samples). Also, START-3 Gomez releases ——— MH Luethe

the decon water used to decon the auger at the sample location.
0955 Sampling Team 2 returns to the command post ——— MH
* All additional site activities will be recorded in the main site logbook maintained by START-3 Michelle Brown. All field activities for Sampling Team 2 are completed. See page 24 for equipment calibration information and page 25-26 for photo log * ——— MH
* END OF LOG DAY *
MH ——— MH
Michelle Luethe
MH ——— MH

1900036

Jackpile
TO-0019-10-02-02

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Melinda Stutts

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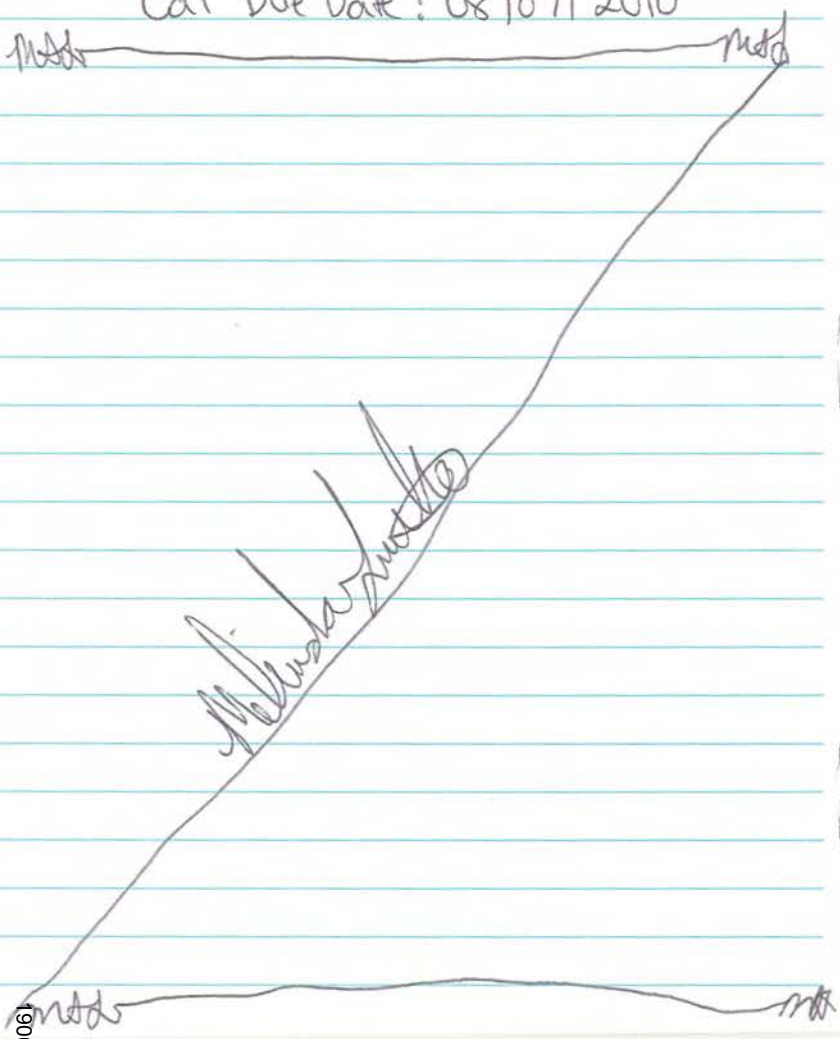
1900038

Jackpile 204016.012.019.0514.01
TO-0019-10-02-02

Equipment Calibration Data
23677
- Ludlum Model 19
Cal Date: 08/07/2009
Cal Due Date: 08/07/2010



Jackpile 204016.012019.0514.01
TO-0019-10-02-02

Photo Log

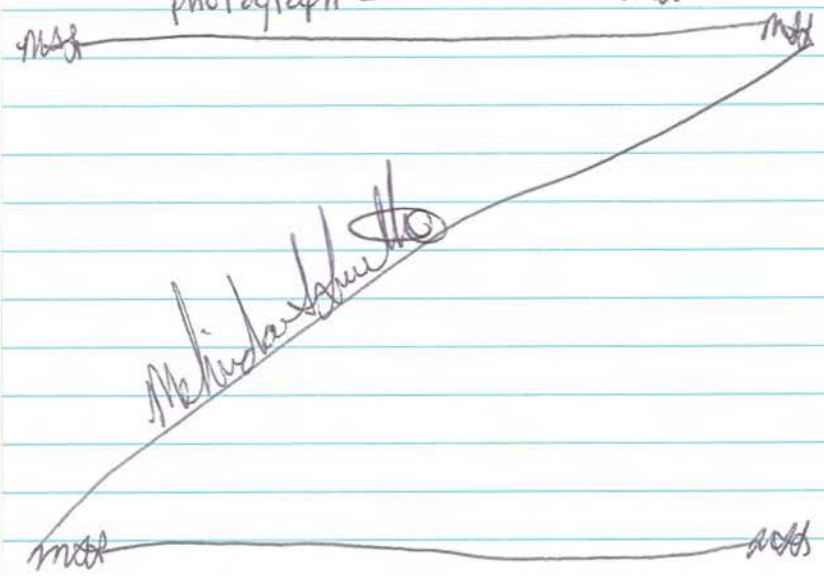
	Time	Photo/W.t.	Direct.		Descript.
DSCF2011	03/2/10 0940	ML/TG	N/A		Sampling Equip.
DSCF2012	DELETED - OVEREXPOSED				
DSCF2013	DELETED - OVEREXPOSED				
DSCF2014	3/2/10 1141	TG/ML			RSJ-SED-03 Loc.
DSCF2015	3/2/10 1141	TG/ML			RSJ-SED-03 Loc
DSCF2016	3/2/10 1208	TG/ML			Special Project Loc.
DSCF2017	3/2/10 1209	TG/ML			ML collecting Spec. Proj.
DSCF2018	3/2/10 1213	TG/ML			Special project loc.
DSCF2019	3/2/10 1619	TG/ML	SE		PR-SW-01 Loc
DSCF2020	DELETED - BLACK SCREEN				
DSCF2021	DELETED - BLACK SCREEN				
DSCF2022	3/2/10 1632	TG/ML	SE		PR-SW-01 Loc
DSCF2023	3/2/10 1632	TG/ML	SE		PR-SW-01 Loc.
DSCF2024	3/2/10 1652	ML/TG			MD-SED-0-2' Loc.
DSCF2025	3/2/10 1738	ML/TG			MD-SED-0-2' collect
DSCF2026	3/2/10 1738	ML/TG			MD-SED-0-2' collect.
DSCF2027	3/3/10 1020	TG/ML			RP-SW-02 Location
DSCF2028	3/3/10 ~~1133 no~~ 1020	TG/ML			RP-SW-02 Sampling
DSCF2029	3/3/10 1033	ML/TG			RP-SW-02 sampling
DSCF2030	3/3/10 ~~1212 no~~ 1112	ML/TG	W		RP-SW-01 location
DSCF2031	3/3/10 1112	ML/TG	E		RP-SW-01 location
DSCF2032	3/3/10 1112	ML/TG	N		RP-SW-01 location
DSCF2033	3/3/10 1113	ML/TG	E		RP-SW-01 location
DSCF2034	3/3/10 1113	ML/TG	S		RP-SW-01 location

Jackpile

TO-0019-10-02-02

DSCF2035	3/3/10	1140	DB/ML	S	RP-SW-01 sampling
DSCF2036	3/3/10	1141	DB/ML	W	RP-SW-01 sampling
DSCF2037	3/3/10	1141	DB/ML	N	RP-SW-01 sampling
DSCF2038	3/3/10	1427 ~~1227~~	ML/TG		view from mesa
DSCF2039	3/3/10	1427	ML/TG		view from mesa

* Camera is 1 year behind (says 2009, is 2010) and 12 hours ahead (says AM, should be PM the ~~per~~ previous day) Dates/times are correct in logbook, but incorrect on the digital date/time stamp on each digital photograph



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1900041

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

March 16, 2010

Ms. Kristie Warr
Weston Solutions, Inc.
5599 San Felipe, Stuite 700
Houston, TX 77056

Re:		
	ALS Workorder:	10-03-045
	Project Name:	Paguate
	Project Number:	TO0019100202

Dear Ms. Warr:

Ten water and fifteen sediment samples were received from Weston Solutions, Inc. on March 4, 2010. The samples were scheduled for the following analyses:

Metals	pages 1-491
Inorganics	pages 1-38
Total Uranium	pages 1-167

The results for these analyses are contained in the enclosed reports.

Thank you for your confidence in ALS Laboratory Group. Should you have any questions, please call.

Sincerely,

ALS Laboratory Group
for Lance Steere
Senior Project Manager

LRS/eh
Enclosure (s): Report

200001

ALS Laboratory Group -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1003045
Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Rinsate 030210	1003045-1		WATER	02-Mar-10	18:20
RM-SED-BG	1003045-2		SEDIMEN	02-Mar-10	10:12
RM-SW-BG	1003045-3		WATER	02-Mar-10	10:12
RSJ-SED-03	1003045-4		SEDIMEN	02-Mar-10	10:37
RSJ-SED-BG	1003045-5		SEDIMEN	02-Mar-10	11:46
RSJ-SW-03	1003045-6		WATER	02-Mar-10	10:37
RSJ-SW-BG	1003045-7		WATER	02-Mar-10	11:46
MD-SED-0-2'	1003045-8		SEDIMEN	02-Mar-10	16:45
MD-SED-2-4'	1003045-9		SEDIMEN	02-Mar-10	17:00
MD-SED-4-6'	1003045-10		SEDIMEN	02-Mar-10	17:15
PR-SED-01	1003045-11		SEDIMEN	02-Mar-10	15:30
RP-SED-BG	1003045-12		SEDIMEN	02-Mar-10	9:29
RP-SED-BGD	1003045-13		SEDIMEN	02-Mar-10	9:29
RP-SW-BG	1003045-14		WATER	02-Mar-10	9:29
RP-SW-BGD	1003045-15		WATER	02-Mar-10	9:29
RSJ-SED-02	1003045-16		SEDIMEN	02-Mar-10	15:15
WR-SED-0-2'	1003045-17		SEDIMEN	02-Mar-10	11:03
WR-SED-3'	1003045-18		SEDIMEN	02-Mar-10	11:10
WR-SED-5.5'	1003045-19		SEDIMEN	02-Mar-10	11:15
PR-SW-01	1003045-20		WATER	02-Mar-10	15:26
RP-SED-03	1003045-21		SEDIMEN	02-Mar-10	17:10
RP-SW-03	1003045-22		WATER	02-Mar-10	17:10
RSJ-SED-01	1003045-23		SEDIMEN	02-Mar-10	16:13
RSJ-SW-01	1003045-24		WATER	02-Mar-10	16:13
RSJ-SW-02	1003045-25		WATER	02-Mar-10	15:15

200002

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0005

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
(1)	Rinsate 030210	TAL Metals + Mercury	3	Days	Water	3/2/2010	18:20	1	1 L poly	HNO3 pH<2		
	Rinsate 030210	Total Cyanide	3	Days	Water	3/2/2010	18:20	1	250 mL	NaOH		
	Rinsate 030210	Isotopic Uranium	3	Days	Water	3/2/2010	18:20	1	1 L poly	HNO3 pH<2		
(2)	RM-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	10:12	1	16 oz	4 C	24uR/hr	
(3)	RM-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	10:12	1	1 L poly	HNO3 pH<2	24 uR/hr	
	RM-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	10:12	1	250 mL	NaOH	24 uR/hr	
	RM-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	10:12	1	1 L poly	HNO3 pH<2	24 uR/hr	
(4)	RSJ-SED-03	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	10:37	1	16 oz	4 C	8 uR/hr	
(5)	RSJ-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:46	1	16 oz	4 C	23 uR/hr	
(6)	RSJ-SW-03	TAL Metals + Mercury	3	Days	Water	3/2/2010	10:37	1	1 L poly	HNO3 pH<2	8 uR/hr	
	RSJ-SW-03	Total Cyanide	3	Days	Water	3/2/2010	10:37	1	250 mL	NaOH	8 uR/hr	
	RSJ-SW-03	Isotopic Uranium	3	Days	Water	3/2/2010	10:37	1	1 L poly	HNO3 pH<2	8 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

200003

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0005

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
(7)	RSJ-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	11:46	1	1 L poly	HNO3 pH<2	23 uR/hr	
↓	RSJ-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	11:46	1	250 mL	NaOH	23 uR/hr	
	RSJ-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	11:46	1	1 L poly	HNO3 pH<2	23 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3.4.10	755						

200004

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0004

Site #: TO0019100202

Contact Name: Weston Solutions, Inc.

Contact Phone: Kristie Warr 832.444.7976.

Lab: ALS

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
8	MD-SED-0-2'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	16:45	1	16 oz	4 C	20 uR/hr	
9	MD-SED-2-4'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:00	1	16 oz	4 C	17 uR/hr	
10	MD-SED-4-6'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:15	1	16 oz	4 C	18 uR/hr	
11	PR-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	15:30	1	16 oz	4 C	9 uR/hr	
12	RP-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	09:29	1	16 oz	4 C	20 uR/hr	
13	RP-SED-BGD	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	09:29	1	16 oz	4 C	20 uR/hr	
14	RP-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
↓	RP-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	09:29	1	250 mL	NaOH	20 uR/hr	
↓	RP-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
15	RP-SW-BGD	TAL Metals + Mercury	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
↓	RP-SW-BGD	Total Cyanide	3	Days	Water	3/2/2010	09:29	1	250 mL	NaOH	20 uR/hr	
↓	RP-SW-BGD	Isotopic Uranium	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
16	RSJ-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	15:15	1	16 oz	4 C	28 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

200005

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0004

Site #: TO0019100202

Contact Name: Weston Solutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832.444.7976.

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
17	WR-SED-0-2'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:03	1	16 oz	4 C	9.5 uR/hr	
18	WR-SED-3'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:10	1	16 oz	4 C	8 uR/hr	
19	WR-SED-5.5'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:15	1	16 oz	4 C	9 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

200006

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/02/10-0001

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
20	PR-SW-01	TAL Metals + Mercury	3	Days	Water	3/2/2010	15:26	1	1 L poly	HNO3 pH<2	9 uR/hr	
	PR-SW-01	Total Cyanide	3	Days	Water	3/2/2010	15:26	1	250 mL	NaOH	9 uR/hr	
	PR-SW-01	Isotopic Uranium	3	Days	Water	3/2/2010	15:26	1	1 L poly	HNO3 pH<2	9 uR/hr	
21	RP-SED-03	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:10	1	16 oz	4 C	22 uR/hr	
22	RP-SW-03	TAL Metals + Mercury	3	Days	Water	3/2/2010	17:10	1	1 L poly	HNO3 pH<2	22 uR/hr	
	RP-SW-03	Total Cyanide	3	Days	Water	3/2/2010	17:10	1	250 mL	NaOH	22 uR/hr	
	RP-SW-03	Isotopic Uranium	3	Days	Water	3/2/2010	17:10	1	1 L poly	HNO3 pH<2	22 uR/hr	
23	RSJ-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	16.13	1	16 oz	4 C	16 uR/hr	
24	RSJ-SW-01	TAL Metals + Mercury	3	Days	Water	3/2/2010	16:13	1	1 L poly	HNO3 pH<2	23 uR/hr	
	RSJ-SW-01	Total Cyanide	3	Days	Water	3/2/2010	16:13	1	250 mL	NaOH	23 uR/hr	
	RSJ-SW-01	Isotopic Uranium	3	Days	Water	3/2/2010	16:13	1	1 L poly	HNO3 pH<2	23 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

200007

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/02/10-0001

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
29	RSJ-SW-02	TAL Metals + Mercury	3	Days	Water	3/2/2010	15:15	1	1 L poly	HNO3 pH<2	28 uR/hr	
	RSJ-SW-02	Total Cyanide	3	Days	Water	3/2/2010	15:15	1	250 mL	NaOH	28 uR/hr	
	RSJ-SW-02	Isotopic Uranium	3	Days	Water	3/2/2010	15:15	1	1 L poly	HNO3 pH<2	28 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

200008

ALS Laboratory Group - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003045

Project Manager: LS Initials: COT Date: 3-4-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	N/A	(YES)	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	N/A	(YES)	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		(YES)	NO
18. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 (#4)	RAD ONLY	(YES)	NO

Cooler #:	1	2	3					
Temperature (°C):	3.2	3.8	4.8					
No. of custody seals on cooler:	2	2	2					
DOT Survey/ Acceptance Information — External µR/hr reading:	12	13	13					
Background µR/hr reading:	11							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

Samples RP-SED-BGD + RP-SW-BGD had 0931 as the time on the label. (13) 0929 on COC.

200009

If applicable, was the client contacted? (YES) / NO / NA Contact: Kristen w/ Michelle B Date/Time: 3/4

Project Manager Signature / Date: 3/4/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r22.xls (6/1/09)

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway Suite 850

Dallas, TX 75254

FedEx Express

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

13
2-
4.8°

SHIP TO: (970) 490-1511 **BILL SENDER**

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

1 of 3

TRK# |0201| 7984 3972 8917

MASTER

THU - 04 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com.FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim.Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic valueof the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss.Maximum for items of extraordinary value is $500, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

2000010

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

3.20 12 2-

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

3 of 3

MPS# |0263| 7984 3972 8972

Mstr# 7984 3972 8917 |0201

THU - 04 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

After printing this label:
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2000011

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

13
2

SHIP TO: (970) 490-1511 **BILL SENDER**

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

2 of 3

MPS# [0263] 7984 3972 8939

Mstr# 7984 3972 8917 [0201]

THU - 04 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

3.8

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

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2000012

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division
Fort Collins, Colorado

Inorganics

Case Narrative

Weston Solutions, Inc.

Paguate -- TO0019100202

Work Order Number: 1003045

1. This report consists of 10 water samples and 15 sediment samples.

2. The samples were received cool and intact by ALS on 03/04/10.

3. The water samples had a pH ranging from approximately 9 to 12 at the time of the total cyanide analysis.

4. The samples were prepared for analysis based on SW-846, 3rd Edition procedures. Sediment was not visible in the water samples. Samples 1003045-2, -5, -11, -16, -21, and -23 were sediment samples that contained standing water. These samples were stirred prior to aliquotting.

5. The samples were analyzed following SW-846 procedures for the following methods:

Analyte	Method	SOP #
Total cyanide	9014	1110 Rev 13

6. All standards and solutions were used within their recommended shelf life.

7. The samples were prepared and analyzed within the established hold time for this analysis.

All in house quality control procedures were followed, as described below.

8. General quality control procedures.

   - A preparation (method) blank and laboratory control sample (LCS) were prepared and analyzed with the samples in each preparation batch. There were not more than 20 samples in each preparation batch.

- The method blank associated with each batch was below the reporting limit for the requested analyte. This indicates that no contaminants were introduced to the samples during preparation and analysis.
- The LCS was within the acceptance limits for each batch.
- All initial and continuing calibration blanks (ICB/CCB) associated with each analytical batch were below the reporting limit for the requested analyte.
- All initial and continuing calibration verifications (ICV/CCV) associated with each analytical batch were within the acceptance criteria for the requested analyte. This indicates a valid calibration and stable instrument conditions.

9. Matrix specific quality control procedures.

   Sample 1003045-6 was designated as the quality control sample for the water analysis. Sample 1003045-2 was designated as the quality control sample for the sediment analysis.

   Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

   - A matrix spike (MS) and matrix spike duplicate (MSD) were prepared and analyzed with each batch. All guidance criteria for precision and accuracy were met.

10. Sample dilutions were not required for the requested analyses.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Megan Johnson — 3/10/10
Megan Johnson
Inorganics Primary Data Reviewer
Date

Inorganics Final Data Reviewer — 3/9/10
Inorganics Final Data Reviewer
Date

2000014

Inorganic Data Reporting Qualifiers

The following qualifiers are used by the laboratory when reporting results of inorganic analyses.

- Concentration qualifier -- If the analyte was analyzed for but not detected a “U” is entered.
- QC qualifier -- Specified entries and their meanings are as follows:

  N - Spiked sample recovery not within control limits.

  * - Duplicate analysis (relative percent difference) not within control limits.

  Z - Calibration spike recovery not within control limits.

Chain of Custody

2000016

ALS Laboratory Group -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1003045
Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Rinsate 030210	1003045-1		WATER	02-Mar-10	18:20
RM-SED-BG	1003045-2		SEDIMEN	02-Mar-10	10:12
RM-SW-BG	1003045-3		WATER	02-Mar-10	10:12
RSJ-SED-03	1003045-4		SEDIMEN	02-Mar-10	10:37
RSJ-SED-BG	1003045-5		SEDIMEN	02-Mar-10	11:46
RSJ-SW-03	1003045-6		WATER	02-Mar-10	10:37
RSJ-SW-BG	1003045-7		WATER	02-Mar-10	11:46
MD-SED-0-2'	1003045-8		SEDIMEN	02-Mar-10	16:45
MD-SED-2-4'	1003045-9		SEDIMEN	02-Mar-10	17:00
MD-SED-4-6'	1003045-10		SEDIMEN	02-Mar-10	17:15
PR-SED-01	1003045-11		SEDIMEN	02-Mar-10	15:30
RP-SED-BG	1003045-12		SEDIMEN	02-Mar-10	9:29
RP-SED-BGD	1003045-13		SEDIMEN	02-Mar-10	9:29
RP-SW-BG	1003045-14		WATER	02-Mar-10	9:29
RP-SW-BGD	1003045-15		WATER	02-Mar-10	9:29
RSJ-SED-02	1003045-16		SEDIMEN	02-Mar-10	15:15
WR-SED-0-2'	1003045-17		SEDIMEN	02-Mar-10	11:03
WR-SED-3'	1003045-18		SEDIMEN	02-Mar-10	11:10
WR-SED-5.5'	1003045-19		SEDIMEN	02-Mar-10	11:15
PR-SW-01	1003045-20		WATER	02-Mar-10	15:26
RP-SED-03	1003045-21		SEDIMEN	02-Mar-10	17:10
RP-SW-03	1003045-22		WATER	02-Mar-10	17:10
RSJ-SED-01	1003045-23		SEDIMEN	02-Mar-10	16:13
RSJ-SW-01	1003045-24		WATER	02-Mar-10	16:13
RSJ-SW-02	1003045-25		WATER	02-Mar-10	15:15

2000017

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0005

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
1	Rinsate 030210	TAL Metals + Mercury	3	Days	Water	3/2/2010	18:20	1	1 L poly	HNO3 pH<2		
	Rinsate 030210	Total Cyanide	3	Days	Water	3/2/2010	18:20	1	250 mL	NaOH		
	Rinsate 030210	Isotopic Uranium	3	Days	Water	3/2/2010	18:20	1	1 L poly	HNO3 pH<2		
2	RM-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	10:12	1	16 oz	4 C	24uR/hr	
3	RM-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	10:12	1	1 L poly	HNO3 pH<2	24 uR/hr	
	RM-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	10:12	1	250 mL	NaOH	24 uR/hr	
	RM-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	10:12	1	1 L poly	HNO3 pH<2	24 uR/hr	
4	RSJ-SED-03	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	10:37	1	16 oz	4 C	8 uR/hr	
5	RSJ-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:46	1	16 oz	4 C	23 uR/hr	
6	RSJ-SW-03	TAL Metals + Mercury	3	Days	Water	3/2/2010	10:37	1	1 L poly	HNO3 pH<2	8 uR/hr	
	RSJ-SW-03	Total Cyanide	3	Days	Water	3/2/2010	10:37	1	250 mL	NaOH	8 uR/hr	
	RSJ-SW-03	Isotopic Uranium	3	Days	Water	3/2/2010	10:37	1	1 L poly	HNO3 pH<2	8 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trumble	3-4-10	755						

2000018

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0005

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
7	RSJ-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	11:46	1	1 L poly	HNO3 pH<2	23 uR/hr	
↓	RSJ-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	11:46	1	250 mL	NaOH	23 uR/hr	
	RSJ-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	11:46	1	1 L poly	HNO3 pH<2	23 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trumble	3.4.10	755						

2000019

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0004

Site #: TO0019100202

Contact Name: Weston Solutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832.444.7976.

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
8	MD-SED-0-2'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	16:45	1	16 oz	4 C	20 uR/hr	
9	MD-SED-2-4'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:00	1	16 oz	4 C	17 uR/hr	
10	MD-SED-4-6'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:15	1	16 oz	4 C	18 uR/hr	
11	PR-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	15:30	1	16 oz	4 C	9 uR/hr	
12	RP-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	09:29	1	16 oz	4 C	20 uR/hr	
13	RP-SED-BGD	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	09:29	1	16 oz	4 C	20 uR/hr	
14	RP-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
	RP-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	09:29	1	250 mL	NaOH	20 uR/hr	
	RP-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
15	RP-SW-BGD	TAL Metals + Mercury	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
	RP-SW-BGD	Total Cyanide	3	Days	Water	3/2/2010	09:29	1	250 mL	NaOH	20 uR/hr	
	RP-SW-BGD	Isotopic Uranium	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
16	RSJ-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	15:15	1	16 oz	4 C	28 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	Cheryl Trumble	3-4-10			755						

2000020

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0004

Site #: TO0019100202

Contact Name: Weston Solutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832.444.7976.

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
17	WR-SED-0-2'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:03	1	16 oz	4 C	9.5 uR/hr	
18	WR-SED-3'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:10	1	16 oz	4 C	8 uR/hr	
19	WR-SED-5.5'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:15	1	16 oz	4 C	9 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

2000021

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/02/10-0001

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
20	PR-SW-01	TAL Metals + Mercury	3	Days	Water	3/2/2010	15:26	1	1 L poly	HNO3 pH<2	9 uR/hr	
	PR-SW-01	Total Cyanide	3	Days	Water	3/2/2010	15:26	1	250 mL	NaOH	9 uR/hr	
	PR-SW-01	Isotopic Uranium	3	Days	Water	3/2/2010	15:26	1	1 L poly	HNO3 pH<2	9 uR/hr	
21	RP-SED-03	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:10	1	16 oz	4 C	22 uR/hr	
22	RP-SW-03	TAL Metals + Mercury	3	Days	Water	3/2/2010	17:10	1	1 L poly	HNO3 pH<2	22 uR/hr	
	RP-SW-03	Total Cyanide	3	Days	Water	3/2/2010	17:10	1	250 mL	NaOH	22 uR/hr	
	RP-SW-03	Isotopic Uranium	3	Days	Water	3/2/2010	17:10	1	1 L poly	HNO3 pH<2	22 uR/hr	
23	RSJ-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	16:13	1	16 oz	4 C	16 uR/hr	
24	RSJ-SW-01	TAL Metals + Mercury	3	Days	Water	3/2/2010	16:13	1	1 L poly	HNO3 pH<2	23 uR/hr	
	RSJ-SW-01	Total Cyanide	3	Days	Water	3/2/2010	16:13	1	250 mL	NaOH	23 uR/hr	
	RSJ-SW-01	Isotopic Uranium	3	Days	Water	3/2/2010	16:13	1	1 L poly	HNO3 pH<2	23 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

2000022

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/02/10-0001

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
29	RSJ-SW-02	TAL Metals + Mercury	3	Days	Water	3/2/2010	15:15	1	1 L poly	HNO3 pH<2	28 uR/hr	
	RSJ-SW-02	Total Cyanide	3	Days	Water	3/2/2010	15:15	1	250 mL	NaOH	28 uR/hr	
	RSJ-SW-02	Isotopic Uranium	3	Days	Water	3/2/2010	15:15	1	1 L poly	HNO3 pH<2	28 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trumble	3-4-10	755						

2000023

ALS Laboratory Group - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003045

Project Manager: LS Initials: COT Date: 3-4-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	N/A	(YES)	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	N/A	(YES)	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		(YES)	NO
18. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 (#4)	RAD ONLY	(YES)	NO

Cooler #:	1	2	3					
Temperature (°C):	3.2	3.8	4.8					
No. of custody seals on cooler:	2	2	2					
DOT Survey/ Acceptance Information — External µR/hr reading:	12	13	13					
Background µR/hr reading:	11							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

SAMPLES RP-SED-BGD + RP-SW-BGD had 0931 as the time on the label. (13) 0929 on COC.

2000024

If applicable, was the client contacted? (YES) / NO / NA Contact: Kristie w/ Michelle B Date/Time: 3/4

Project Manager Signature / Date: 3/4/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r22.xls (6/1/09)

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway Suite 850

Dallas, TX 75254

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

13
2-
4.8°

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

1 of 3

TRK# 0201 7984 3972 8917

THU - 04 MAR A2
FIRST OVERNIGHT

MASTER

80524
CO-US
DEN

X1 FTCA

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com.FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim.Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic valueof the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss.Maximum for items of extraordinary value is $500, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

2000025

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

3.20 12 2-

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

3 of 3

MPS# 0263 7984 3972 8972

Mstr# 7984 3972 8917 0201

THU - 04 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

After printing this label:
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2000026

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

13
2-

SHIP TO: (970) 490-1511 **BILL SENDER**

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

2 of 3

MPS# |0263| 7984 3972 8939

Mstr# 7984 3972 8917 |0201

THU - 04 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

3.8

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim.Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic valueof the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss.Maximum for items of extraordinary value is $500, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

2000027

Sample Results

2000028

CYANIDE, TOTAL

Method SW9014

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003045
Reporting Basis: As Received
Prep Method: SW9010
Final Volume: 50 ml
Matrix: WATER
Result Units: MG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
Rinsate 030210	1003045-1	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml
RM-SW-BG	1003045-3	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml
RSJ-SW-03	1003045-6	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml
RSJ-SW-BG	1003045-7	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml
RP-SW-BG	1003045-14	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml
RP-SW-BGD	1003045-15	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml
PR-SW-01	1003045-20	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml
RP-SW-03	1003045-22	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml
RSJ-SW-01	1003045-24	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml
RSJ-SW-02	1003045-25	03/02/2010	03/05/2010	03/05/2010	N/A	1	0.01	0.01	U	50 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *cn1003045-1*

2000029

CYANIDE, TOTAL

Method SW9014

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003045
Reporting Basis: Dry Weight
Prep Method: SW9010B
Final Volume: 50 ml
Matrix: SEDIMENT
Result Units: MG/KG

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
RM-SED-BG	1003045-2	03/02/2010	03/08/2010	03/08/2010	35.4	1	0.77	0.77	U	1 g
RSJ-SED-03	1003045-4	03/02/2010	03/08/2010	03/08/2010	8.0	1	0.54	0.54	U	1 g
RSJ-SED-BG	1003045-5	03/02/2010	03/08/2010	03/08/2010	29.2	1	0.71	0.71	U	1 g
MD-SED-0-2'	1003045-8	03/02/2010	03/08/2010	03/08/2010	25.8	1	0.67	0.67	U	1 g
MD-SED-2-4'	1003045-9	03/02/2010	03/08/2010	03/08/2010	16.4	1	0.6	0.6	U	1 g
MD-SED-4-6'	1003045-10	03/02/2010	03/08/2010	03/08/2010	16.9	1	0.6	0.6	U	1 g
PR-SED-01	1003045-11	03/02/2010	03/08/2010	03/08/2010	21.5	1	0.64	0.64	U	1 g
RP-SED-BG	1003045-12	03/02/2010	03/08/2010	03/08/2010	29.6	1	0.71	0.71	U	1 g
RP-SED-BGD	1003045-13	03/02/2010	03/08/2010	03/08/2010	35.8	1	0.78	0.78	U	1 g
RSJ-SED-02	1003045-16	03/02/2010	03/08/2010	03/08/2010	40.2	1	0.84	0.84	U	1 g
WR-SED-0-2'	1003045-17	03/02/2010	03/08/2010	03/08/2010	5.1	1	0.53	0.53	U	1 g
WR-SED-3'	1003045-18	03/02/2010	03/08/2010	03/08/2010	19.9	1	0.62	0.62	U	1 g
WR-SED-5.5'	1003045-19	03/02/2010	03/08/2010	03/08/2010	19.5	1	0.62	0.62	U	1 g
RP-SED-03	1003045-21	03/02/2010	03/08/2010	03/08/2010	39.4	1	0.83	0.83	U	1 g
RSJ-SED-01	1003045-23	03/02/2010	03/08/2010	03/08/2010	22.8	1	0.65	0.65	U	1 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *cn1003045-1*

2000030

QC and Summary Report Forms

2000031

Total Cyanide

Method SW9014

Method Blank

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CN100305-1MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 05-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW9010

Prep Batch: CN100305-2
QCBatchID: CN100305-2-1
Run ID: cn100305-1a
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
57-12-5	CYANIDE, TOTAL	1	0.01	0.01	U	

2000032

Data Package ID: *cn1003045-1*

Total Cyanide

Method SW9014

Method Blank

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CN100308-1MB

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 08-Mar-10
Date Analyzed: 08-Mar-10
Prep Method: SW9010 Rev B

Prep Batch: CN100308-1
QCBatchID: CN100308-1-1
Run ID: cn100308-1a
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
57-12-5	CYANIDE, TOTAL	1	0.5	0.5	U	

2000033

Data Package ID: *cn1003045-1*

Total Cyanide

Method SW9014

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: CN100305-1LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/05/2010
Date Analyzed: 03/05/2010
Prep Method: SW9010

Prep Batch: CN100305-2
QCBatchID: CN100305-2-1
Run ID: cn100305-1a
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
57-12-5	CYANIDE, TOTAL	0.4	0.382	0.01		95	85 - 115%

2000034

Data Package ID: *cn1003045-1*

Total Cyanide

Method SW9014

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CN100308-1LCS

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/08/2010
Date Analyzed: 03/08/2010
Prep Method: SW9010B

Prep Batch: CN100308-1
QCBatchID: CN100308-1-1
Run ID: cn100308-1a
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
57-12-5	CYANIDE, TOTAL	20	18.1	0.5		90	85 - 115%

2000035

Data Package ID: *cn1003045-1*

Total Cyanide

Method SW9014

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RM-SED-BG
LabID: 1003045-2MS

Sample Matrix: SEDIMENT
% Moisture: 35.4
Date Collected: 02-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 08-Mar-10
Prep Method: SW9010 Rev B

Prep Batch: CN100308-1
QCBatchID: CN100308-1-1
Run ID: cn100308-1a
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: MG/KG
File Name: Manual Entry

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
57-12-5	CYANIDE, TOTAL	0.77	U	6.05		0.774	7.74	78	75 - 125%

Field ID: RM-SED-BG
LabID: 1003045-2MSD

Sample Matrix: SEDIMENT
% Moisture: 35.4
Date Collected: 02-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 08-Mar-10
Prep Method: SW9010 Rev B

Prep Batch: CN100308-1
QCBatchID: CN100308-1-1
Run ID: cn100308-1a
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: MG/KG
File Name: Manual Entry

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
57-12-5	CYANIDE, TOTAL	6.3		7.74	81	0.774	30	4

2000036

Data Package ID: *cn1003045-1*

Total Cyanide

Method SW9014

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SW-03
LabID: 1003045-6MS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 05-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW9010

Prep Batch: CN100305-2
QCBatchID: CN100305-2-1
Run ID: cn100305-1a
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
File Name: Manual Entry

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
57-12-5	CYANIDE, TOTAL	0.01	U	0.101		0.01	0.1	101	75 - 125%

Field ID: RSJ-SW-03
LabID: 1003045-6MSD

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 05-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW9010

Prep Batch: CN100305-2
QCBatchID: CN100305-2-1
Run ID: cn100305-1a
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
File Name: Manual Entry

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
57-12-5	CYANIDE, TOTAL	0.1		0.1	100	0.01	30	1

2000037

Data Package ID: *cn1003045-1*

CYANIDE, TOTAL

Method SW9014

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: CN100305-1A
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
ICV	Initial Calibration	3/5/2010		0.0999	0.0988	0.01	N/A	99	85 - 115
CCV2	Continuing Calibration	3/5/2010		0.2	0.202	0.01	N/A	101	85 - 115
CCV1	Continuing Calibration	3/5/2010		0.2	0.203	0.01	N/A	102	85 - 115

Data Package ID: *cn1003045-1*

CYANIDE, TOTAL

Method SW9014

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: CN100308-1A
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
ICV	Initial Calibration	3/8/2010		0.0999	0.0961	0.01	N/A	96	85 - 115
CCV2	Continuing Calibration	3/8/2010		0.2	0.22	0.01	N/A	110	85 - 115
CCV1	Continuing Calibration	3/8/2010		0.2	0.219	0.01	N/A	109	85 - 115

Data Package ID: *cn1003045-1*

CYANIDE, TOTAL

Method SW9014

Calibration Blanks

Lab Name: **ALS Laboratory Group -- FC**

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Run ID: CN100305-1A

Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Result	Reporting Limit	Flag
ICB	Initial Calibration	3/5/2010		0.01	0.01	U
CCB2	Continuing Calibration	3/5/2010		0.01	0.01	U
CCB1	Continuing Calibration	3/5/2010		0.01	0.01	U

Data Package ID: *cn1003045-1*

CYANIDE, TOTAL

Method SW9014

Calibration Blanks

Lab Name: **ALS Laboratory Group -- FC**

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Run ID: CN100308-1A

Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Result	Reporting Limit	Flag
ICB	Initial Calibration	3/8/2010		0.01	0.01	U
CCB2	Continuing Calibration	3/8/2010		0.01	0.01	U
CCB1	Continuing Calibration	3/8/2010		0.01	0.01	U

Data Package ID: *cn1003045-1*

Prep Batch ID: CN100305-2

Start Date: 03/05/10
Start Time: 8:30
Prep Analyst: Jason McNall

End Date: 03/05/10
End Time: 10:30

Concentration Method: NONE
Extract Method: SW9010
Initial Volume Units: ml
Final Volume Units: ml

Batch Created By: JBM
Date Created: 03/05/10
Time Created: 8:55
Validated By: EAL
Date Validated: 03/09/10
Time Validated: 10:37

Comments:

QC Batch ID: CN100305-2-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
CN100305-1	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003045
CN100305-1	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003045
CN100305-2	LCSD	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003045
1003045-6	MS	RSJ-SW-03	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-6	MSD	RSJ-SW-03	WATER	3/2/2010	50	50	NONE	1	1003045
1002212-18	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1002212
1002238-15	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1002238
1002238-18	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1002238
1002244-9	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1002244
1003045-1	SMP	Rinsate 030210	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-14	SMP	RP-SW-BG	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-15	SMP	RP-SW-BGD	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-20	SMP	PR-SW-01	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-22	SMP	RP-SW-03	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-24	SMP	RSJ-SW-01	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-25	SMP	RSJ-SW-02	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-3	SMP	RM-SW-BG	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-6	SMP	RSJ-SW-03	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-7	SMP	RSJ-SW-BG	WATER	3/2/2010	50	50	NONE	1	1003045

QC Types

CAR	Carrier reference sample		DUP	Laboratory Duplicate
LCS	Laboratory Control Sample		LCSD	Laboratory Control Sample Duplicat
MB	Method Blank		MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate		REP	Sample replicate
RVS	Reporting Level Verification Standar		SMP	Field Sample
SYS	Sample Yield Spike			

2000042

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Tuesday, March 09, 2010

Prep Batch ID: CN100308-1

Start Date: 03/08/10
Start Time: 10:00
Prep Analyst: Eric Allen Lintner

End Date: 03/08/10
End Time: 12:00

Concentration Method: NONE
Extract Method: SW9010B
Initial Volume Units: g
Final Volume Units: ml

Batch Created By: EAL
Date Created: 03/08/10
Time Created: 11:24
Validated By: EAL
Date Validated: 03/08/10
Time Validated: 13:12

Comments:

QC Batch ID: CN100308-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
CN100308-1	MB	XXXXXX	SEDIME	XXXXXX	1	50	NONE	1	1003045
CN100308-1	LCS	XXXXXX	SEDIME	XXXXXX	1	50	NONE	1	1003045
CN100308-1	LCSD	XXXXXX	SEDIME	XXXXXX	1	50	NONE	1	1003045
1003045-2	MS	RM-SED-BG	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-2	MSD	RM-SED-BG	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-10	SMP	MD-SED-4-6'	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-11	SMP	PR-SED-01	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-12	SMP	RP-SED-BG	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-13	SMP	RP-SED-BGD	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-16	SMP	RSJ-SED-02	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-17	SMP	WR-SED-0-2'	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-18	SMP	WR-SED-3'	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-19	SMP	WR-SED-5.5'	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-2	SMP	RM-SED-BG	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-21	SMP	RP-SED-03	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-23	SMP	RSJ-SED-01	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-4	SMP	RSJ-SED-03	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-5	SMP	RSJ-SED-BG	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-8	SMP	MD-SED-0-2'	SEDIME	3/2/2010	1	50	NONE	1	1003045
1003045-9	SMP	MD-SED-2-4'	SEDIME	3/2/2010	1	50	NONE	1	1003045

QC Types

CAR	Carrier reference sample	DUP	Laboratory Duplicate	
LCS	Laboratory Control Sample	LCSD	Laboratory Control Sample Duplicat	
MB	Method Blank	MS	Laboratory Matrix Spike	
MSD	Laboratory Matrix Spike Duplicate	REP	Sample replicate	
RVS	Reporting Level Verification Standar	SMP	Field Sample	
SYS	Sample Yield Spike			2000043

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Tuesday, March 09, 2010

Supporting Raw Data

2000044

CYANIDE, TOTAL Raw Data Worksheet

Anal Run ID **CN100305-1A**

Anal Start Date **3/5/2010** JBM

Calib Ref ID **CNCAL100305-1**

3/9/10

Slope	0.4722684
Intercept	-0.002703345
RSQ	0.9999294

Standard	Response	Soln Conc	Units
0	0.001	-0.002231077	mg/L
0.01	0.024	0.008631095	mg/L
0.05	0.113	0.05066298	mg/L
0.1	0.223	0.1026125	mg/L
0.2	0.432	0.2013166	mg/L
0.3	0.642	0.300493	mg/L
0.4	0.852	0.3996693	mg/L
0.5	1.062	0.4988457	mg/L

Num	Don't Use	ReRun Num	Lab ID	QC Type	Anal Dil	Abs (578nm)	Soln Conc(mg/L)	pH	KI	Pb	Expected	%Rec	Prepared?
1	☐	0	ICV	ICV	1	0.215	0.09883436	NA	NA	NA	0.1	99	NO
2	☐	0	ICB	ICB	1	0	-0.0027033	NA	NA	NA			NO
3	☐	0	CN100305-1	MB	1	0.006	0.00013027	NA	NA	NA			YES
4	☐	0	CN100305-1	LCS	1	0.814	0.3817231	NA	NA	NA			YES
5	☐	0	CN100305-1	LCSD	1	0.431	0.2008443	NA	NA	NA			YES
6	☐	0	1002238-18	SMP	1	0.011	0.00249161	12	-	-			YES
7	☐	0	1002238-15	SMP	1	0.01	0.00201934	12	-	-			YES
8	☐	0	1002238-18	SMP	1	0.009	0.00154707	12	-	-			YES
9	☐	0	1002244-9	SMP	1	0.011	0.00249161	12	-	-			YES
10	☐	0	1003026-1	SMP	1	0.007	0.00060253	12	-	-			YES
11	☐	0	1003045-1	SMP	1	0.006	0.00013027	12	-	-			YES
12	☐	0	1003045-3	SMP	1	0.007	0.00060253	~11	-	-			YES
13	☐	0	CCV1	CCV	1	0.436	0.2032057	NA	NA	NA	0.2	102	NO
14	☐	0	CCB1	CCB	1	0.005	-0.0003420	NA	NA	NA			NO
15	☐	0	1003045-6	SMP	1	0.008	0.00107480	~11	-	-			YES
16	☐	0	1003045-6	MS	1	0.22	0.1011957	~11	-	-			YES
17	☐	0	1003045-6	MSD	1	0.218	0.1002512	~11	-	-			YES
18	☐	0	1003045-7	SMP	1	0.013	0.00343614	~11	-	-			YES
19	☐	0	1003045-14	SMP	1	0.011	0.00249161	12	-	-			YES
20	☐	0	1003045-15	SMP	1	0.008	0.00107480	~11	-	-			YES
21	☐	0	1003045-20	SMP	1	0.008	0.00107480	~9	-	-			YES
22	☐	0	1003045-22	SMP	1	0.008	0.00107480	~10	-	-			YES
23	☐	0	1003045-24	SMP	1	0.015	0.00438068	~11	-	-			YES
24	☐	0	1003045-25	SMP	1	0.008	0.00107480	~11	-	-			YES
25	☐	0	CCV2	CCV	1	0.434	0.2022611	NA	NA	NA	0.2	101	NO
26	☐	0	CCB2	CCB	1	0.005	-0.0003420	NA	NA	NA			NO

JBM

2000045

Anal Run ID **CN100305-1A**

Anal Start Date **3/5/2010**

Num	Don't Use	ReRun Num	Lab ID	QC Type	Anal Dil	Abs (578nm)	Soln Conc(mg/L)	pH	KI	Pb	Expected	%Rec	Prepared?

Comments: PREPPED 3/5/10 0830-1030 (JBM)
ANLAYZED 3/5/2010 1100-1230 (JBM)

Standards, Batch QC, and Matrix Spike Information

ID	Parent ID	Parent Conc	Parent Vol.	Final Vol.
0.50 mg/L CN	*	10 mg/L CN	0.5	10
0.40 mg/L CN	*	10 mg/L CN	0.4	10
0.30 mg/L CN	*	10 mg/L CN	0.3	10
0.20 mg/L CN	*	10 mg/L CN	0.2	10
0.10 mg/L CN	*	10 mg/L CN	0.1	10
0.05 mg/L CN	*	10 mg/L CN	0.05	10
0.01 mg/L CN	*	10 mg/L CN	0.01	10
LCS(0.4mg/L CN)	*	10 mg/L CN	2	50
LCSD (0.2mg/L CN)	*	10 mg/L CN	1	50
MS/MSD (0.1mg/L CN)	*	10 mg/L CN	0.5	50
LCS (20mg/kg CN)	*	100 mg/kg CN	2	50
LCSD (10mg/kg CN)	*	100 mg/kg CN	1	50
MS/MSD (5mg/kg CN)	*	100 mg/kg CN	0.5	50
ICV (0.10 mg/L CN)	**	10 mg/L CN	0.1	10
CCV (0.20 mg/L CN)	*	10 mg/L CN	0.2	10
REAC LCS	***	1000 mg/L	10.0	100

Reagent List:

50% H2SO4	**RG091117-1**
0.25 N NaOH	**RG100219-1**
Sand	**RG090807-1**
NaH2PO4 Solution	**RG100305-3**
Chloramine-T Solution	**RG050411-1**
Pyridine-Barbituric Acid	**RG100126-2**
CN Parent Std(*)	**ST100205-1**
CN 2nd Source Std(**)	**ST100205-2**
51% MgCL2	
Acetate Buffer	
ZN Acetate Solution	

JBM
3/5/10

2000046

CYANIDE, TOTAL Raw Data Worksheet

Anal Run ID **CN100308-1A**

Anal Start Date **3/8/2010**

Calib Ref ID **CNCAL100308-1**

3/8/10

Standard	Response	Soln Conc	Units
0	0.007	-0.002482716	mg/L
0.01	0.029	0.00765642	mg/L
0.05	0.113	0.04636949	mg/L
0.1	0.24	0.1049	mg/L
0.2	0.476	0.2136652	mg/L
0.3	0.643	0.2906305	mg/L
0.4	0.884	0.4017001	mg/L
0.5	1.092	0.497561	mg/L

Slope	0.4608698
Intercept	-0.005708804
RSQ	0.9986626

Num	Don't Use	ReRun Num	Lab ID	QC Type	Anal Dil	Abs (578nm)	Soln Conc(mg/L)	pH	KI	Pb	Expected	%Rec	Prepared?
1	☐	0	ICV	ICV	1	0.221	0.09614342	NA	NA	NA	0.1	96	NO
2	☐	0	ICB	ICB	1	0.007	-0.0024827	NA	NA	NA			NO
3	☐	0	CN100308-1	MB	1	0.004	-0.0038653	NA	NA	NA			YES
4	☐	0	CN100308-1	LCS	1	0.797	0.3616044	NA	NA	NA			YES
5	☐	0	CN100308-1	LCSD	1	0.434	0.1943087	NA	NA	NA			YES
6	☐	0	1003045-2	SMP	1	0.007	-0.0024827	NA	NA	NA			YES
7	☐	0	1003045-2	MS	1	0.182	0.0781695	NA	NA	NA			YES
8	☐	0	1003045-2	MSD	1	0.189	0.08139559	NA	NA	NA			YES
9	☐	0	1003045-4	SMP	1	0.009	-0.001561	NA	NA	NA			YES
10	☐	0	1003045-5	SMP	1	0.006	-0.0029436	NA	NA	NA			YES
11	☐	0	1003045-8	SMP	1	0.01	-0.0011001	NA	NA	NA			YES
12	☐	0	1003045-9	SMP	1	0.008	-0.0020218	NA	NA	NA			YES
13	☐	0	CCV1	CCV	1	0.487	0.2187348	NA	NA	NA	0.2	109	NO
14	☐	0	CCB1	CCB	1	0.006	-0.0029436	NA	NA	NA			NO
15	☐	0	1003045-10	SMP	1	0.007	-0.0024827	NA	NA	NA			YES
16	☐	0	1003045-11	SMP	1	0.005	-0.0034045	NA	NA	NA			YES
17	☐	0	1003045-12	SMP	1	0.004	-0.0038653	NA	NA	NA			YES
18	☐	0	1003045-13	SMP	1	0.007	-0.0024827	NA	NA	NA			YES
19	☐	0	1003045-16	SMP	1	0.008	-0.0020218	NA	NA	NA			YES
20	☐	0	1003045-17	SMP	1	0.006	-0.0029436	NA	NA	NA			YES
21	☐	0	1003045-18	SMP	1	0.006	-0.0029436	NA	NA	NA			YES
22	☐	0	1003045-19	SMP	1	0.008	-0.0020218	NA	NA	NA			YES
23	☐	0	1003045-21	SMP	1	0.008	-0.0020218	NA	NA	NA			YES
24	☐	0	1003045-23	SMP	1	0.008	-0.0020218	NA	NA	NA			YES
25	☐	0	CCV2	CCV	1	0.489	0.2196565	NA	NA	NA	0.2	110	NO
26	☐	0	CCB2	CCB	1	0.007	-0.0024827	NA	NA	NA			NO

2000047

3/8/10

Anal Run ID **CN100308-1A**

Anal Start Date **3/8/2010**

Num	Don't Use	ReRun Num	Lab ID	QC Type	Anal Dil	Abs (578nm)	Soln Conc(mg/L)	pH	KI	Pb	Expected	%Rec	Prepared?

Comments: PREPPED: 03/08/2010 1000-1200 (EAL)
ANALYZED: 03/08/2010 1230-1300 (EAL)

Standards, Batch QC, and Matrix Spike Information

ID	Parent ID	Parent Conc	Parent Vol.	Final Vol.
0.50 mg/L CN	*	10 mg/L CN	0.5	10
0.40 mg/L CN	*	10 mg/L CN	0.4	10
0.30 mg/L CN	*	10 mg/L CN	0.3	10
0.20 mg/L CN	*	10 mg/L CN	0.2	10
0.10 mg/L CN	*	10 mg/L CN	0.1	10
0.05 mg/L CN	*	10 mg/L CN	0.05	10
0.01 mg/L CN	*	10 mg/L CN	0.01	10
LCS(0.4mg/L CN)	**	10 mg/L CN	2	50
LCSD (0.2mg/L CN)	**	10 mg/L CN	1	50
MS/MSD (0.1mg/L CN)	**	10 mg/L CN	0.5	50
LCS (20mg/kg CN)	*	100 mg/kg CN	2	50
LCSD (10mg/kg CN)	*	100 mg/kg CN	1	50
MS/MSD (5mg/kg CN)	*	100 mg/kg CN	0.5	50
ICV (0.10 mg/L CN)	**	10 mg/L CN	0.1	10
CCV (0.20 mg/L CN)	*	10 mg/L CN	0.2	10
REAC LCS	***	1000 mg/L	10.0	100

Reagent List:

50% H2SO4	**RG091117-1**
0.25 N NaOH	**RG100308-1**
Sand	**RG090807-1**
NaH2PO4 Solution	**RG100305-3**
Chloramine-T Solution	**RG050411-1**
Pyridine-Barbituric Acid	**RG100126-2**
CN Parent Std(*)	**ST100205-1**
CN 2nd Source Std(**)	**ST100205-2**
51% MgCL2	
Acetate Buffer	
ZN Acetate Solution	

3/8/10

2000048

Miscellaneous

2000049

Percent Moisture

Method SOP642 Revision 8

Lab Name: ALS Laboratory Group -- FC

Date Extracted: 03/05/2010
Date Analyzed: 03/05/2010
Analyst: Mike Lundgreen

Balance ID: 31
Oven ID: 17
In Oven: 3/4/2010 @ 2:30:00 PM
Out of Oven: 3/5/2010 @ 10:05:00 AM

Validated By: mtl
Validation Date: 03/05/2010
Validation Time: 11:27:02 AM

Run ID	Prep Batch ID	QC Batch ID	Lab ID	QC Type	Dish Wt	Wet Wt	Dry Wt	Dry Wt-Dish Wt	Percent Moisture	Percent Solids	RPD
EX100304-4A	EX100304-4	EX100304-4-1	1003045-10	SMP	1.303	10.09	9.693	8.39	16.9	83.1	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-11	SMP	1.306	10.14	9.266	7.96	21.5	78.5	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-12	SMP	1.301	10.66	8.807	7.51	29.6	70.4	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-13	SMP	1.295	10.31	7.918	6.62	35.8	64.2	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-16	SMP	1.295	10.56	7.615	6.32	40.2	59.8	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-17	DUP	1.292	10.16	10.96	9.67	4.8	95.2	5
EX100304-4A	EX100304-4	EX100304-4-2	1003045-17	SMP	1.294	10.22	11.00	9.71	5.1	94.9	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-18	SMP	1.308	10.79	9.949	8.64	19.9	80.1	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-19	SMP	1.31	10.29	9.59	8.28	19.5	80.5	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-2	SMP	1.295	10.09	7.817	6.52	35.4	64.6	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-21	SMP	1.298	10.30	7.541	6.24	39.4	60.6	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-23	SMP	1.296	11.05	9.822	8.53	22.8	77.2	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-4	DUP	1.292	10.07	10.55	9.26	8.1	91.9	1
EX100304-4A	EX100304-4	EX100304-4-1	1003045-4	SMP	1.31	10.65	11.12	9.81	8.0	92.0	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-5	SMP	1.311	10.23	8.552	7.24	29.2	70.8	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-8	SMP	1.293	10.36	8.983	7.69	25.8	74.2	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-9	SMP	1.295	10.83	10.35	9.05	16.4	83.6	
EX100304-4A	EX100304-4	EX100304-4-1	EX100304-4	MB	1.286	1.286	1.285	0.00	100.1	-0.1	
EX100304-4A	EX100304-4	EX100304-4-2	EX100304-4	MB	1.286	1.286	1.285	0.00	100.1	-0.1	

QC Types

CAR	Carrier reference sample
LCS	Laboratory Control Sample
MB	Method Blank
MSD	Laboratory Matrix Spike Duplicate
RVS	Reporting Level Verification Standar
SYS	Sample Yield Spike

DUP	Laboratory Duplicate
LCSD	Laboratory Control Sample Duplicat
MS	Laboratory Matrix Spike
REP	Sample replicate
SMP	Field Sample

Comments:

DUP = Sample Duplicate
Wet Wt = Sample Wet Wt - Dish Wt
Dry Wt = Sample Dry Wt + Dish Wt
Dry Wt - Dish Wt = Sample Dry Wt - Dish Wt
All weight values shown above are expressed in grams.

$$RPD = \frac{(\text{Sample Value} - \text{Duplicate Value})}{2} \times 100$$

$$\% \text{ Solids} = \frac{\text{Dry Weight}}{\text{Wet Weight}} \times 100$$

$$\% \text{ Moisture} = \frac{(\text{Wet Weight} - \text{Dry Weight})}{\text{Wet Weight}} \times 100$$

2000050

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Tuesday, March 09, 2010

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division
Fort Collins, Colorado

Metals

Case Narrative

Weston Solutions, Inc.

Paguate – TO0019100202

Work Order Number: 1003045

1. This report consists of 10 water samples and 15 sediment samples.

2. The samples were received cool and intact by ALS on 03/04/10.

3. The water samples had a pH less than 2 upon receipt.

4. The samples were prepared for analysis based on SW-846, 3rd Edition procedures.

   Sediment was not visible in the water samples. Samples 1003045-2, -5, -11, -16, -21, and -23 were sediment samples that contained standing water. These samples were stirred prior to aliquotting.

   For analysis by Trace ICP, the water samples were digested following method 3005A and SOP 806 Rev. 13. The sediment samples were digested following method 3050B and SOP 806 Rev. 13.

   For analysis by Cold Vapor AA (CVAA), the water samples were digested following method 7470A and SOP 812 Rev. 14. The sediment samples were digested following method 7471A and SOP 812 Rev. 14.

5. The samples were analyzed following SW-846, 3rd Edition procedures.

   Analysis by Trace ICP followed method 6010B and SOP 834 Rev. 7.

   The relationship between intensity and concentration for each element is established using at least four standards, one of which is a blank solution.

   2000051

   During sample analysis concentrations are computed by the software and the results are printed in mg/L. The instrument software does not provide a printout which gives both intensity and concentration. The validity of the calibration equation is tested by

analyzing the following solutions: a blank, a low level check solution with concentrations near the reporting limit, an Initial Calibration Verification (ICV) standard from a 2nd source standard solution with concentrations near the middle of the analytical range, a Continuing Calibration Verification (CCV) standard with concentrations at two times those in the ICV, and a readback of the highest calibration standard.

These solutions provide verification that the calibration equations are functioning properly throughout the analytical range of the instrument. During sample analysis dilutions are made for analytes found at concentrations above the highest calibration standard. No results are taken from extrapolations beyond the highest standard.

Water analysis by CVAA followed method 7470A and SOP 812 Rev. 14. Sediment analysis by CVAA followed method 7471A and SOP 812 Rev. 14.

The relationship between intensity and concentration is determined daily, prior to sample analysis. At least five standards and a blank solution are analyzed to establish the calibration curve. The instrument software performs a linear regression to fit the calibration data to a curve of the form:

$$conc. = B * I + C$$

where: conc. = concentration

B = slope coefficient
I = intensity
C = intercept coefficient

A printout summarizing the calibration data supplies the calibration curve and correlation coefficient. During sample analysis both intensity and concentration values are printed. Dilutions are made for concentrations above the highest calibration standard. No results are taken from extrapolations above the highest standard.

6. All standards and solutions are NIST traceable and were used within their recommended shelf life.

7. The samples were prepared and analyzed within the established hold times.

All in house quality control procedures were followed, as described below.

8. General quality control procedures.

- A preparation (method) blank and laboratory control sample were digested and analyzed with the samples in each digestion batch. There were not more than 20 samples in each digestion batch.

2000052

- The preparation (method) blank associated with each digestion batch was below the reporting limit for the requested analytes.

- The laboratory control sample associated with each digestion batch was within the acceptance limits. This indicates complete digestions according to the method.
- All initial and continuing calibration blanks associated with each analytical batch were below the practical quantitation limits for the requested analytes.
- All initial and continuing calibration verifications associated with each analytical batch were within the acceptance criteria for the requested analytes. This indicates a valid calibration and stable instrument conditions.
- The interference check samples and high standard readbacks associated with Method 6010B were within acceptance criteria.

9. Matrix specific quality control procedures.

Sample 1003045-1 was designated as the quality control sample for the water analyses. Sample 1003045-4 was designated as the quality control sample for the sediment analyses.

Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

- A matrix spike and matrix spike duplicate were digested and analyzed with each batch. All acceptance criteria for accuracy were met with the following exceptions:

Analyte	Sample ID
Antimony	1003045-4MS & MSD

The native sample result is flagged for matrix spike failure and an analytical post spike was performed. The result of the spike was acceptable indicating that the matrix was not significantly affecting quantitation of this analyte.

- Matrix spike recoveries could not be evaluated for the following analytes:

Analyte	Sample ID
Aluminum	1003045-4
Iron	1003045-4

The concentrations of these analytes in the native sample were greater than four times the concentration of matrix spike added during the digestion. When sample concentration is that much greater than the spike added, spike recoveries may not be accurate. The laboratory control sample indicates that the digestion and analysis were in control.

- A sample duplicate and matrix spike duplicate were digested and analyzed with each batch. All acceptance criteria for precision were met with the following exceptions:

Analyte	Sample ID
Iron	1003045-4D
Lead	1003045-4D
Magnesium	1003045-4D
Potassium	1003045-4D

The native sample results are flagged for duplicate failure.

- A serial dilution was analyzed with each ICP batch. All acceptance criteria were met.

10. Sample 1003045-20 required a dilution to bring sodium into the analytical range of the Trace ICP.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Emily Knodel
Inorganics Primary Data Reviewer

03-09-10
Date

Inorganics Final Data Reviewer

3/9/10
Date

2000054

Inorganic Data Reporting Qualifiers

The following qualifiers are used by the laboratory when reporting results of inorganic analyses.

- Result qualifier -- If the analyte was analyzed for but not detected a “U” is entered.
- QC qualifier -- Specified entries and their meanings are as follows:

  E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

  M - Duplicate injection precision was not met.

  N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

  Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

  * - Duplicate analysis (relative percent difference) not within control limits.

Chain of Custody

2000056

ALS Laboratory Group -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1003045
Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Rinsate 030210	1003045-1		WATER	02-Mar-10	18:20
RM-SED-BG	1003045-2		SEDIMEN	02-Mar-10	10:12
RM-SW-BG	1003045-3		WATER	02-Mar-10	10:12
RSJ-SED-03	1003045-4		SEDIMEN	02-Mar-10	10:37
RSJ-SED-BG	1003045-5		SEDIMEN	02-Mar-10	11:46
RSJ-SW-03	1003045-6		WATER	02-Mar-10	10:37
RSJ-SW-BG	1003045-7		WATER	02-Mar-10	11:46
MD-SED-0-2'	1003045-8		SEDIMEN	02-Mar-10	16:45
MD-SED-2-4'	1003045-9		SEDIMEN	02-Mar-10	17:00
MD-SED-4-6'	1003045-10		SEDIMEN	02-Mar-10	17:15
PR-SED-01	1003045-11		SEDIMEN	02-Mar-10	15:30
RP-SED-BG	1003045-12		SEDIMEN	02-Mar-10	9:29
RP-SED-BGD	1003045-13		SEDIMEN	02-Mar-10	9:29
RP-SW-BG	1003045-14		WATER	02-Mar-10	9:29
RP-SW-BGD	1003045-15		WATER	02-Mar-10	9:29
RSJ-SED-02	1003045-16		SEDIMEN	02-Mar-10	15:15
WR-SED-0-2'	1003045-17		SEDIMEN	02-Mar-10	11:03
WR-SED-3'	1003045-18		SEDIMEN	02-Mar-10	11:10
WR-SED-5.5'	1003045-19		SEDIMEN	02-Mar-10	11:15
PR-SW-01	1003045-20		WATER	02-Mar-10	15:26
RP-SED-03	1003045-21		SEDIMEN	02-Mar-10	17:10
RP-SW-03	1003045-22		WATER	02-Mar-10	17:10
RSJ-SED-01	1003045-23		SEDIMEN	02-Mar-10	16:13
RSJ-SW-01	1003045-24		WATER	02-Mar-10	16:13
RSJ-SW-02	1003045-25		WATER	02-Mar-10	15:15

2000057

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0005

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
1	Rinsate 030210	TAL Metals + Mercury	3	Days	Water	3/2/2010	18:20	1	1 L poly	HNO3 pH<2		
	Rinsate 030210	Total Cyanide	3	Days	Water	3/2/2010	18:20	1	250 mL	NaOH		
	Rinsate 030210	Isotopic Uranium	3	Days	Water	3/2/2010	18:20	1	1 L poly	HNO3 pH<2		
2	RM-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	10:12	1	16 oz	4 C	24uR/hr	
3	RM-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	10:12	1	1 L poly	HNO3 pH<2	24 uR/hr	
	RM-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	10:12	1	250 mL	NaOH	24 uR/hr	
	RM-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	10:12	1	1 L poly	HNO3 pH<2	24 uR/hr	
4	RSJ-SED-03	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	10:37	1	16 oz	4 C	8 uR/hr	
5	RSJ-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:46	1	16 oz	4 C	23 uR/hr	
6	RSJ-SW-03	TAL Metals + Mercury	3	Days	Water	3/2/2010	10:37	1	1 L poly	HNO3 pH<2	8 uR/hr	
	RSJ-SW-03	Total Cyanide	3	Days	Water	3/2/2010	10:37	1	250 mL	NaOH	8 uR/hr	
	RSJ-SW-03	Isotopic Uranium	3	Days	Water	3/2/2010	10:37	1	1 L poly	HNO3 pH<2	8 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

2000058

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0005

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
7	RSJ-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	11:46	1	1 L poly	HNO3 pH<2	23 uR/hr	
↓	RSJ-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	11:46	1	250 mL	NaOH	23 uR/hr	
	RSJ-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	11:46	1	1 L poly	HNO3 pH<2	23 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trumble	3.4.10	755						

2000059

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0004

Site #: TO0019100202

Contact Name: Weston Solutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832.444.7976.

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
8	MD-SED-0-2'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	16:45	1	16 oz	4 C	20 uR/hr	
9	MD-SED-2-4'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:00	1	16 oz	4 C	17 uR/hr	
10	MD-SED-4-6'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:15	1	16 oz	4 C	18 uR/hr	
11	PR-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	15:30	1	16 oz	4 C	9 uR/hr	
12	RP-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	09:29	1	16 oz	4 C	20 uR/hr	
13	RP-SED-BGD	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	09:29	1	16 oz	4 C	20 uR/hr	
14	RP-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
	RP-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	09:29	1	250 mL	NaOH	20 uR/hr	
	RP-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
15	RP-SW-BGD	TAL Metals + Mercury	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
	RP-SW-BGD	Total Cyanide	3	Days	Water	3/2/2010	09:29	1	250 mL	NaOH	20 uR/hr	
	RP-SW-BGD	Isotopic Uranium	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
16	RSJ-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	15:15	1	16 oz	4 C	28 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	Cheryl Trumble	3-4-10			755						

2000060

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0004

Site #: TO0019100202

Contact Name: Weston Solutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832.444.7976.

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
17	WR-SED-0-2'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:03	1	16 oz	4 C	9.5 uR/hr	
18	WR-SED-3'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:10	1	16 oz	4 C	8 uR/hr	
19	WR-SED-5.5'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:15	1	16 oz	4 C	9 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

2000061

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/02/10-0001

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
20	PR-SW-01	TAL Metals + Mercury	3	Days	Water	3/2/2010	15:26	1	1 L poly	HNO3 pH<2	9 uR/hr	
	PR-SW-01	Total Cyanide	3	Days	Water	3/2/2010	15:26	1	250 mL	NaOH	9 uR/hr	
	PR-SW-01	Isotopic Uranium	3	Days	Water	3/2/2010	15:26	1	1 L poly	HNO3 pH<2	9 uR/hr	
21	RP-SED-03	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:10	1	16 oz	4 C	22 uR/hr	
22	RP-SW-03	TAL Metals + Mercury	3	Days	Water	3/2/2010	17:10	1	1 L poly	HNO3 pH<2	22 uR/hr	
	RP-SW-03	Total Cyanide	3	Days	Water	3/2/2010	17:10	1	250 mL	NaOH	22 uR/hr	
	RP-SW-03	Isotopic Uranium	3	Days	Water	3/2/2010	17:10	1	1 L poly	HNO3 pH<2	22 uR/hr	
23	RSJ-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	16:13	1	16 oz	4 C	16 uR/hr	
24	RSJ-SW-01	TAL Metals + Mercury	3	Days	Water	3/2/2010	16:13	1	1 L poly	HNO3 pH<2	23 uR/hr	
	RSJ-SW-01	Total Cyanide	3	Days	Water	3/2/2010	16:13	1	250 mL	NaOH	23 uR/hr	
	RSJ-SW-01	Isotopic Uranium	3	Days	Water	3/2/2010	16:13	1	1 L poly	HNO3 pH<2	23 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

2000062

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/02/10-0001

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
29	RSJ-SW-02	TAL Metals + Mercury	3	Days	Water	3/2/2010	15:15	1	1 L poly	HNO3 pH<2	28 uR/hr	
	RSJ-SW-02	Total Cyanide	3	Days	Water	3/2/2010	15:15	1	250 mL	NaOH	28 uR/hr	
	RSJ-SW-02	Isotopic Uranium	3	Days	Water	3/2/2010	15:15	1	1 L poly	HNO3 pH<2	28 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trumble	3-4-10	755						

2000063

ALS Laboratory Group - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003045

Project Manager: LS Initials: COT Date: 3-4-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	N/A	(YES)	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	N/A	(YES)	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		(YES)	NO
18. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 (#4)	RAD ONLY	(YES)	NO

Cooler #:	1	2	3					
Temperature (°C):	3.2	3.8	4.8					
No. of custody seals on cooler:	2	2	2					
DOT Survey/ Acceptance Information — External µR/hr reading:	12	13	13					
Background µR/hr reading:	11							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

SAMPLES RP-SED-BGD + RP-SW-BGD had 0931 as the time on the label. (13) 0929 on COC.

2000064

If applicable, was the client contacted? (YES) / NO / NA Contact: Kristie w/ Michelle B Date/Time: 3/4

Project Manager Signature / Date: 3/4/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r22.xls (6/1/09)

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway Suite 850

Dallas, TX 75254

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

13
2-
4.8°

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

1 of 3

TRK# 0201 7984 3972 8917

THU - 04 MAR A2
FIRST OVERNIGHT

MASTER

80524
CO-US
DEN

X1 FTCA

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com.FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim.Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic valueof the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss.Maximum for items of extraordinary value is $500, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

2000065

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

3.20 12 2-

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

3 of 3

MPS# 0263 7984 3972 8972

Mstr# 7984 3972 8917 0201

THU - 04 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
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2000066

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

13
2-

SHIP TO: (970) 490-1511 **BILL SENDER**

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

2 of 3

MPS# |0263| 7984 3972 8939

Mstr# 7984 3972 8917 |0201

THU - 04 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

3.8

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim.Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic valueof the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss.Maximum for items of extraordinary value is $500, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

2000067

Sample Results

2000068

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: Rinsate 030210
Lab ID: 1003045-1

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	1	1	U	
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	1	1	U	
7439-96-5	MANGANESE	1	0.01	0.01	U	
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	1	1	U	
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	1	1	U	
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000069

Data Package ID: *IT1003045-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RM-SW-BG
Lab ID: 1003045-3

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	100	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.18	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	56	1		
7439-96-5	MANGANESE	1	0.027	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	5.9	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	94	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000070

Data Package ID: *IT1003045-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SW-03
Lab ID: 1003045-6

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.43	0.2		
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	100	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.32	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	55	1		
7439-96-5	MANGANESE	1	0.023	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	8	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	180	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000071

Data Package ID: *IT1003045-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SW-BG
Lab ID: 1003045-7

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.77	0.2		
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	98	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.53	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	53	1		
7439-96-5	MANGANESE	1	0.056	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	7.8	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	170	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000072

Data Package ID: *IT1003045-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-BG
Lab ID: 1003045-14

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	54	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.27	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	19	1		
7439-96-5	MANGANESE	1	0.045	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	3.7	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	21	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000073

Data Package ID: *IT1003045-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-BGD
Lab ID: 1003045-15

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	54	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.26	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	19	1		
7439-96-5	MANGANESE	1	0.044	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	3.7	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	21	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000074

Data Package ID: *IT1003045-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: PR-SW-01
Lab ID: 1003045-20

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	440	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	230	1		
7439-96-5	MANGANESE	1	0.25	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	19	1		
7782-49-2	SELENIUM	1	0.01	0.005		
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	100	420	100		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000075

Data Package ID: *IT1003045-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-03
Lab ID: 1003045-22

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	150	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	91	1		
7439-96-5	MANGANESE	1	0.01	0.01	U	
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	13	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	140	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000076

Data Package ID: *IT1003045-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SW-01
Lab ID: 1003045-24

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.61	0.2		
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	98	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.46	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	53	1		
7439-96-5	MANGANESE	1	0.045	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	7.8	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	170	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000077

Data Package ID: *IT1003045-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SW-02
Lab ID: 1003045-25

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.72	0.2		
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	96	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.52	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	52	1		
7439-96-5	MANGANESE	1	0.042	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	7.9	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	170	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000078

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RM-SED-BG
Lab ID: 1003045-2

Sample Matrix: SEDIMENT
% Moisture: 35.4
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.005 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	8400	31		
7440-36-0	ANTIMONY	1	3.1	3.1	U	
7440-38-2	ARSENIC	1	6.9	1.5		
7440-39-3	BARIUM	1	100	15		
7440-41-7	BERYLLIUM	1	0.77	0.77	U	
7440-43-9	CADMIUM	1	0.77	0.77	U	
7440-70-2	CALCIUM	1	20000	150		
7440-47-3	CHROMIUM	1	8.8	1.5		
7440-48-4	COBALT	1	6.6	1.5		
7440-50-8	COPPER	1	12	1.5		
7439-89-6	IRON	1	23000	15		
7439-92-1	LEAD	1	12	0.46		
7439-95-4	MAGNESIUM	1	5400	150		
7439-96-5	MANGANESE	1	200	1.5		
7440-02-0	NICKEL	1	13	3.1		
7440-09-7	POTASSIUM	1	1800	150		
7782-49-2	SELENIUM	1	0.77	0.77	U	
7440-22-4	SILVER	1	1.5	1.5	U	
7440-23-5	SODIUM	1	310	150		
7440-28-0	THALLIUM	1	1.5	1.5	U	
7440-62-2	VANADIUM	1	21	1.5		
7440-66-6	ZINC	1	46	3.1		

2000079

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-03
Lab ID: 1003045-4

Sample Matrix: SEDIMENT
% Moisture: 8.0
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.004 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	2800	22		
7440-36-0	ANTIMONY	1	2.2	2.2	U	N
7440-38-2	ARSENIC	1	1.5	1.1		
7440-39-3	BARIUM	1	77	11		
7440-41-7	BERYLLIUM	1	0.54	0.54	U	
7440-43-9	CADMIUM	1	0.54	0.54	U	
7440-70-2	CALCIUM	1	6200	110		
7440-47-3	CHROMIUM	1	2.6	1.1		
7440-48-4	COBALT	1	1.6	1.1		
7440-50-8	COPPER	1	2.4	1.1		
7439-89-6	IRON	1	5100	11		*
7439-92-1	LEAD	1	2.9	0.32		*
7439-95-4	MAGNESIUM	1	1300	110		*
7439-96-5	MANGANESE	1	75	1.1		
7440-02-0	NICKEL	1	3.2	2.2		
7440-09-7	POTASSIUM	1	580	110		*
7782-49-2	SELENIUM	1	0.54	0.54	U	
7440-22-4	SILVER	1	1.1	1.1	U	
7440-23-5	SODIUM	1	160	110		
7440-28-0	THALLIUM	1	1.1	1.1	U	
7440-62-2	VANADIUM	1	6.9	1.1		
7440-66-6	ZINC	1	10	2.2		

2000080

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-BG
Lab ID: 1003045-5

Sample Matrix: SEDIMENT
% Moisture: 29.2
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.041 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	5400	27		
7440-36-0	ANTIMONY	1	2.7	2.7	U	
7440-38-2	ARSENIC	1	2.3	1.4		
7440-39-3	BARIUM	1	100	14		
7440-41-7	BERYLLIUM	1	0.68	0.68	U	
7440-43-9	CADMIUM	1	0.68	0.68	U	
7440-70-2	CALCIUM	1	14000	140		
7440-47-3	CHROMIUM	1	4.2	1.4		
7440-48-4	COBALT	1	2.9	1.4		
7440-50-8	COPPER	1	4.8	1.4		
7439-89-6	IRON	1	8500	14		
7439-92-1	LEAD	1	5.6	0.41		
7439-95-4	MAGNESIUM	1	2700	140		
7439-96-5	MANGANESE	1	160	1.4		
7440-02-0	NICKEL	1	5.2	2.7		
7440-09-7	POTASSIUM	1	1200	140		
7782-49-2	SELENIUM	1	0.68	0.68	U	
7440-22-4	SILVER	1	1.4	1.4	U	
7440-23-5	SODIUM	1	280	140		
7440-28-0	THALLIUM	1	1.4	1.4	U	
7440-62-2	VANADIUM	1	12	1.4		
7440-66-6	ZINC	1	18	2.7		

2000081

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: MD-SED-0-2'
Lab ID: 1003045-8

Sample Matrix: SEDIMENT
% Moisture: 25.8
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.022 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	9600	26		
7440-36-0	ANTIMONY	1	2.6	2.6	U	
7440-38-2	ARSENIC	1	4.7	1.3		
7440-39-3	BARIUM	1	120	13		
7440-41-7	BERYLLIUM	1	0.67	0.66		
7440-43-9	CADMIUM	1	0.66	0.66	U	
7440-70-2	CALCIUM	1	13000	130		
7440-47-3	CHROMIUM	1	8	1.3		
7440-48-4	COBALT	1	5.2	1.3		
7440-50-8	COPPER	1	9	1.3		
7439-89-6	IRON	1	17000	13		
7439-92-1	LEAD	1	10	0.4		
7439-95-4	MAGNESIUM	1	3600	130		
7439-96-5	MANGANESE	1	120	1.3		
7440-02-0	NICKEL	1	11	2.6		
7440-09-7	POTASSIUM	1	1900	130		
7782-49-2	SELENIUM	1	0.72	0.66		
7440-22-4	SILVER	1	1.3	1.3	U	
7440-23-5	SODIUM	1	210	130		
7440-28-0	THALLIUM	1	1.3	1.3	U	
7440-62-2	VANADIUM	1	19	1.3		
7440-66-6	ZINC	1	34	2.6		

2000082

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: MD-SED-2-4'
Lab ID: 1003045-9

Sample Matrix: SEDIMENT
% Moisture: 16.4
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.034 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	4700	23		
7440-36-0	ANTIMONY	1	2.3	2.3	U	
7440-38-2	ARSENIC	1	1.5	1.2		
7440-39-3	BARIUM	1	130	12		
7440-41-7	BERYLLIUM	1	0.58	0.58	U	
7440-43-9	CADMIUM	1	0.58	0.58	U	
7440-70-2	CALCIUM	1	9300	120		
7440-47-3	CHROMIUM	1	4.1	1.2		
7440-48-4	COBALT	1	2.1	1.2		
7440-50-8	COPPER	1	2.7	1.2		
7439-89-6	IRON	1	6800	12		
7439-92-1	LEAD	1	3.8	0.35		
7439-95-4	MAGNESIUM	1	1600	120		
7439-96-5	MANGANESE	1	79	1.2		
7440-02-0	NICKEL	1	4.7	2.3		
7440-09-7	POTASSIUM	1	810	120		
7782-49-2	SELENIUM	1	0.58	0.58	U	
7440-22-4	SILVER	1	1.2	1.2	U	
7440-23-5	SODIUM	1	120	120	U	
7440-28-0	THALLIUM	1	1.2	1.2	U	
7440-62-2	VANADIUM	1	12	1.2		
7440-66-6	ZINC	1	12	2.3		

2000083

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: MD-SED-4-6'
Lab ID: 1003045-10

Sample Matrix: SEDIMENT
% Moisture: 16.9
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.009 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	6500	24		
7440-36-0	ANTIMONY	1	2.4	2.4	U	
7440-38-2	ARSENIC	1	2.1	1.2		
7440-39-3	BARIUM	1	100	12		
7440-41-7	BERYLLIUM	1	0.6	0.6	U	
7440-43-9	CADMIUM	1	0.6	0.6	U	
7440-70-2	CALCIUM	1	8700	120		
7440-47-3	CHROMIUM	1	3.9	1.2		
7440-48-4	COBALT	1	2.6	1.2		
7440-50-8	COPPER	1	1.8	1.2		
7439-89-6	IRON	1	6700	12		
7439-92-1	LEAD	1	4.5	0.36		
7439-95-4	MAGNESIUM	1	1800	120		
7439-96-5	MANGANESE	1	69	1.2		
7440-02-0	NICKEL	1	4.9	2.4		
7440-09-7	POTASSIUM	1	940	120		
7782-49-2	SELENIUM	1	0.6	0.6	U	
7440-22-4	SILVER	1	1.2	1.2	U	
7440-23-5	SODIUM	1	150	120		
7440-28-0	THALLIUM	1	1.2	1.2	U	
7440-62-2	VANADIUM	1	11	1.2		
7440-66-6	ZINC	1	11	2.4		

2000084

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: PR-SED-01
Lab ID: 1003045-11

Sample Matrix: SEDIMENT
% Moisture: 21.5
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.018 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	2400	25		
7440-36-0	ANTIMONY	1	2.5	2.5	U	
7440-38-2	ARSENIC	1	1.3	1.3	U	
7440-39-3	BARIUM	1	24	13		
7440-41-7	BERYLLIUM	1	0.63	0.63	U	
7440-43-9	CADMIUM	1	0.63	0.63	U	
7440-70-2	CALCIUM	1	19000	130		
7440-47-3	CHROMIUM	1	1.3	1.3	U	
7440-48-4	COBALT	1	2.2	1.3		
7440-50-8	COPPER	1	2.2	1.3		
7439-89-6	IRON	1	3700	13		
7439-92-1	LEAD	1	4	0.38		
7439-95-4	MAGNESIUM	1	2400	130		
7439-96-5	MANGANESE	1	500	1.3		
7440-02-0	NICKEL	1	2.9	2.5		
7440-09-7	POTASSIUM	1	450	130		
7782-49-2	SELENIUM	1	0.63	0.63	U	
7440-22-4	SILVER	1	1.3	1.3	U	
7440-23-5	SODIUM	1	1500	130		
7440-28-0	THALLIUM	1	1.3	1.3	U	
7440-62-2	VANADIUM	1	6.1	1.3		
7440-66-6	ZINC	1	7	2.5		

2000085

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-BG
Lab ID: 1003045-12

Sample Matrix: SEDIMENT
% Moisture: 29.6
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.02 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	6800	28		
7440-36-0	ANTIMONY	1	2.8	2.8	U	
7440-38-2	ARSENIC	1	6.8	1.4		
7440-39-3	BARIUM	1	88	14		
7440-41-7	BERYLLIUM	1	0.7	0.7	U	
7440-43-9	CADMIUM	1	0.7	0.7	U	
7440-70-2	CALCIUM	1	16000	140		
7440-47-3	CHROMIUM	1	6.9	1.4		
7440-48-4	COBALT	1	6.5	1.4		
7440-50-8	COPPER	1	7.5	1.4		
7439-89-6	IRON	1	24000	14		
7439-92-1	LEAD	1	9.3	0.42		
7439-95-4	MAGNESIUM	1	4100	140		
7439-96-5	MANGANESE	1	220	1.4		
7440-02-0	NICKEL	1	11	2.8		
7440-09-7	POTASSIUM	1	1300	140		
7782-49-2	SELENIUM	1	0.9	0.7		
7440-22-4	SILVER	1	1.4	1.4	U	
7440-23-5	SODIUM	1	280	140		
7440-28-0	THALLIUM	1	1.4	1.4	U	
7440-62-2	VANADIUM	1	23	1.4		
7440-66-6	ZINC	1	40	2.8		

2000086

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-BGD
Lab ID: 1003045-13

Sample Matrix: SEDIMENT
% Moisture: 35.8
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.014 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	7300	31		
7440-36-0	ANTIMONY	1	3.1	3.1	U	
7440-38-2	ARSENIC	1	5.4	1.5		
7440-39-3	BARIUM	1	110	15		
7440-41-7	BERYLLIUM	1	0.77	0.77	U	
7440-43-9	CADMIUM	1	0.77	0.77	U	
7440-70-2	CALCIUM	1	18000	150		
7440-47-3	CHROMIUM	1	7.7	1.5		
7440-48-4	COBALT	1	5.9	1.5		
7440-50-8	COPPER	1	8.7	1.5		
7439-89-6	IRON	1	20000	15		
7439-92-1	LEAD	1	9.9	0.46		
7439-95-4	MAGNESIUM	1	4600	150		
7439-96-5	MANGANESE	1	270	1.5		
7440-02-0	NICKEL	1	11	3.1		
7440-09-7	POTASSIUM	1	1600	150		
7782-49-2	SELENIUM	1	0.77	0.77	U	
7440-22-4	SILVER	1	1.5	1.5	U	
7440-23-5	SODIUM	1	150	150	U	
7440-28-0	THALLIUM	1	1.5	1.5	U	
7440-62-2	VANADIUM	1	22	1.5		
7440-66-6	ZINC	1	39	3.1		

2000087

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-02
Lab ID: 1003045-16

Sample Matrix: SEDIMENT
% Moisture: 40.2
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.019 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	9800	33		
7440-36-0	ANTIMONY	1	3.3	3.3	U	
7440-38-2	ARSENIC	1	5.2	1.6		
7440-39-3	BARIUM	1	150	16		
7440-41-7	BERYLLIUM	1	0.82	0.82	U	
7440-43-9	CADMIUM	1	0.82	0.82	U	
7440-70-2	CALCIUM	1	25000	160		
7440-47-3	CHROMIUM	1	7.7	1.6		
7440-48-4	COBALT	1	6.1	1.6		
7440-50-8	COPPER	1	11	1.6		
7439-89-6	IRON	1	18000	16		
7439-92-1	LEAD	1	11	0.49		
7439-95-4	MAGNESIUM	1	5000	160		
7439-96-5	MANGANESE	1	360	1.6		
7440-02-0	NICKEL	1	10	3.3		
7440-09-7	POTASSIUM	1	2200	160		
7782-49-2	SELENIUM	1	0.82	0.82	U	
7440-22-4	SILVER	1	1.6	1.6	U	
7440-23-5	SODIUM	1	500	160		
7440-28-0	THALLIUM	1	1.6	1.6	U	
7440-62-2	VANADIUM	1	19	1.6		
7440-66-6	ZINC	1	39	3.3		

2000088

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: WR-SED-0-2'
Lab ID: 1003045-17

Sample Matrix: SEDIMENT
% Moisture: 5.1
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.036 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	2500	20		
7440-36-0	ANTIMONY	1	2	2	U	
7440-38-2	ARSENIC	1	1.3	1		
7440-39-3	BARIUM	1	170	10		
7440-41-7	BERYLLIUM	1	0.51	0.51	U	
7440-43-9	CADMIUM	1	0.51	0.51	U	
7440-70-2	CALCIUM	1	8100	100		
7440-47-3	CHROMIUM	1	4.4	1		
7440-48-4	COBALT	1	2	1		
7440-50-8	COPPER	1	2.6	1		
7439-89-6	IRON	1	6700	10		
7439-92-1	LEAD	1	3.4	0.3		
7439-95-4	MAGNESIUM	1	1200	100		
7439-96-5	MANGANESE	1	100	1		
7440-02-0	NICKEL	1	3.3	2		
7440-09-7	POTASSIUM	1	700	100		
7782-49-2	SELENIUM	1	0.51	0.51	U	
7440-22-4	SILVER	1	1	1	U	
7440-23-5	SODIUM	1	100	100	U	
7440-28-0	THALLIUM	1	1	1	U	
7440-62-2	VANADIUM	1	12	1		
7440-66-6	ZINC	1	12	2		

2000089

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: WR-SED-3'
Lab ID: 1003045-18

Sample Matrix: SEDIMENT
% Moisture: 19.9
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.036 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	660	24		
7440-36-0	ANTIMONY	1	2.4	2.4	U	
7440-38-2	ARSENIC	1	1.2	1.2	U	
7440-39-3	BARIUM	1	56	12		
7440-41-7	BERYLLIUM	1	0.6	0.6	U	
7440-43-9	CADMIUM	1	0.6	0.6	U	
7440-70-2	CALCIUM	1	4200	120		
7440-47-3	CHROMIUM	1	1.2	1.2	U	
7440-48-4	COBALT	1	1.2	1.2	U	
7440-50-8	COPPER	1	1.2	1.2	U	
7439-89-6	IRON	1	1400	12		
7439-92-1	LEAD	1	0.95	0.36		
7439-95-4	MAGNESIUM	1	320	120		
7439-96-5	MANGANESE	1	32	1.2		
7440-02-0	NICKEL	1	2.4	2.4	U	
7440-09-7	POTASSIUM	1	120	120	U	
7782-49-2	SELENIUM	1	0.6	0.6	U	
7440-22-4	SILVER	1	1.2	1.2	U	
7440-23-5	SODIUM	1	120	120	U	
7440-28-0	THALLIUM	1	1.2	1.2	U	
7440-62-2	VANADIUM	1	2.4	1.2		
7440-66-6	ZINC	1	3.1	2.4		

2000090

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: WR-SED-5.5'
Lab ID: 1003045-19

Sample Matrix: SEDIMENT
% Moisture: 19.5
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.041 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	660	24		
7440-36-0	ANTIMONY	1	2.4	2.4	U	
7440-38-2	ARSENIC	1	1.2	1.2	U	
7440-39-3	BARIUM	1	73	12		
7440-41-7	BERYLLIUM	1	0.6	0.6	U	
7440-43-9	CADMIUM	1	0.6	0.6	U	
7440-70-2	CALCIUM	1	4300	120		
7440-47-3	CHROMIUM	1	1.2	1.2	U	
7440-48-4	COBALT	1	1.2	1.2	U	
7440-50-8	COPPER	1	1.2	1.2	U	
7439-89-6	IRON	1	1800	12		
7439-92-1	LEAD	1	1.2	0.36		
7439-95-4	MAGNESIUM	1	340	120		
7439-96-5	MANGANESE	1	40	1.2		
7440-02-0	NICKEL	1	2.4	2.4	U	
7440-09-7	POTASSIUM	1	120	120	U	
7782-49-2	SELENIUM	1	0.6	0.6	U	
7440-22-4	SILVER	1	1.2	1.2	U	
7440-23-5	SODIUM	1	120	120	U	
7440-28-0	THALLIUM	1	1.2	1.2	U	
7440-62-2	VANADIUM	1	3.5	1.2		
7440-66-6	ZINC	1	2.6	2.4		

2000091

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-03
Lab ID: 1003045-21

Sample Matrix: SEDIMENT
% Moisture: 39.4
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.023 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	11000	32		
7440-36-0	ANTIMONY	1	3.2	3.2	U	
7440-38-2	ARSENIC	1	7.9	1.6		
7440-39-3	BARIUM	1	130	16		
7440-41-7	BERYLLIUM	1	0.9	0.81		
7440-43-9	CADMIUM	1	0.81	0.81	U	
7440-70-2	CALCIUM	1	27000	160		
7440-47-3	CHROMIUM	1	9.8	1.6		
7440-48-4	COBALT	1	7.3	1.6		
7440-50-8	COPPER	1	14	1.6		
7439-89-6	IRON	1	24000	16		
7439-92-1	LEAD	1	15	0.48		
7439-95-4	MAGNESIUM	1	6700	160		
7439-96-5	MANGANESE	1	260	1.6		
7440-02-0	NICKEL	1	14	3.2		
7440-09-7	POTASSIUM	1	2500	160		
7782-49-2	SELENIUM	1	1.6	0.81		
7440-22-4	SILVER	1	1.6	1.6	U	
7440-23-5	SODIUM	1	470	160		
7440-28-0	THALLIUM	1	1.6	1.6	U	
7440-62-2	VANADIUM	1	23	1.6		
7440-66-6	ZINC	1	50	3.2		

2000092

Data Package ID: *IT1003045-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-01
Lab ID: 1003045-23

Sample Matrix: SEDIMENT
% Moisture: 22.8
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.041 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	2100	25		
7440-36-0	ANTIMONY	1	2.5	2.5	U	
7440-38-2	ARSENIC	1	1.3	1.2		
7440-39-3	BARIUM	1	73	12		
7440-41-7	BERYLLIUM	1	0.62	0.62	U	
7440-43-9	CADMIUM	1	0.62	0.62	U	
7440-70-2	CALCIUM	1	6900	120		
7440-47-3	CHROMIUM	1	1.5	1.2		
7440-48-4	COBALT	1	1.2	1.2	U	
7440-50-8	COPPER	1	1.5	1.2		
7439-89-6	IRON	1	3700	12		
7439-92-1	LEAD	1	2.4	0.37		
7439-95-4	MAGNESIUM	1	1100	120		
7439-96-5	MANGANESE	1	83	1.2		
7440-02-0	NICKEL	1	2.5	2.5	U	
7440-09-7	POTASSIUM	1	440	120		
7782-49-2	SELENIUM	1	0.62	0.62	U	
7440-22-4	SILVER	1	1.2	1.2	U	
7440-23-5	SODIUM	1	130	120		
7440-28-0	THALLIUM	1	1.2	1.2	U	
7440-62-2	VANADIUM	1	5	1.2		
7440-66-6	ZINC	1	7.4	2.5		

2000093

Data Package ID: *IT1003045-1*

Total MERCURY

Method SW7470A

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003045
Reporting Basis: As Received
Prep Method: METHOD
Final Volume: 20 g
Matrix: WATER
Result Units: MG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
Rinsate 030210	1003045-1	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g
RM-SW-BG	1003045-3	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g
RSJ-SW-03	1003045-6	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g
RSJ-SW-BG	1003045-7	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g
RP-SW-BG	1003045-14	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g
RP-SW-BGD	1003045-15	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g
PR-SW-01	1003045-20	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g
RP-SW-03	1003045-22	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g
RSJ-SW-01	1003045-24	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g
RSJ-SW-02	1003045-25	03/02/2010	03/04/2010	03/05/2010	N/A	1	0.0002	0.0002	U	20 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *HG1003045-1*

2000094

Total MERCURY

Method SW7471A

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003045
Reporting Basis: Dry Weight
Prep Method: METHOD
Final Volume: 100 g
Matrix: SEDIMENT
Result Units: MG/KG

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
RM-SED-BG	1003045-2	03/02/2010	03/04/2010	03/05/2010	35.4	1	0.051	0.051	U	0.607 g
RSJ-SED-03	1003045-4	03/02/2010	03/04/2010	03/05/2010	8.0	1	0.036	0.036	U	0.603 g
RSJ-SED-BG	1003045-5	03/02/2010	03/04/2010	03/05/2010	29.2	1	0.047	0.047	U	0.604 g
MD-SED-0-2'	1003045-8	03/02/2010	03/04/2010	03/05/2010	25.8	1	0.045	0.045	U	0.602 g
MD-SED-2-4'	1003045-9	03/02/2010	03/04/2010	03/05/2010	16.4	1	0.04	0.04	U	0.6 g
MD-SED-4-6'	1003045-10	03/02/2010	03/04/2010	03/05/2010	16.9	1	0.04	0.04	U	0.605 g
PR-SED-01	1003045-11	03/02/2010	03/04/2010	03/05/2010	21.5	1	0.042	0.042	U	0.604 g
RP-SED-BG	1003045-12	03/02/2010	03/04/2010	03/05/2010	29.6	1	0.047	0.047	U	0.606 g
RP-SED-BGD	1003045-13	03/02/2010	03/04/2010	03/05/2010	35.8	1	0.051	0.051	U	0.605 g
RSJ-SED-02	1003045-16	03/02/2010	03/04/2010	03/05/2010	40.2	1	0.055	0.055	U	0.604 g
WR-SED-0-2'	1003045-17	03/02/2010	03/04/2010	03/05/2010	5.1	1	0.035	0.035	U	0.601 g
WR-SED-3'	1003045-18	03/02/2010	03/04/2010	03/05/2010	19.9	1	0.042	0.042	U	0.601 g
WR-SED-5.5'	1003045-19	03/02/2010	03/04/2010	03/05/2010	19.5	1	0.041	0.041	U	0.601 g
RP-SED-03	1003045-21	03/02/2010	03/04/2010	03/05/2010	39.4	1	0.055	0.055	U	0.601 g
RSJ-SED-01	1003045-23	03/02/2010	03/04/2010	03/05/2010	22.8	1	0.043	0.043	U	0.601 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *HG1003045-1*

2000095

Summary Report Forms

2000096

ICP Metals

Method SW6010B

Method Blank

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: IP100304-3MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: N/A
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	1	1	U	
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	1	1	U	
7439-96-5	MANGANESE	1	0.01	0.01	U	
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	1	1	U	
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	1	1	U	
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

2000097

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010B

Method Blank

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: IP100304-4MB

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: N/A
File Name: 100305A.

Sample Aliquot: 1 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	20	20	U	
7440-36-0	ANTIMONY	1	2	2	U	
7440-38-2	ARSENIC	1	1	1	U	
7440-39-3	BARIUM	1	10	10	U	
7440-41-7	BERYLLIUM	1	0.5	0.5	U	
7440-43-9	CADMIUM	1	0.5	0.5	U	
7440-70-2	CALCIUM	1	100	100	U	
7440-47-3	CHROMIUM	1	1	1	U	
7440-48-4	COBALT	1	1	1	U	
7440-50-8	COPPER	1	1	1	U	
7439-89-6	IRON	1	10	10	U	
7439-92-1	LEAD	1	0.3	0.3	U	
7439-95-4	MAGNESIUM	1	100	100	U	
7439-96-5	MANGANESE	1	1	1	U	
7440-02-0	NICKEL	1	2	2	U	
7440-09-7	POTASSIUM	1	100	100	U	
7782-49-2	SELENIUM	1	0.5	0.5	U	
7440-22-4	SILVER	1	1	1	U	
7440-23-5	SODIUM	1	100	100	U	
7440-28-0	THALLIUM	1	1	1	U	
7440-62-2	VANADIUM	1	1	1	U	
7440-66-6	ZINC	1	2	2	U	

2000098

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010B

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: IP100304-3LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/04/2010
Date Analyzed: 03/04/2010
Prep Method: SW3005A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: N/A
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7429-90-5	ALUMINUM	2	2.05	0.2		103	80 - 120%
7440-36-0	ANTIMONY	0.5	0.475	0.02		95	80 - 120%
7440-38-2	ARSENIC	2	1.99	0.01		99	80 - 120%
7440-39-3	BARIUM	2	1.95	0.1		97	80 - 120%
7440-41-7	BERYLLIUM	0.05	0.0476	0.005		95	80 - 120%
7440-43-9	CADMIUM	0.05	0.05	0.005		100	80 - 120%
7440-70-2	CALCIUM	40	39.3	1		98	80 - 120%
7440-47-3	CHROMIUM	0.2	0.192	0.01		96	80 - 120%
7440-48-4	COBALT	0.5	0.476	0.01		95	80 - 120%
7440-50-8	COPPER	0.25	0.245	0.01		98	80 - 120%
7439-89-6	IRON	1	0.997	0.1		100	80 - 120%
7439-92-1	LEAD	0.5	0.467	0.003		93	80 - 120%
7439-95-4	MAGNESIUM	40	40.3	1		101	80 - 120%
7439-96-5	MANGANESE	0.5	0.475	0.01		95	80 - 120%
7440-02-0	NICKEL	0.5	0.469	0.02		94	80 - 120%
7440-09-7	POTASSIUM	40	38.1	1		95	80 - 120%
7782-49-2	SELENIUM	2	2.02	0.005		101	80 - 120%
7440-22-4	SILVER	0.1	0.0978	0.01		98	80 - 120%
7440-23-5	SODIUM	40	37.3	1		93	80 - 120%
7440-28-0	THALLIUM	2	1.97	0.01		98	80 - 120%
7440-62-2	VANADIUM	0.5	0.486	0.01		97	80 - 120%
7440-66-6	ZINC	0.5	0.467	0.02		93	80 - 120%

2000099

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: IP100304-4LCS

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/04/2010
Date Analyzed: 03/05/2010
Prep Method: SW3050B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: N/A
File Name: 100305A.

Sample Aliquot: 1 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7429-90-5	ALUMINUM	200	210	20		105	80 - 120%
7440-36-0	ANTIMONY	50	47.5	2		95	80 - 120%
7440-38-2	ARSENIC	200	195	1		98	80 - 120%
7440-39-3	BARIUM	200	196	10		98	80 - 120%
7440-41-7	BERYLLIUM	5	4.52	0.5		90	80 - 120%
7440-43-9	CADMIUM	5	4.9	0.5		98	80 - 120%
7440-70-2	CALCIUM	4000	3840	100		96	80 - 120%
7440-47-3	CHROMIUM	20	18.7	1		94	80 - 120%
7440-48-4	COBALT	50	46.7	1		93	80 - 120%
7440-50-8	COPPER	25	24.6	1		98	80 - 120%
7439-89-6	IRON	100	101	10		101	80 - 120%
7439-92-1	LEAD	50	44.7	0.3		89	80 - 120%
7439-95-4	MAGNESIUM	4000	3880	100		97	80 - 120%
7439-96-5	MANGANESE	50	46.2	1		92	80 - 120%
7440-02-0	NICKEL	50	47.8	2		96	80 - 120%
7440-09-7	POTASSIUM	4000	3790	100		95	80 - 120%
7782-49-2	SELENIUM	200	183	0.5		91	80 - 120%
7440-22-4	SILVER	10	9.79	1		98	80 - 120%
7440-23-5	SODIUM	4000	3650	100		91	80 - 120%
7440-28-0	THALLIUM	200	200	1		100	80 - 120%
7440-62-2	VANADIUM	50	48	1		96	80 - 120%
7440-66-6	ZINC	50	44.5	2		89	80 - 120%

20000100

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: Rinsate 030210
LabID: 1003045-1MS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
File Name: 100304A.

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7429-90-5	ALUMINUM	0.2	U	2.23		0.2	2	111	80 - 120%
7440-36-0	ANTIMONY	0.02	U	0.482		0.02	0.5	96	80 - 120%
7440-38-2	ARSENIC	0.01	U	2.02		0.01	2	101	80 - 120%
7440-39-3	BARIUM	0.1	U	1.98		0.1	2	99	80 - 120%
7440-41-7	BERYLLIUM	0.005	U	0.0483		0.005	0.05	97	80 - 120%
7440-43-9	CADMIUM	0.005	U	0.0514		0.005	0.05	103	80 - 120%
7440-70-2	CALCIUM	1	U	40		1	40	100	80 - 120%
7440-47-3	CHROMIUM	0.01	U	0.195		0.01	0.2	98	80 - 120%
7440-48-4	COBALT	0.01	U	0.484		0.01	0.5	97	80 - 120%
7440-50-8	COPPER	0.01	U	0.249		0.01	0.25	100	80 - 120%
7439-89-6	IRON	0.1	U	1.09		0.1	1	109	80 - 120%
7439-92-1	LEAD	0.003	U	0.472		0.003	0.5	94	80 - 120%
7439-95-4	MAGNESIUM	1	U	41		1	40	102	80 - 120%
7439-96-5	MANGANESE	0.01	U	0.482		0.01	0.5	96	80 - 120%
7440-02-0	NICKEL	0.02	U	0.479		0.02	0.5	96	80 - 120%
7440-09-7	POTASSIUM	1	U	38.5		1	40	96	80 - 120%
7782-49-2	SELENIUM	0.005	U	2.04		0.005	2	102	80 - 120%
7440-22-4	SILVER	0.01	U	0.0989		0.01	0.1	99	80 - 120%
7440-23-5	SODIUM	1	U	37.9		1	40	95	80 - 120%
7440-28-0	THALLIUM	0.01	U	2.01		0.01	2	100	80 - 120%
7440-62-2	VANADIUM	0.01	U	0.494		0.01	0.5	99	80 - 120%
7440-66-6	ZINC	0.02	U	0.476		0.02	0.5	95	80 - 120%

20000101

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: Rinsate 030210
LabID: 1003045-1MSD

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 04-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
File Name: 100304A.

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7429-90-5	ALUMINUM	2.26		2	113	0.2	20	2
7440-36-0	ANTIMONY	0.494		0.5	99	0.02	20	2
7440-38-2	ARSENIC	2.08		2	104	0.01	20	3
7440-39-3	BARIUM	2		2	100	0.1	20	1
7440-41-7	BERYLLIUM	0.0498		0.05	100	0.005	20	3
7440-43-9	CADMIUM	0.0524		0.05	105	0.005	20	2
7440-70-2	CALCIUM	41.3		40	103	1	20	3
7440-47-3	CHROMIUM	0.201		0.2	100	0.01	20	3
7440-48-4	COBALT	0.498		0.5	100	0.01	20	3
7440-50-8	COPPER	0.253		0.25	101	0.01	20	1
7439-89-6	IRON	1.12		1	112	0.1	20	3
7439-92-1	LEAD	0.484		0.5	97	0.003	20	3
7439-95-4	MAGNESIUM	42.2		40	105	1	20	3
7439-96-5	MANGANESE	0.494		0.5	99	0.01	20	2
7440-02-0	NICKEL	0.495		0.5	99	0.02	20	3
7440-09-7	POTASSIUM	38.7		40	97	1	20	1
7782-49-2	SELENIUM	2.09		2	104	0.005	20	2
7440-22-4	SILVER	0.1		0.1	100	0.01	20	2
7440-23-5	SODIUM	38.1		40	95	1	20	1
7440-28-0	THALLIUM	2.06		2	103	0.01	20	3
7440-62-2	VANADIUM	0.505		0.5	101	0.01	20	2
7440-66-6	ZINC	0.497		0.5	99	0.02	20	4

20000102

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-03
LabID: 1003045-4MS

Sample Matrix: SEDIMENT
% Moisture: 8.0
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1.014 g
Final Volume: 100 ml
Result Units: MG/KG
File Name: 100305A.

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7429-90-5	ALUMINUM	2800		5370		21.4	214	1215	80 - 120%
7440-36-0	ANTIMONY	2.14	U	34	N	2.14	53.6	64	80 - 120%
7440-38-2	ARSENIC	1.5		220		1.07	214	102	80 - 120%
7440-39-3	BARIUM	77		279		10.7	214	94	80 - 120%
7440-41-7	BERYLLIUM	0.536	U	5.3		0.536	5.36	99	80 - 120%
7440-43-9	CADMIUM	0.536	U	5.38		0.536	5.36	100	80 - 120%
7440-70-2	CALCIUM	6200		11100		107	4290	114	80 - 120%
7440-47-3	CHROMIUM	2.6		24.2		1.07	21.4	100	80 - 120%
7440-48-4	COBALT	1.6		53.2		1.07	53.6	96	80 - 120%
7440-50-8	COPPER	2.4		29.9		1.07	26.8	103	80 - 120%
7439-89-6	IRON	5100		5620		10.7	107	506	80 - 120%
7439-92-1	LEAD	2.9		51.9		0.321	53.6	91	80 - 120%
7439-95-4	MAGNESIUM	1300		5850		107	4290	107	80 - 120%
7439-96-5	MANGANESE	75		124		1.07	53.6	91	80 - 120%
7440-02-0	NICKEL	3.2		57.1		2.14	53.6	101	80 - 120%
7440-09-7	POTASSIUM	580		5060		107	4290	104	80 - 120%
7782-49-2	SELENIUM	0.536	U	202		0.536	214	94	80 - 120%
7440-22-4	SILVER	1.07	U	10.7		1.07	10.7	100	80 - 120%
7440-23-5	SODIUM	160		4310		107	4290	97	80 - 120%
7440-28-0	THALLIUM	1.07	U	221		1.07	214	103	80 - 120%
7440-62-2	VANADIUM	6.9		60.3		1.07	53.6	100	80 - 120%
7440-66-6	ZINC	10		59.1		2.14	53.6	92	80 - 120%

20000103

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-03
LabID: 1003045-4MSD

Sample Matrix: SEDIMENT
% Moisture: 8.0
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1.004 g
Final Volume: 100 ml
Result Units: MG/KG
File Name: 100305A.

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7429-90-5	ALUMINUM	4870		216	974	21.6	20	10
7440-36-0	ANTIMONY	36.1	N	54.1	67	2.16	20	6
7440-38-2	ARSENIC	223		216	102	1.08	20	2
7440-39-3	BARIUM	301		216	104	10.8	20	8
7440-41-7	BERYLLIUM	5.38		5.41	99	0.541	20	1
7440-43-9	CADMIUM	5.49		5.41	101	0.541	20	2
7440-70-2	CALCIUM	10300		4330	95	108	20	7
7440-47-3	CHROMIUM	24.8		21.6	102	1.08	20	2
7440-48-4	COBALT	54.1		54.1	97	1.08	20	2
7440-50-8	COPPER	29.9		27.1	102	1.08	20	0
7439-89-6	IRON	5330		108	229	10.8	20	5
7439-92-1	LEAD	52.4		54.1	92	0.325	20	1
7439-95-4	MAGNESIUM	5760		4330	104	108	20	2
7439-96-5	MANGANESE	119		54.1	80	1.08	20	4
7440-02-0	NICKEL	57.9		54.1	101	2.16	20	1
7440-09-7	POTASSIUM	4990		4330	102	108	20	1
7782-49-2	SELENIUM	207		216	95	0.541	20	2
7440-22-4	SILVER	10.9		10.8	101	1.08	20	2
7440-23-5	SODIUM	4300		4330	96	108	20	0
7440-28-0	THALLIUM	225		216	104	1.08	20	2
7440-62-2	VANADIUM	62		54.1	102	1.08	20	3
7440-66-6	ZINC	59.6		54.1	92	2.16	20	1

20000104

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Analytical Spike Sample Recovery

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-03
LabID: 1003045-4A

Run ID: IT100305-2A1
Date Analyzed: 05-Mar-10
Result Units: mg/l

Target Analyte	Sample Result	Samp Qual	PS Result	PS Qual	Spike Added	PS % Rec.	Control Limits
ANTIMONY	0.0200	U	0.966		1	97	75 - 125%

20000105

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Duplicate Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: Rinsate 030210
Lab ID: 1003045-1D

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03/02/2010
Date Extracted: 03/04/2010
Date Analyzed: 03/04/2010

Prep Batch: IP100304-3
QCBatchID: IP100304-3-1
Run ID: IT100304-2A1
Cleanup: NONE
Basis: As Received
File Name: 100304A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Sample Result	Samp Qual	Duplicate Result	Dup Qual	Reporting Limit	Dilution Factor	RPD	RPD Limit
7429-90-5	ALUMINUM	0.2	U	0.2	U	0.2	1		20
7440-36-0	ANTIMONY	0.02	U	0.02	U	0.02	1		20
7440-38-2	ARSENIC	0.01	U	0.01	U	0.01	1		20
7440-39-3	BARIUM	0.1	U	0.1	U	0.1	1		20
7440-41-7	BERYLLIUM	0.005	U	0.005	U	0.005	1		20
7440-43-9	CADMIUM	0.005	U	0.005	U	0.005	1		20
7440-70-2	CALCIUM	1	U	1	U	1	1		20
7440-47-3	CHROMIUM	0.01	U	0.01	U	0.01	1		20
7440-48-4	COBALT	0.01	U	0.01	U	0.01	1		20
7440-50-8	COPPER	0.01	U	0.01	U	0.01	1		20
7439-89-6	IRON	0.1	U	0.1	U	0.1	1		20
7439-92-1	LEAD	0.003	U	0.003	U	0.003	1		20
7439-95-4	MAGNESIUM	1	U	1	U	1	1		20
7439-96-5	MANGANESE	0.01	U	0.01	U	0.01	1		20
7440-02-0	NICKEL	0.02	U	0.02	U	0.02	1		20
7440-09-7	POTASSIUM	1	U	1	U	1	1		20
7782-49-2	SELENIUM	0.005	U	0.005	U	0.005	1		20
7440-22-4	SILVER	0.01	U	0.01	U	0.01	1		20
7440-23-5	SODIUM	1	U	1	U	1	1		20
7440-28-0	THALLIUM	0.01	U	0.01	U	0.01	1		20
7440-62-2	VANADIUM	0.01	U	0.01	U	0.01	1		20
7440-66-6	ZINC	0.02	U	0.0353		0.02	1		20

20000106

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Duplicate Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-03
Lab ID: 1003045-4D

Sample Matrix: SEDIMENT
% Moisture: 8.0
Date Collected: 03/02/2010
Date Extracted: 03/04/2010
Date Analyzed: 03/05/2010

Prep Batch: IP100304-4
QCBatchID: IP100304-4-1
Run ID: IT100305-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100305A.

Sample Aliquot: 1.012 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Sample Result	Samp Qual	Duplicate Result	Dup Qual	Reporting Limit	Dilution Factor	RPD	RPD Limit
7429-90-5	ALUMINUM	2800		2260		21.5	1	20	20
7440-36-0	ANTIMONY	2.15	U	2.15	U	2.15	1		20
7440-38-2	ARSENIC	1.5		1.35		1.07	1		20
7440-39-3	BARIUM	77		75.6		10.7	1	2	20
7440-41-7	BERYLLIUM	0.537	U	0.537	U	0.537	1		20
7440-43-9	CADMIUM	0.537	U	0.537	U	0.537	1		20
7440-70-2	CALCIUM	6200		5880		107	1	6	20
7440-47-3	CHROMIUM	2.6		2.44		1.07	1		20
7440-48-4	COBALT	1.6		1.41		1.07	1		20
7440-50-8	COPPER	2.4		1.82		1.07	1		20
7439-89-6	IRON	5100		4110	*	10.7	1	21	20
7439-92-1	LEAD	2.9		2.39	*	0.322	1	21	20
7439-95-4	MAGNESIUM	1300		985	*	107	1	24	20
7439-96-5	MANGANESE	75		65.4		1.07	1	14	20
7440-02-0	NICKEL	3.2		2.42		2.15	1		20
7440-09-7	POTASSIUM	580		461	*	107	1	23	20
7782-49-2	SELENIUM	0.537	U	0.537	U	0.537	1		20
7440-22-4	SILVER	1.07	U	1.07	U	1.07	1		20
7440-23-5	SODIUM	160		129		107	1		20
7440-28-0	THALLIUM	1.07	U	1.07	U	1.07	1		20
7440-62-2	VANADIUM	6.9		6.21		1.07	1	10	20
7440-66-6	ZINC	10		8.04		2.15	1		20

20000107

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Serial Dilution

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Field ID: Rinsate 030210
Lab ID: 1003045-1L

Run ID: IT100304-2A1
Date Analyzed: 04-Mar-10
Result Units: mg/l

CASNO	Target Analyte	Sample Result	Samp Qual	SD Result	SD Qual	EPA Qualifier	%D
7429-90-5	ALUMINUM	0.200	U	1.00	U		
7440-36-0	ANTIMONY	0.0200	U	0.100	U		
7440-38-2	ARSENIC	0.0100	U	0.0500	U		
7440-39-3	BARIUM	0.100	U	0.500	U		
7440-41-7	BERYLLIUM	0.00500	U	0.0250	U		
7440-43-9	CADMIUM	0.00500	U	0.0250	U		
7440-70-2	CALCIUM	1.00	U	5.00	U		
7440-47-3	CHROMIUM	0.0100	U	0.0500	U		
7440-48-4	COBALT	0.0100	U	0.0500	U		
7440-50-8	COPPER	0.0100	U	0.0500	U		
7439-89-6	IRON	0.100	U	0.500	U		
7439-92-1	LEAD	0.00300	U	0.0150	U		
7439-95-4	MAGNESIUM	1.00	U	5.00	U		
7439-96-5	MANGANESE	0.0100	U	0.0500	U		
7440-02-0	NICKEL	0.0200	U	0.100	U		
7440-09-7	POTASSIUM	1.00	U	5.00	U		
7782-49-2	SELENIUM	0.00500	U	0.0250	U		
7440-22-4	SILVER	0.0100	U	0.0500	U		
7440-23-5	SODIUM	1.00	U	5.00	U		
7440-28-0	THALLIUM	0.0100	U	0.0500	U		
7440-62-2	VANADIUM	0.0100	U	0.0500	U		
7440-66-6	ZINC	0.0200	U	0.100	U		

20000108

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Serial Dilution

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-03
Lab ID: 1003045-4L

Run ID: IT100305-2A1
Date Analyzed: 05-Mar-10
Result Units: mg/l

CASNO	Target Analyte	Sample Result	Samp Qual	SD Result	SD Qual	EPA Qualifier	%D
7429-90-5	ALUMINUM	25.5		26.4			4
7440-36-0	ANTIMONY	0.0200	U	0.100	U		
7440-38-2	ARSENIC	0.0142		0.0500	U		
7440-39-3	BARIUM	0.714		0.736			
7440-41-7	BERYLLIUM	0.00500	U	0.0250	U		
7440-43-9	CADMIUM	0.00500	U	0.0250	U		
7440-70-2	CALCIUM	57.4		60.2			5
7440-47-3	CHROMIUM	0.0244		0.0500	U		
7440-48-4	COBALT	0.0146		0.0500	U		
7440-50-8	COPPER	0.0219		0.0500	U		
7439-89-6	IRON	46.9		47.4			1
7439-92-1	LEAD	0.0273		0.0270			
7439-95-4	MAGNESIUM	11.6		12.2			6
7439-96-5	MANGANESE	0.697		0.737			6
7440-02-0	NICKEL	0.0294		0.100	U		
7440-09-7	POTASSIUM	5.37		5.00	U		
7782-49-2	SELENIUM	0.00500	U	0.0250	U		
7440-22-4	SILVER	0.0100	U	0.0500	U		
7440-23-5	SODIUM	1.44		5.00	U		
7440-28-0	THALLIUM	0.0100	U	0.0500	U		
7440-62-2	VANADIUM	0.0637		0.0672			
7440-66-6	ZINC	0.0931		0.100	U		

20000109

Data Package ID: *IT1003045-1*

Prep Batch ID: IP100304-3

Start Date: 03/04/10
Start Time: 13:10
Prep Analyst: Preston Mathiesen

End Date: 03/04/10
End Time: 16:20

Concentration Method: NONE
Extract Method: SW3005A
Initial Volume Units: g
Final Volume Units: g

Batch Created By: plm
Date Created: 03/04/10
Time Created: 13:08
Validated By: plm
Date Validated: 03/04/10
Time Validated: 18:32

Comments:

QC Batch ID: IP100304-3-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP100304-3	RVS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003045
IP100304-3	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003045
IP100304-3	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003045
1003045-1	MS	Rinsate 030210	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-1	MSD	Rinsate 030210	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-1	DUP	Rinsate 030210	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-1	SMP	Rinsate 030210	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-14	SMP	RP-SW-BG	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-15	SMP	RP-SW-BGD	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-20	SMP	PR-SW-01	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-22	SMP	RP-SW-03	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-24	SMP	RSJ-SW-01	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-25	SMP	RSJ-SW-02	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-3	SMP	RM-SW-BG	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-6	SMP	RSJ-SW-03	WATER	3/2/2010	50	50	NONE	1	1003045
1003045-7	SMP	RSJ-SW-BG	WATER	3/2/2010	50	50	NONE	1	1003045

QC Types

CAR	Carrier reference sample		DUP	Laboratory Duplicate
LCS	Laboratory Control Sample		LCSD	Laboratory Control Sample Duplicat
MB	Method Blank		MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate		REP	Sample replicate
RVS	Reporting Level Verification Standar		SMP	Field Sample
SYS	Sample Yield Spike			

20000110

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

Prep Batch ID: IP100304-4

Start Date: 03/04/10
Start Time: 13:55
Prep Analyst: Preston Mathiesen

End Date: 03/04/10
End Time: 17:25

Concentration Method: NONE
Extract Method: SW3050B
Initial Volume Units: g
Final Volume Units: ml

Batch Created By: plm
Date Created: 03/04/10
Time Created: 13:55
Validated By: plm
Date Validated: 03/04/10
Time Validated: 19:27

Comments:

QC Batch ID: IP100304-4-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP100304-4	RVS	XXXXXX	SEDIME	XXXXXX	1.004	100	NONE	1	1003045
IP100304-4	MB	XXXXXX	SEDIME	XXXXXX	1	100	NONE	1	1003045
IP100304-4	LCS	XXXXXX	SEDIME	XXXXXX	1	100	NONE	1	1003045
1003045-4	MS	RSJ-SED-03	SEDIME	3/2/2010	1.014	100	NONE	1	1003045
1003045-4	MSD	RSJ-SED-03	SEDIME	3/2/2010	1.004	100	NONE	1	1003045
1003045-4	DUP	RSJ-SED-03	SEDIME	3/2/2010	1.012	100	NONE	1	1003045
1003045-10	SMP	MD-SED-4-6'	SEDIME	3/2/2010	1.009	100	NONE	1	1003045
1003045-11	SMP	PR-SED-01	SEDIME	3/2/2010	1.018	100	NONE	1	1003045
1003045-12	SMP	RP-SED-BG	SEDIME	3/2/2010	1.02	100	NONE	1	1003045
1003045-13	SMP	RP-SED-BGD	SEDIME	3/2/2010	1.014	100	NONE	1	1003045
1003045-16	SMP	RSJ-SED-02	SEDIME	3/2/2010	1.019	100	NONE	1	1003045
1003045-17	SMP	WR-SED-0-2'	SEDIME	3/2/2010	1.036	100	NONE	1	1003045
1003045-18	SMP	WR-SED-3'	SEDIME	3/2/2010	1.036	100	NONE	1	1003045
1003045-19	SMP	WR-SED-5.5'	SEDIME	3/2/2010	1.041	100	NONE	1	1003045
1003045-2	SMP	RM-SED-BG	SEDIME	3/2/2010	1.005	100	NONE	1	1003045
1003045-21	SMP	RP-SED-03	SEDIME	3/2/2010	1.023	100	NONE	1	1003045
1003045-23	SMP	RSJ-SED-01	SEDIME	3/2/2010	1.041	100	NONE	1	1003045
1003045-4	SMP	RSJ-SED-03	SEDIME	3/2/2010	1.004	100	NONE	1	1003045
1003045-5	SMP	RSJ-SED-BG	SEDIME	3/2/2010	1.041	100	NONE	1	1003045
1003045-8	SMP	MD-SED-0-2'	SEDIME	3/2/2010	1.022	100	NONE	1	1003045
1003045-9	SMP	MD-SED-2-4'	SEDIME	3/2/2010	1.034	100	NONE	1	1003045

QC Types

CAR	Carrier reference sample	DUP	Laboratory Duplicate	
LCS	Laboratory Control Sample	LCSD	Laboratory Control Sample Duplicat	
MB	Method Blank	MS	Laboratory Matrix Spike	
MSD	Laboratory Matrix Spike Duplicate	REP	Sample replicate	
RVS	Reporting Level Verification Standar	SMP	Field Sample	20000111
SYS	Sample Yield Spike			

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: ICV
QC Type: Initial Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 12:30
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	25	25	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.25	0.246	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.25	0.254	0.01		102	90 - 110%
7440-39-3	BARIUM	0.5	0.499	0.1		100	90 - 110%
7440-41-7	BERYLLIUM	0.25	0.248	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.25	0.245	0.005		98	90 - 110%
7440-70-2	CALCIUM	25	24.5	1		98	90 - 110%
7440-47-3	CHROMIUM	0.5	0.497	0.01		99	90 - 110%
7440-48-4	COBALT	0.25	0.25	0.01		100	90 - 110%
7440-50-8	COPPER	0.5	0.488	0.01		98	90 - 110%
7439-89-6	IRON	10	10.1	0.1		101	90 - 110%
7439-92-1	LEAD	0.5	0.48	0.003		96	90 - 110%
7439-95-4	MAGNESIUM	25	24.8	1		99	90 - 110%
7439-96-5	MANGANESE	0.5	0.493	0.01		99	90 - 110%
7440-02-0	NICKEL	0.5	0.502	0.02		100	90 - 110%
7440-09-7	POTASSIUM	25	24.8	1		99	90 - 110%
7782-49-2	SELENIUM	0.5	0.497	0.005		99	90 - 110%
7440-22-4	SILVER	0.1	0.0985	0.01		98	90 - 110%
7440-23-5	SODIUM	25	24.6	1		98	90 - 110%
7440-28-0	THALLIUM	0.25	0.253	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.25	0.244	0.01		98	90 - 110%
7440-66-6	ZINC	0.5	0.506	0.02		101	90 - 110%

20000112

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV1
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 12:39
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.3	0.2		101	90 - 110%
7440-36-0	ANTIMONY	0.5	0.493	0.02		99	90 - 110%
7440-38-2	ARSENIC	0.5	0.518	0.01		104	90 - 110%
7440-39-3	BARIUM	1	0.991	0.1		99	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.499	0.005		100	90 - 110%
7440-43-9	CADMIUM	0.5	0.495	0.005		99	90 - 110%
7440-70-2	CALCIUM	50	50.1	1		100	90 - 110%
7440-47-3	CHROMIUM	1	1	0.01		100	90 - 110%
7440-48-4	COBALT	0.5	0.504	0.01		101	90 - 110%
7440-50-8	COPPER	1	0.975	0.01		97	90 - 110%
7439-89-6	IRON	20	20.6	0.1		103	90 - 110%
7439-92-1	LEAD	1	0.975	0.003		98	90 - 110%
7439-95-4	MAGNESIUM	50	51.1	1		102	90 - 110%
7439-96-5	MANGANESE	1	0.993	0.01		99	90 - 110%
7440-02-0	NICKEL	1	1.01	0.02		101	90 - 110%
7440-09-7	POTASSIUM	50	51.4	1		103	90 - 110%
7782-49-2	SELENIUM	1	1.01	0.005		101	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		99	90 - 110%
7440-23-5	SODIUM	50	49.6	1		99	90 - 110%
7440-28-0	THALLIUM	0.5	0.507	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.49	0.01		98	90 - 110%
7440-66-6	ZINC	1	1.04	0.02		104	90 - 110%

20000113

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV2
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 13:00
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.5	0.2		99	90 - 110%
7440-36-0	ANTIMONY	0.5	0.479	0.02		96	90 - 110%
7440-38-2	ARSENIC	0.5	0.498	0.01		100	90 - 110%
7440-39-3	BARIUM	1	0.978	0.1		98	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.479	0.005		96	90 - 110%
7440-43-9	CADMIUM	0.5	0.48	0.005		96	90 - 110%
7440-70-2	CALCIUM	50	47.8	1		96	90 - 110%
7440-47-3	CHROMIUM	1	0.964	0.01		96	90 - 110%
7440-48-4	COBALT	0.5	0.484	0.01		97	90 - 110%
7440-50-8	COPPER	1	0.96	0.01		96	90 - 110%
7439-89-6	IRON	20	19.9	0.1		99	90 - 110%
7439-92-1	LEAD	1	0.933	0.003		93	90 - 110%
7439-95-4	MAGNESIUM	50	48.8	1		98	90 - 110%
7439-96-5	MANGANESE	1	0.958	0.01		96	90 - 110%
7440-02-0	NICKEL	1	0.968	0.02		97	90 - 110%
7440-09-7	POTASSIUM	50	51.1	1		102	90 - 110%
7782-49-2	SELENIUM	1	0.98	0.005		98	90 - 110%
7440-22-4	SILVER	0.2	0.194	0.01		97	90 - 110%
7440-23-5	SODIUM	50	49.2	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.495	0.01		99	90 - 110%
7440-62-2	VANADIUM	0.5	0.475	0.01		95	90 - 110%
7440-66-6	ZINC	1	0.977	0.02		98	90 - 110%

20000114

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV3
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 13:23
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	51.5	0.2		103	90 - 110%
7440-36-0	ANTIMONY	0.5	0.505	0.02		101	90 - 110%
7440-38-2	ARSENIC	0.5	0.526	0.01		105	90 - 110%
7440-39-3	BARIUM	1	1.02	0.1		102	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.5	0.005		100	90 - 110%
7440-43-9	CADMIUM	0.5	0.504	0.005		101	90 - 110%
7440-70-2	CALCIUM	50	50.3	1		101	90 - 110%
7440-47-3	CHROMIUM	1	1.01	0.01		101	90 - 110%
7440-48-4	COBALT	0.5	0.508	0.01		102	90 - 110%
7440-50-8	COPPER	1	1	0.01		100	90 - 110%
7439-89-6	IRON	20	20.8	0.1		104	90 - 110%
7439-92-1	LEAD	1	0.975	0.003		97	90 - 110%
7439-95-4	MAGNESIUM	50	51.2	1		102	90 - 110%
7439-96-5	MANGANESE	1	0.997	0.01		100	90 - 110%
7440-02-0	NICKEL	1	1.03	0.02		103	90 - 110%
7440-09-7	POTASSIUM	50	52.4	1		105	90 - 110%
7782-49-2	SELENIUM	1	1.04	0.005		104	90 - 110%
7440-22-4	SILVER	0.2	0.201	0.01		101	90 - 110%
7440-23-5	SODIUM	50	50.4	1		101	90 - 110%
7440-28-0	THALLIUM	0.5	0.521	0.01		104	90 - 110%
7440-62-2	VANADIUM	0.5	0.495	0.01		99	90 - 110%
7440-66-6	ZINC	1	1.02	0.02		102	90 - 110%

20000115

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV4
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 13:44
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.9	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.488	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.5	0.508	0.01		102	90 - 110%
7440-39-3	BARIUM	1	0.983	0.1		98	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.489	0.005		98	90 - 110%
7440-43-9	CADMIUM	0.5	0.49	0.005		98	90 - 110%
7440-70-2	CALCIUM	50	49.4	1		99	90 - 110%
7440-47-3	CHROMIUM	1	0.985	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.496	0.01		99	90 - 110%
7440-50-8	COPPER	1	0.971	0.01		97	90 - 110%
7439-89-6	IRON	20	20.3	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.96	0.003		96	90 - 110%
7439-95-4	MAGNESIUM	50	50	1		100	90 - 110%
7439-96-5	MANGANESE	1	0.973	0.01		97	90 - 110%
7440-02-0	NICKEL	1	0.997	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	51.1	1		102	90 - 110%
7782-49-2	SELENIUM	1	0.998	0.005		100	90 - 110%
7440-22-4	SILVER	0.2	0.197	0.01		99	90 - 110%
7440-23-5	SODIUM	50	49.5	1		99	90 - 110%
7440-28-0	THALLIUM	0.5	0.501	0.01		100	90 - 110%
7440-62-2	VANADIUM	0.5	0.483	0.01		97	90 - 110%
7440-66-6	ZINC	1	1.01	0.02		101	90 - 110%

20000116

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV5
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 14:06
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.1	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.489	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.5	0.508	0.01		102	90 - 110%
7440-39-3	BARIUM	1	0.989	0.1		99	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.484	0.005		97	90 - 110%
7440-43-9	CADMIUM	0.5	0.492	0.005		98	90 - 110%
7440-70-2	CALCIUM	50	49	1		98	90 - 110%
7440-47-3	CHROMIUM	1	0.978	0.01		98	90 - 110%
7440-48-4	COBALT	0.5	0.493	0.01		99	90 - 110%
7440-50-8	COPPER	1	0.982	0.01		98	90 - 110%
7439-89-6	IRON	20	20.1	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.946	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	49.6	1		99	90 - 110%
7439-96-5	MANGANESE	1	0.965	0.01		96	90 - 110%
7440-02-0	NICKEL	1	0.999	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	51.5	1		103	90 - 110%
7782-49-2	SELENIUM	1	0.989	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.198	0.01		99	90 - 110%
7440-23-5	SODIUM	50	49.6	1		99	90 - 110%
7440-28-0	THALLIUM	0.5	0.504	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.482	0.01		96	90 - 110%
7440-66-6	ZINC	1	0.983	0.02		98	90 - 110%

20000117

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV6
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 14:16
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.1	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.495	0.02		99	90 - 110%
7440-38-2	ARSENIC	0.5	0.512	0.01		102	90 - 110%
7440-39-3	BARIUM	1	0.989	0.1		99	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.491	0.005		98	90 - 110%
7440-43-9	CADMIUM	0.5	0.498	0.005		100	90 - 110%
7440-70-2	CALCIUM	50	49.9	1		100	90 - 110%
7440-47-3	CHROMIUM	1	0.991	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.5	0.01		100	90 - 110%
7440-50-8	COPPER	1	0.984	0.01		98	90 - 110%
7439-89-6	IRON	20	20.4	0.1		102	90 - 110%
7439-92-1	LEAD	1	0.961	0.003		96	90 - 110%
7439-95-4	MAGNESIUM	50	50.5	1		101	90 - 110%
7439-96-5	MANGANESE	1	0.975	0.01		98	90 - 110%
7440-02-0	NICKEL	1	1.02	0.02		102	90 - 110%
7440-09-7	POTASSIUM	50	51.3	1		103	90 - 110%
7782-49-2	SELENIUM	1	0.997	0.005		100	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		100	90 - 110%
7440-23-5	SODIUM	50	49.5	1		99	90 - 110%
7440-28-0	THALLIUM	0.5	0.508	0.01		102	90 - 110%
7440-62-2	VANADIUM	0.5	0.486	0.01		97	90 - 110%
7440-66-6	ZINC	1	1.01	0.02		101	90 - 110%

20000118

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV7
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 15:22
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.8	0.2		102	90 - 110%
7440-36-0	ANTIMONY	0.5	0.488	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.5	0.514	0.01		103	90 - 110%
7440-39-3	BARIUM	1	0.994	0.1		99	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.501	0.005		100	90 - 110%
7440-43-9	CADMIUM	0.5	0.493	0.005		99	90 - 110%
7440-70-2	CALCIUM	50	50.4	1		101	90 - 110%
7440-47-3	CHROMIUM	1	1.01	0.01		101	90 - 110%
7440-48-4	COBALT	0.5	0.507	0.01		101	90 - 110%
7440-50-8	COPPER	1	0.983	0.01		98	90 - 110%
7439-89-6	IRON	20	20.7	0.1		104	90 - 110%
7439-92-1	LEAD	1	0.98	0.003		98	90 - 110%
7439-95-4	MAGNESIUM	50	51.4	1		103	90 - 110%
7439-96-5	MANGANESE	1	0.996	0.01		100	90 - 110%
7440-02-0	NICKEL	1	1.01	0.02		101	90 - 110%
7440-09-7	POTASSIUM	50	51.4	1		103	90 - 110%
7782-49-2	SELENIUM	1	1.02	0.005		102	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		100	90 - 110%
7440-23-5	SODIUM	50	50	1		100	90 - 110%
7440-28-0	THALLIUM	0.5	0.508	0.01		102	90 - 110%
7440-62-2	VANADIUM	0.5	0.493	0.01		99	90 - 110%
7440-66-6	ZINC	1	1.05	0.02		105	90 - 110%

20000119

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV8
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 15:44
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.9	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.476	0.02		95	90 - 110%
7440-38-2	ARSENIC	0.5	0.498	0.01		100	90 - 110%
7440-39-3	BARIUM	1	0.979	0.1		98	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.485	0.005		97	90 - 110%
7440-43-9	CADMIUM	0.5	0.48	0.005		96	90 - 110%
7440-70-2	CALCIUM	50	48.6	1		97	90 - 110%
7440-47-3	CHROMIUM	1	0.978	0.01		98	90 - 110%
7440-48-4	COBALT	0.5	0.491	0.01		98	90 - 110%
7440-50-8	COPPER	1	0.971	0.01		97	90 - 110%
7439-89-6	IRON	20	20.1	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.947	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	49.7	1		99	90 - 110%
7439-96-5	MANGANESE	1	0.966	0.01		97	90 - 110%
7440-02-0	NICKEL	1	0.977	0.02		98	90 - 110%
7440-09-7	POTASSIUM	50	50.7	1		101	90 - 110%
7782-49-2	SELENIUM	1	0.991	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.196	0.01		98	90 - 110%
7440-23-5	SODIUM	50	49.1	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.495	0.01		99	90 - 110%
7440-62-2	VANADIUM	0.5	0.479	0.01		96	90 - 110%
7440-66-6	ZINC	1	1	0.02		100	90 - 110%

20000120

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV9
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 16:06
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	48.8	0.2		98	90 - 110%
7440-36-0	ANTIMONY	0.5	0.466	0.02		93	90 - 110%
7440-38-2	ARSENIC	0.5	0.492	0.01		98	90 - 110%
7440-39-3	BARIUM	1	0.96	0.1		96	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.48	0.005		96	90 - 110%
7440-43-9	CADMIUM	0.5	0.476	0.005		95	90 - 110%
7440-70-2	CALCIUM	50	48.1	1		96	90 - 110%
7440-47-3	CHROMIUM	1	0.964	0.01		96	90 - 110%
7440-48-4	COBALT	0.5	0.484	0.01		97	90 - 110%
7440-50-8	COPPER	1	0.956	0.01		96	90 - 110%
7439-89-6	IRON	20	19.8	0.1		99	90 - 110%
7439-92-1	LEAD	1	0.932	0.003		93	90 - 110%
7439-95-4	MAGNESIUM	50	49.1	1		98	90 - 110%
7439-96-5	MANGANESE	1	0.95	0.01		95	90 - 110%
7440-02-0	NICKEL	1	0.968	0.02		97	90 - 110%
7440-09-7	POTASSIUM	50	49.7	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.971	0.005		97	90 - 110%
7440-22-4	SILVER	0.2	0.193	0.01		96	90 - 110%
7440-23-5	SODIUM	50	46.3	1		93	90 - 110%
7440-28-0	THALLIUM	0.5	0.491	0.01		98	90 - 110%
7440-62-2	VANADIUM	0.5	0.473	0.01		95	90 - 110%
7440-66-6	ZINC	1	0.988	0.02		99	90 - 110%

20000121

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV10
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 16:27
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	48.8	0.2		98	90 - 110%
7440-36-0	ANTIMONY	0.5	0.468	0.02		94	90 - 110%
7440-38-2	ARSENIC	0.5	0.488	0.01		98	90 - 110%
7440-39-3	BARIUM	1	0.961	0.1		96	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.473	0.005		95	90 - 110%
7440-43-9	CADMIUM	0.5	0.474	0.005		95	90 - 110%
7440-70-2	CALCIUM	50	47.7	1		95	90 - 110%
7440-47-3	CHROMIUM	1	0.955	0.01		96	90 - 110%
7440-48-4	COBALT	0.5	0.48	0.01		96	90 - 110%
7440-50-8	COPPER	1	0.958	0.01		96	90 - 110%
7439-89-6	IRON	20	19.6	0.1		98	90 - 110%
7439-92-1	LEAD	1	0.922	0.003		92	90 - 110%
7439-95-4	MAGNESIUM	50	48.6	1		97	90 - 110%
7439-96-5	MANGANESE	1	0.939	0.01		94	90 - 110%
7440-02-0	NICKEL	1	0.962	0.02		96	90 - 110%
7440-09-7	POTASSIUM	50	50	1		100	90 - 110%
7782-49-2	SELENIUM	1	0.963	0.005		96	90 - 110%
7440-22-4	SILVER	0.2	0.194	0.01		97	90 - 110%
7440-23-5	SODIUM	50	47.8	1		96	90 - 110%
7440-28-0	THALLIUM	0.5	0.488	0.01		98	90 - 110%
7440-62-2	VANADIUM	0.5	0.47	0.01		94	90 - 110%
7440-66-6	ZINC	1	0.967	0.02		97	90 - 110%

20000122

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV11
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 16:49
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.8	0.2		102	90 - 110%
7440-36-0	ANTIMONY	0.5	0.485	0.02		97	90 - 110%
7440-38-2	ARSENIC	0.5	0.512	0.01		102	90 - 110%
7440-39-3	BARIUM	1	0.994	0.1		99	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.499	0.005		100	90 - 110%
7440-43-9	CADMIUM	0.5	0.485	0.005		97	90 - 110%
7440-70-2	CALCIUM	50	49.7	1		99	90 - 110%
7440-47-3	CHROMIUM	1	1	0.01		100	90 - 110%
7440-48-4	COBALT	0.5	0.502	0.01		100	90 - 110%
7440-50-8	COPPER	1	0.985	0.01		99	90 - 110%
7439-89-6	IRON	20	20.6	0.1		103	90 - 110%
7439-92-1	LEAD	1	0.966	0.003		97	90 - 110%
7439-95-4	MAGNESIUM	50	51.1	1		102	90 - 110%
7439-96-5	MANGANESE	1	0.989	0.01		99	90 - 110%
7440-02-0	NICKEL	1	0.996	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	51.1	1		102	90 - 110%
7782-49-2	SELENIUM	1	1.02	0.005		102	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		99	90 - 110%
7440-23-5	SODIUM	50	49.4	1		99	90 - 110%
7440-28-0	THALLIUM	0.5	0.506	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.49	0.01		98	90 - 110%
7440-66-6	ZINC	1	1.04	0.02		104	90 - 110%

20000123

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV12
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 17:13
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.7	0.2		99	90 - 110%
7440-36-0	ANTIMONY	0.5	0.468	0.02		94	90 - 110%
7440-38-2	ARSENIC	0.5	0.494	0.01		99	90 - 110%
7440-39-3	BARIUM	1	0.966	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.486	0.005		97	90 - 110%
7440-43-9	CADMIUM	0.5	0.473	0.005		95	90 - 110%
7440-70-2	CALCIUM	50	48.2	1		96	90 - 110%
7440-47-3	CHROMIUM	1	0.976	0.01		98	90 - 110%
7440-48-4	COBALT	0.5	0.489	0.01		98	90 - 110%
7440-50-8	COPPER	1	0.961	0.01		96	90 - 110%
7439-89-6	IRON	20	20.1	0.1		100	90 - 110%
7439-92-1	LEAD	1	0.947	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	49.8	1		100	90 - 110%
7439-96-5	MANGANESE	1	0.965	0.01		96	90 - 110%
7440-02-0	NICKEL	1	0.959	0.02		96	90 - 110%
7440-09-7	POTASSIUM	50	50.3	1		101	90 - 110%
7782-49-2	SELENIUM	1	0.985	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.195	0.01		97	90 - 110%
7440-23-5	SODIUM	50	49.1	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.484	0.01		97	90 - 110%
7440-62-2	VANADIUM	0.5	0.477	0.01		95	90 - 110%
7440-66-6	ZINC	1	1.01	0.02		101	90 - 110%

20000124

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV13
QC Type: Continuing Calibration

File Name: 100304A.

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 17:23
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.7	0.2		99	90 - 110%
7440-36-0	ANTIMONY	0.5	0.469	0.02		94	90 - 110%
7440-38-2	ARSENIC	0.5	0.5	0.01		100	90 - 110%
7440-39-3	BARIUM	1	0.965	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.493	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.475	0.005		95	90 - 110%
7440-70-2	CALCIUM	50	49	1		98	90 - 110%
7440-47-3	CHROMIUM	1	0.99	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.496	0.01		99	90 - 110%
7440-50-8	COPPER	1	0.959	0.01		96	90 - 110%
7439-89-6	IRON	20	20.3	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.963	0.003		96	90 - 110%
7439-95-4	MAGNESIUM	50	50.5	1		101	90 - 110%
7439-96-5	MANGANESE	1	0.975	0.01		98	90 - 110%
7440-02-0	NICKEL	1	0.969	0.02		97	90 - 110%
7440-09-7	POTASSIUM	50	50.2	1		100	90 - 110%
7782-49-2	SELENIUM	1	0.996	0.005		100	90 - 110%
7440-22-4	SILVER	0.2	0.195	0.01		98	90 - 110%
7440-23-5	SODIUM	50	49.1	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.491	0.01		98	90 - 110%
7440-62-2	VANADIUM	0.5	0.481	0.01		96	90 - 110%
7440-66-6	ZINC	1	1.03	0.02		103	90 - 110%

20000125

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: ICV
QC Type: Initial Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 11:15
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	25	25.5	0.2		102	90 - 110%
7440-36-0	ANTIMONY	0.25	0.245	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.25	0.262	0.01		105	90 - 110%
7440-39-3	BARIUM	0.5	0.502	0.1		100	90 - 110%
7440-41-7	BERYLLIUM	0.25	0.259	0.005		103	90 - 110%
7440-43-9	CADMIUM	0.25	0.251	0.005		101	90 - 110%
7440-70-2	CALCIUM	25	24.9	1		99	90 - 110%
7440-47-3	CHROMIUM	0.5	0.511	0.01		102	90 - 110%
7440-48-4	COBALT	0.25	0.257	0.01		103	90 - 110%
7440-50-8	COPPER	0.5	0.496	0.01		99	90 - 110%
7439-89-6	IRON	10	10.3	0.1		103	90 - 110%
7439-92-1	LEAD	0.5	0.497	0.003		99	90 - 110%
7439-95-4	MAGNESIUM	25	25.5	1		102	90 - 110%
7439-96-5	MANGANESE	0.5	0.507	0.01		101	90 - 110%
7440-02-0	NICKEL	0.5	0.512	0.02		102	90 - 110%
7440-09-7	POTASSIUM	25	24.5	1		98	90 - 110%
7782-49-2	SELENIUM	0.5	0.507	0.005		101	90 - 110%
7440-22-4	SILVER	0.1	0.101	0.01		101	90 - 110%
7440-23-5	SODIUM	25	24.8	1		99	90 - 110%
7440-28-0	THALLIUM	0.25	0.257	0.01		103	90 - 110%
7440-62-2	VANADIUM	0.25	0.249	0.01		100	90 - 110%
7440-66-6	ZINC	0.5	0.524	0.02		105	90 - 110%

20000126

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV1
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 11:24
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.6	0.2		101	90 - 110%
7440-36-0	ANTIMONY	0.5	0.492	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.5	0.514	0.01		103	90 - 110%
7440-39-3	BARIUM	1	0.995	0.1		100	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.505	0.005		101	90 - 110%
7440-43-9	CADMIUM	0.5	0.5	0.005		100	90 - 110%
7440-70-2	CALCIUM	50	49.4	1		99	90 - 110%
7440-47-3	CHROMIUM	1	0.998	0.01		100	90 - 110%
7440-48-4	COBALT	0.5	0.501	0.01		100	90 - 110%
7440-50-8	COPPER	1	0.981	0.01		98	90 - 110%
7439-89-6	IRON	20	20.5	0.1		103	90 - 110%
7439-92-1	LEAD	1	0.973	0.003		97	90 - 110%
7439-95-4	MAGNESIUM	50	50.7	1		101	90 - 110%
7439-96-5	MANGANESE	1	0.989	0.01		99	90 - 110%
7440-02-0	NICKEL	1	1.02	0.02		102	90 - 110%
7440-09-7	POTASSIUM	50	49.9	1		100	90 - 110%
7782-49-2	SELENIUM	1	1.02	0.005		102	90 - 110%
7440-22-4	SILVER	0.2	0.2	0.01		100	90 - 110%
7440-23-5	SODIUM	50	49.2	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.509	0.01		102	90 - 110%
7440-62-2	VANADIUM	0.5	0.487	0.01		97	90 - 110%
7440-66-6	ZINC	1	1.03	0.02		103	90 - 110%

20000127

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV2
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 11:45
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.8	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.488	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.5	0.504	0.01		101	90 - 110%
7440-39-3	BARIUM	1	0.976	0.1		98	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.497	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.493	0.005		99	90 - 110%
7440-70-2	CALCIUM	50	48.6	1		97	90 - 110%
7440-47-3	CHROMIUM	1	0.983	0.01		98	90 - 110%
7440-48-4	COBALT	0.5	0.493	0.01		99	90 - 110%
7440-50-8	COPPER	1	0.967	0.01		97	90 - 110%
7439-89-6	IRON	20	20.2	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.954	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	49.9	1		100	90 - 110%
7439-96-5	MANGANESE	1	0.971	0.01		97	90 - 110%
7440-02-0	NICKEL	1	0.993	0.02		99	90 - 110%
7440-09-7	POTASSIUM	50	49.5	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.984	0.005		98	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		99	90 - 110%
7440-23-5	SODIUM	50	48.7	1		97	90 - 110%
7440-28-0	THALLIUM	0.5	0.505	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.481	0.01		96	90 - 110%
7440-66-6	ZINC	1	1	0.02		100	90 - 110%

20000128

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV3
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 12:07
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.1	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.491	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.5	0.507	0.01		101	90 - 110%
7440-39-3	BARIUM	1	0.982	0.1		98	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.494	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.496	0.005		99	90 - 110%
7440-70-2	CALCIUM	50	48.6	1		97	90 - 110%
7440-47-3	CHROMIUM	1	0.979	0.01		98	90 - 110%
7440-48-4	COBALT	0.5	0.493	0.01		99	90 - 110%
7440-50-8	COPPER	1	0.976	0.01		98	90 - 110%
7439-89-6	IRON	20	20.1	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.947	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	49.7	1		99	90 - 110%
7439-96-5	MANGANESE	1	0.966	0.01		97	90 - 110%
7440-02-0	NICKEL	1	1	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	49.8	1		100	90 - 110%
7782-49-2	SELENIUM	1	0.984	0.005		98	90 - 110%
7440-22-4	SILVER	0.2	0.2	0.01		100	90 - 110%
7440-23-5	SODIUM	50	49	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.509	0.01		102	90 - 110%
7440-62-2	VANADIUM	0.5	0.48	0.01		96	90 - 110%
7440-66-6	ZINC	1	0.994	0.02		99	90 - 110%

20000129

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV4
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 12:28
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.5	0.2		101	90 - 110%
7440-36-0	ANTIMONY	0.5	0.501	0.02		100	90 - 110%
7440-38-2	ARSENIC	0.5	0.515	0.01		103	90 - 110%
7440-39-3	BARIUM	1	0.989	0.1		99	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.501	0.005		100	90 - 110%
7440-43-9	CADMIUM	0.5	0.507	0.005		101	90 - 110%
7440-70-2	CALCIUM	50	49.6	1		99	90 - 110%
7440-47-3	CHROMIUM	1	0.995	0.01		100	90 - 110%
7440-48-4	COBALT	0.5	0.502	0.01		100	90 - 110%
7440-50-8	COPPER	1	0.992	0.01		99	90 - 110%
7439-89-6	IRON	20	20.4	0.1		102	90 - 110%
7439-92-1	LEAD	1	0.961	0.003		96	90 - 110%
7439-95-4	MAGNESIUM	50	50.6	1		101	90 - 110%
7439-96-5	MANGANESE	1	0.977	0.01		98	90 - 110%
7440-02-0	NICKEL	1	1.03	0.02		103	90 - 110%
7440-09-7	POTASSIUM	50	50	1		100	90 - 110%
7782-49-2	SELENIUM	1	0.993	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.203	0.01		102	90 - 110%
7440-23-5	SODIUM	50	49	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.521	0.01		104	90 - 110%
7440-62-2	VANADIUM	0.5	0.487	0.01		97	90 - 110%
7440-66-6	ZINC	1	1.01	0.02		101	90 - 110%

20000130

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV5
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 12:50
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.2	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.496	0.02		99	90 - 110%
7440-38-2	ARSENIC	0.5	0.516	0.01		103	90 - 110%
7440-39-3	BARIUM	1	0.982	0.1		98	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.5	0.005		100	90 - 110%
7440-43-9	CADMIUM	0.5	0.508	0.005		102	90 - 110%
7440-70-2	CALCIUM	50	49.7	1		99	90 - 110%
7440-47-3	CHROMIUM	1	0.994	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.501	0.01		100	90 - 110%
7440-50-8	COPPER	1	0.986	0.01		99	90 - 110%
7439-89-6	IRON	20	20.3	0.1		102	90 - 110%
7439-92-1	LEAD	1	0.958	0.003		96	90 - 110%
7439-95-4	MAGNESIUM	50	50.5	1		101	90 - 110%
7439-96-5	MANGANESE	1	0.974	0.01		97	90 - 110%
7440-02-0	NICKEL	1	1.03	0.02		103	90 - 110%
7440-09-7	POTASSIUM	50	49.7	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.986	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.203	0.01		101	90 - 110%
7440-23-5	SODIUM	50	49	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.516	0.01		103	90 - 110%
7440-62-2	VANADIUM	0.5	0.487	0.01		97	90 - 110%
7440-66-6	ZINC	1	1.01	0.02		101	90 - 110%

20000131

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV6
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 13:11
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.4	0.2		101	90 - 110%
7440-36-0	ANTIMONY	0.5	0.504	0.02		101	90 - 110%
7440-38-2	ARSENIC	0.5	0.517	0.01		103	90 - 110%
7440-39-3	BARIUM	1	0.991	0.1		99	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.495	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.512	0.005		102	90 - 110%
7440-70-2	CALCIUM	50	49.3	1		99	90 - 110%
7440-47-3	CHROMIUM	1	0.985	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.499	0.01		100	90 - 110%
7440-50-8	COPPER	1	1	0.01		100	90 - 110%
7439-89-6	IRON	20	20.1	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.943	0.003		94	90 - 110%
7439-95-4	MAGNESIUM	50	50.1	1		100	90 - 110%
7439-96-5	MANGANESE	1	0.962	0.01		96	90 - 110%
7440-02-0	NICKEL	1	1.05	0.02		105	90 - 110%
7440-09-7	POTASSIUM	50	50.1	1		100	90 - 110%
7782-49-2	SELENIUM	1	0.991	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.204	0.01		102	90 - 110%
7440-23-5	SODIUM	50	48.4	1		97	90 - 110%
7440-28-0	THALLIUM	0.5	0.522	0.01		104	90 - 110%
7440-62-2	VANADIUM	0.5	0.485	0.01		97	90 - 110%
7440-66-6	ZINC	1	0.983	0.02		98	90 - 110%

20000132

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV7
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 13:34
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.6	0.2		99	90 - 110%
7440-36-0	ANTIMONY	0.5	0.486	0.02		97	90 - 110%
7440-38-2	ARSENIC	0.5	0.507	0.01		101	90 - 110%
7440-39-3	BARIUM	1	0.972	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.489	0.005		98	90 - 110%
7440-43-9	CADMIUM	0.5	0.495	0.005		99	90 - 110%
7440-70-2	CALCIUM	50	48.5	1		97	90 - 110%
7440-47-3	CHROMIUM	1	0.974	0.01		97	90 - 110%
7440-48-4	COBALT	0.5	0.49	0.01		98	90 - 110%
7440-50-8	COPPER	1	0.977	0.01		98	90 - 110%
7439-89-6	IRON	20	19.9	0.1		99	90 - 110%
7439-92-1	LEAD	1	0.936	0.003		94	90 - 110%
7439-95-4	MAGNESIUM	50	49.4	1		99	90 - 110%
7439-96-5	MANGANESE	1	0.953	0.01		95	90 - 110%
7440-02-0	NICKEL	1	1	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	49.3	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.973	0.005		97	90 - 110%
7440-22-4	SILVER	0.2	0.2	0.01		100	90 - 110%
7440-23-5	SODIUM	50	47.9	1		96	90 - 110%
7440-28-0	THALLIUM	0.5	0.506	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.478	0.01		96	90 - 110%
7440-66-6	ZINC	1	0.98	0.02		98	90 - 110%

20000133

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV8
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 13:57
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.1	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.498	0.02		100	90 - 110%
7440-38-2	ARSENIC	0.5	0.521	0.01		104	90 - 110%
7440-39-3	BARIUM	1	0.984	0.1		98	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.497	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.508	0.005		102	90 - 110%
7440-70-2	CALCIUM	50	49.5	1		99	90 - 110%
7440-47-3	CHROMIUM	1	0.987	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.499	0.01		100	90 - 110%
7440-50-8	COPPER	1	0.995	0.01		100	90 - 110%
7439-89-6	IRON	20	20.1	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.945	0.003		94	90 - 110%
7439-95-4	MAGNESIUM	50	50.2	1		100	90 - 110%
7439-96-5	MANGANESE	1	0.962	0.01		96	90 - 110%
7440-02-0	NICKEL	1	1.04	0.02		104	90 - 110%
7440-09-7	POTASSIUM	50	49.5	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.988	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.202	0.01		101	90 - 110%
7440-23-5	SODIUM	50	47.6	1		95	90 - 110%
7440-28-0	THALLIUM	0.5	0.517	0.01		103	90 - 110%
7440-62-2	VANADIUM	0.5	0.484	0.01		97	90 - 110%
7440-66-6	ZINC	1	0.992	0.02		99	90 - 110%

20000134

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV9
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 14:19
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.6	0.2		99	90 - 110%
7440-36-0	ANTIMONY	0.5	0.482	0.02		96	90 - 110%
7440-38-2	ARSENIC	0.5	0.504	0.01		101	90 - 110%
7440-39-3	BARIUM	1	0.971	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.489	0.005		98	90 - 110%
7440-43-9	CADMIUM	0.5	0.491	0.005		98	90 - 110%
7440-70-2	CALCIUM	50	48.3	1		97	90 - 110%
7440-47-3	CHROMIUM	1	0.973	0.01		97	90 - 110%
7440-48-4	COBALT	0.5	0.489	0.01		98	90 - 110%
7440-50-8	COPPER	1	0.976	0.01		98	90 - 110%
7439-89-6	IRON	20	19.9	0.1		99	90 - 110%
7439-92-1	LEAD	1	0.936	0.003		94	90 - 110%
7439-95-4	MAGNESIUM	50	49.5	1		99	90 - 110%
7439-96-5	MANGANESE	1	0.953	0.01		95	90 - 110%
7440-02-0	NICKEL	1	0.998	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	48.9	1		98	90 - 110%
7782-49-2	SELENIUM	1	0.969	0.005		97	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		99	90 - 110%
7440-23-5	SODIUM	50	48	1		96	90 - 110%
7440-28-0	THALLIUM	0.5	0.505	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.477	0.01		95	90 - 110%
7440-66-6	ZINC	1	0.98	0.02		98	90 - 110%

20000135

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV10
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 14:59
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.9	0.2		102	90 - 110%
7440-36-0	ANTIMONY	0.5	0.486	0.02		97	90 - 110%
7440-38-2	ARSENIC	0.5	0.513	0.01		103	90 - 110%
7440-39-3	BARIUM	1	0.987	0.1		99	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.507	0.005		101	90 - 110%
7440-43-9	CADMIUM	0.5	0.494	0.005		99	90 - 110%
7440-70-2	CALCIUM	50	49.6	1		99	90 - 110%
7440-47-3	CHROMIUM	1	1	0.01		100	90 - 110%
7440-48-4	COBALT	0.5	0.504	0.01		101	90 - 110%
7440-50-8	COPPER	1	0.986	0.01		99	90 - 110%
7439-89-6	IRON	20	20.5	0.1		103	90 - 110%
7439-92-1	LEAD	1	0.968	0.003		97	90 - 110%
7439-95-4	MAGNESIUM	50	51.1	1		102	90 - 110%
7439-96-5	MANGANESE	1	0.988	0.01		99	90 - 110%
7440-02-0	NICKEL	1	1.01	0.02		101	90 - 110%
7440-09-7	POTASSIUM	50	49.5	1		99	90 - 110%
7782-49-2	SELENIUM	1	1.01	0.005		101	90 - 110%
7440-22-4	SILVER	0.2	0.202	0.01		101	90 - 110%
7440-23-5	SODIUM	50	49.3	1		99	90 - 110%
7440-28-0	THALLIUM	0.5	0.508	0.01		102	90 - 110%
7440-62-2	VANADIUM	0.5	0.49	0.01		98	90 - 110%
7440-66-6	ZINC	1	1.04	0.02		104	90 - 110%

20000136

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV11
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 15:21
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.3	0.2		101	90 - 110%
7440-36-0	ANTIMONY	0.5	0.482	0.02		96	90 - 110%
7440-38-2	ARSENIC	0.5	0.513	0.01		103	90 - 110%
7440-39-3	BARIUM	1	0.971	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.51	0.005		102	90 - 110%
7440-43-9	CADMIUM	0.5	0.49	0.005		98	90 - 110%
7440-70-2	CALCIUM	50	49.8	1		100	90 - 110%
7440-47-3	CHROMIUM	1	1.01	0.01		101	90 - 110%
7440-48-4	COBALT	0.5	0.505	0.01		101	90 - 110%
7440-50-8	COPPER	1	0.972	0.01		97	90 - 110%
7439-89-6	IRON	20	20.5	0.1		103	90 - 110%
7439-92-1	LEAD	1	0.976	0.003		98	90 - 110%
7439-95-4	MAGNESIUM	50	51.5	1		103	90 - 110%
7439-96-5	MANGANESE	1	0.99	0.01		99	90 - 110%
7440-02-0	NICKEL	1	0.996	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	48.9	1		98	90 - 110%
7782-49-2	SELENIUM	1	1	0.005		100	90 - 110%
7440-22-4	SILVER	0.2	0.202	0.01		101	90 - 110%
7440-23-5	SODIUM	50	48.6	1		97	90 - 110%
7440-28-0	THALLIUM	0.5	0.508	0.01		102	90 - 110%
7440-62-2	VANADIUM	0.5	0.489	0.01		98	90 - 110%
7440-66-6	ZINC	1	1.05	0.02		105	90 - 110%

20000137

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV12
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 15:42
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.5	0.2		99	90 - 110%
7440-36-0	ANTIMONY	0.5	0.477	0.02		95	90 - 110%
7440-38-2	ARSENIC	0.5	0.498	0.01		100	90 - 110%
7440-39-3	BARIUM	1	0.961	0.1		96	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.493	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.48	0.005		96	90 - 110%
7440-70-2	CALCIUM	50	48	1		96	90 - 110%
7440-47-3	CHROMIUM	1	0.976	0.01		98	90 - 110%
7440-48-4	COBALT	0.5	0.49	0.01		98	90 - 110%
7440-50-8	COPPER	1	0.967	0.01		97	90 - 110%
7439-89-6	IRON	20	19.9	0.1		100	90 - 110%
7439-92-1	LEAD	1	0.939	0.003		94	90 - 110%
7439-95-4	MAGNESIUM	50	49.7	1		99	90 - 110%
7439-96-5	MANGANESE	1	0.959	0.01		96	90 - 110%
7440-02-0	NICKEL	1	0.968	0.02		97	90 - 110%
7440-09-7	POTASSIUM	50	48.5	1		97	90 - 110%
7782-49-2	SELENIUM	1	0.98	0.005		98	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		99	90 - 110%
7440-23-5	SODIUM	50	48	1		96	90 - 110%
7440-28-0	THALLIUM	0.5	0.494	0.01		99	90 - 110%
7440-62-2	VANADIUM	0.5	0.477	0.01		95	90 - 110%
7440-66-6	ZINC	1	1	0.02		100	90 - 110%

20000138

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV13
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 16:04
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.475	0.02		95	90 - 110%
7440-38-2	ARSENIC	0.5	0.502	0.01		100	90 - 110%
7440-39-3	BARIUM	1	0.968	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.493	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.483	0.005		97	90 - 110%
7440-70-2	CALCIUM	50	48.2	1		96	90 - 110%
7440-47-3	CHROMIUM	1	0.979	0.01		98	90 - 110%
7440-48-4	COBALT	0.5	0.491	0.01		98	90 - 110%
7440-50-8	COPPER	1	0.975	0.01		98	90 - 110%
7439-89-6	IRON	20	20	0.1		100	90 - 110%
7439-92-1	LEAD	1	0.947	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	49.7	1		99	90 - 110%
7439-96-5	MANGANESE	1	0.961	0.01		96	90 - 110%
7440-02-0	NICKEL	1	0.976	0.02		98	90 - 110%
7440-09-7	POTASSIUM	50	49	1		98	90 - 110%
7782-49-2	SELENIUM	1	0.986	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		99	90 - 110%
7440-23-5	SODIUM	50	48.8	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.495	0.01		99	90 - 110%
7440-62-2	VANADIUM	0.5	0.478	0.01		96	90 - 110%
7440-66-6	ZINC	1	0.999	0.02		100	90 - 110%

20000139

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV14
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 16:26
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.482	0.02		96	90 - 110%
7440-38-2	ARSENIC	0.5	0.508	0.01		102	90 - 110%
7440-39-3	BARIUM	1	0.967	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.499	0.005		100	90 - 110%
7440-43-9	CADMIUM	0.5	0.488	0.005		98	90 - 110%
7440-70-2	CALCIUM	50	48.9	1		98	90 - 110%
7440-47-3	CHROMIUM	1	0.989	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.496	0.01		99	90 - 110%
7440-50-8	COPPER	1	0.977	0.01		98	90 - 110%
7439-89-6	IRON	20	20.1	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.943	0.003		94	90 - 110%
7439-95-4	MAGNESIUM	50	50.3	1		101	90 - 110%
7439-96-5	MANGANESE	1	0.968	0.01		97	90 - 110%
7440-02-0	NICKEL	1	0.988	0.02		99	90 - 110%
7440-09-7	POTASSIUM	50	48.8	1		98	90 - 110%
7782-49-2	SELENIUM	1	0.976	0.005		98	90 - 110%
7440-22-4	SILVER	0.2	0.201	0.01		100	90 - 110%
7440-23-5	SODIUM	50	48.5	1		97	90 - 110%
7440-28-0	THALLIUM	0.5	0.504	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.483	0.01		97	90 - 110%
7440-66-6	ZINC	1	1.02	0.02		102	90 - 110%

20000140

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV15
QC Type: Continuing Calibration

File Name: 100305A.

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 16:36
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.479	0.02		96	90 - 110%
7440-38-2	ARSENIC	0.5	0.507	0.01		101	90 - 110%
7440-39-3	BARIUM	1	0.967	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.496	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.487	0.005		97	90 - 110%
7440-70-2	CALCIUM	50	48.6	1		97	90 - 110%
7440-47-3	CHROMIUM	1	0.984	0.01		98	90 - 110%
7440-48-4	COBALT	0.5	0.494	0.01		99	90 - 110%
7440-50-8	COPPER	1	0.978	0.01		98	90 - 110%
7439-89-6	IRON	20	20	0.1		100	90 - 110%
7439-92-1	LEAD	1	0.946	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	50.2	1		100	90 - 110%
7439-96-5	MANGANESE	1	0.963	0.01		96	90 - 110%
7440-02-0	NICKEL	1	0.986	0.02		99	90 - 110%
7440-09-7	POTASSIUM	50	48.9	1		98	90 - 110%
7782-49-2	SELENIUM	1	0.982	0.005		98	90 - 110%
7440-22-4	SILVER	0.2	0.201	0.01		101	90 - 110%
7440-23-5	SODIUM	50	48.7	1		97	90 - 110%
7440-28-0	THALLIUM	0.5	0.506	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.481	0.01		96	90 - 110%
7440-66-6	ZINC	1	1.01	0.02		101	90 - 110%

20000141

Data Package ID:

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: ICB
QC Type: Initial Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 12:32:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000142

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB1
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 12:41:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000143

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB2
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 1:02:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000144

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB3
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 1:25:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000145

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB4
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 1:46:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000146

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB5
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 2:08:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000147

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB6
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 2:17:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000148

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB7
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 3:24:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000149

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB8
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 3:46:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000150

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB9
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 4:07:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000151

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB10
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 4:29:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000152

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB11
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 4:51:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000153

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB12
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 5:15:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000154

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB13
QC Type: Continuing Calibration

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Time Analyzed: 5:25:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000155

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: ICB
QC Type: Initial Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 11:16:00 AM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000156

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB1
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 11:26:00 AM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000157

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB2
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 11:47:00 AM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000158

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB3
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 12:09:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000159

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB4
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 12:30:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000160

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB5
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 12:52:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000161

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: CCB6

QC Type: Continuing Calibration

Run ID: IT100305-2A1

Date Analyzed: 03/05/2010

Time Analyzed: 1:15:00 PM

Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000162

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB7
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 1:36:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000163

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB8
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 2:01:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000164

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB9
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 2:21:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000165

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB10
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 3:01:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000166

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB11
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 3:22:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000167

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB12
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 3:44:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000168

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB13
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 4:06:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000169

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB14
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 4:28:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000170

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB15
QC Type: Continuing Calibration

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Time Analyzed: 4:37:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000171

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

ICP Interference Check Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Run ID: IT100304-2A1

Date Analyzed: 03/04/2010

Result Units: MG/L

CASNO	Target Analyte	Spike Added		Results		% Rec.
		ICSA1	ICSAB1	ICSA1	ICSAB1	
7429-90-5	ALUMINUM	250	250	260	263	105
7440-36-0	ANTIMONY		0.6		0.608	101
7440-38-2	ARSENIC		0.1		0.113	113
7440-39-3	BARIUM		0.5		0.516	103
7440-41-7	BERYLLIUM		0.5		0.47400	95
7440-43-9	CADMIUM		1		1	100
7440-70-2	CALCIUM	250	250	255	256	102
7440-47-3	CHROMIUM		0.5		0.471	94
7440-48-4	COBALT		0.5		0.468	94
7440-50-8	COPPER		0.5		0.514	103
7439-89-6	IRON	100	100	105	105	105
7439-92-1	LEAD		0.05		0.05480	110
7439-95-4	MAGNESIUM	250	250	264	266	106
7439-96-5	MANGANESE		0.5		0.46900	94
7440-02-0	NICKEL		1		0.93000	93
7440-09-7	POTASSIUM					
7782-49-2	SELENIUM		0.05		0.05600	112
7440-22-4	SILVER		0.2		0.204	102
7440-23-5	SODIUM					
7440-28-0	THALLIUM		0.1		0.109	109
7440-62-2	VANADIUM		0.5		0.482	96
7440-66-6	ZINC		1		0.88	88

20000172

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

ICP Interference Check Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Run ID: IT100304-2A1

Date Analyzed: 03/04/2010

Result Units: MG/L

CASNO	Target Analyte	Spike Added		Results		% Rec.
		ICSA2	ICSAB2	ICSA2	ICSAB2	
7429-90-5	ALUMINUM	250	250	263	264	106
7440-36-0	ANTIMONY		0.6		0.612	102
7440-38-2	ARSENIC		0.1		0.11400	114
7440-39-3	BARIUM		0.5		0.52200	104
7440-41-7	BERYLLIUM		0.5		0.47200	94
7440-43-9	CADMIUM		1		1.02	102
7440-70-2	CALCIUM	250	250	259	258	103
7440-47-3	CHROMIUM		0.5		0.471	94
7440-48-4	COBALT		0.5		0.47	94
7440-50-8	COPPER		0.5		0.524	105
7439-89-6	IRON	100	100	105	105	105
7439-92-1	LEAD		0.05		0.0545	109
7439-95-4	MAGNESIUM	250	250	265	266	106
7439-96-5	MANGANESE		0.5		0.466	93
7440-02-0	NICKEL		1		0.95200	95
7440-09-7	POTASSIUM					
7782-49-2	SELENIUM		0.05		0.0561	112
7440-22-4	SILVER		0.2		0.20700	103
7440-23-5	SODIUM					
7440-28-0	THALLIUM		0.1		0.105	105
7440-62-2	VANADIUM		0.5		0.484	97
7440-66-6	ZINC		1		0.86900	87

20000173

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

ICP Interference Check Sample

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: IT100304-2A1
Date Analyzed: 03/04/2010
Result Units: MG/L

CASNO	Target Analyte	Spike Added		Results		% Rec.
		ICSA3	ICSAB3	ICSA3	ICSAB3	
7429-90-5	ALUMINUM	250	250	266	265	106
7440-36-0	ANTIMONY		0.6		0.594	99
7440-38-2	ARSENIC		0.1		0.11200	112
7440-39-3	BARIUM		0.5		0.515	103
7440-41-7	BERYLLIUM		0.5		0.48800	98
7440-43-9	CADMIUM		1		0.99500	100
7440-70-2	CALCIUM	250	250	264	262	105
7440-47-3	CHROMIUM		0.5		0.48300	97
7440-48-4	COBALT		0.5		0.47900	96
7440-50-8	COPPER		0.5		0.51800	104
7439-89-6	IRON	100	100	109	108	108
7439-92-1	LEAD		0.05		0.05590	112
7439-95-4	MAGNESIUM	250	250	276	275	110
7439-96-5	MANGANESE		0.5		0.478	96
7440-02-0	NICKEL		1		0.936	94
7440-09-7	POTASSIUM					
7782-49-2	SELENIUM		0.05		0.05810	116
7440-22-4	SILVER		0.2		0.20600	103
7440-23-5	SODIUM					
7440-28-0	THALLIUM		0.1		0.10800	108
7440-62-2	VANADIUM		0.5		0.489	98
7440-66-6	ZINC		1		0.92400	92

20000174

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

ICP Interference Check Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Run ID: IT100305-2A1

Date Analyzed: 03/05/2010

Result Units: MG/L

CASNO	Target Analyte	Spike Added		Results		% Rec.
		ICSA1	ICSAB1	ICSA1	ICSAB1	
7429-90-5	ALUMINUM	250	250	277	282	113
7440-36-0	ANTIMONY		0.6		0.641	107
7440-38-2	ARSENIC		0.1		0.116	116
7440-39-3	BARIUM		0.5		0.53500	107
7440-41-7	BERYLLIUM		0.5		0.50700	101
7440-43-9	CADMIUM		1		1.06	106
7440-70-2	CALCIUM	250	250	278	280	112
7440-47-3	CHROMIUM		0.5		0.494	99
7440-48-4	COBALT		0.5		0.49300	99
7440-50-8	COPPER		0.5		0.534	107
7439-89-6	IRON	100	100	114	116	116
7439-92-1	LEAD		0.05		0.0574	115
7439-95-4	MAGNESIUM	250	250	286	289	116
7439-96-5	MANGANESE		0.5		0.491	98
7440-02-0	NICKEL		1		0.99400	99
7440-09-7	POTASSIUM					
7782-49-2	SELENIUM		0.05		0.05820	116
7440-22-4	SILVER		0.2		0.21500	108
7440-23-5	SODIUM					
7440-28-0	THALLIUM		0.1		0.109	109
7440-62-2	VANADIUM		0.5		0.50400	101
7440-66-6	ZINC		1		0.93900	94

20000175

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

ICP Interference Check Sample

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: IT100305-2A1
Date Analyzed: 03/05/2010
Result Units: MG/L

CASNO	Target Analyte	Spike Added		Results		% Rec.
		ICSA2	ICSAB2	ICSA2	ICSAB2	
7429-90-5	ALUMINUM	250	250	278	274	110
7440-36-0	ANTIMONY		0.6		0.62000	103
7440-38-2	ARSENIC		0.1		0.11500	115
7440-39-3	BARIUM		0.5		0.52100	104
7440-41-7	BERYLLIUM		0.5		0.48800	98
7440-43-9	CADMIUM		1		1.04	104
7440-70-2	CALCIUM	250	250	277	271	108
7440-47-3	CHROMIUM		0.5		0.47900	96
7440-48-4	COBALT		0.5		0.478	96
7440-50-8	COPPER		0.5		0.53	106
7439-89-6	IRON	100	100	113	111	111
7439-92-1	LEAD		0.05		0.0541	108
7439-95-4	MAGNESIUM	250	250	285	280	112
7439-96-5	MANGANESE		0.5		0.46900	94
7440-02-0	NICKEL		1		0.969	97
7440-09-7	POTASSIUM					
7782-49-2	SELENIUM		0.05		0.0552	110
7440-22-4	SILVER		0.2		0.21400	107
7440-23-5	SODIUM					
7440-28-0	THALLIUM		0.1		0.109	109
7440-62-2	VANADIUM		0.5		0.491	98
7440-66-6	ZINC		1		0.886	89

20000176

Data Package ID: *IT1003045-1*

ICP Metals

Method SW6010

ICP Interference Check Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Run ID: IT100305-2A1

Date Analyzed: 03/05/2010

Result Units: MG/L

CASNO	Target Analyte	Spike Added		Results		% Rec.
		ICSA3	ICSAB3	ICSA3	ICSAB3	
7429-90-5	ALUMINUM	250	250	274	274	110
7440-36-0	ANTIMONY		0.6		0.607	101
7440-38-2	ARSENIC		0.1		0.113	113
7440-39-3	BARIUM		0.5		0.515	103
7440-41-7	BERYLLIUM		0.5		0.487	97
7440-43-9	CADMIUM		1		1.02	102
7440-70-2	CALCIUM	250	250	270	268	107
7440-47-3	CHROMIUM		0.5		0.477	95
7440-48-4	COBALT		0.5		0.475	95
7440-50-8	COPPER		0.5		0.528	106
7439-89-6	IRON	100	100	110	110	110
7439-92-1	LEAD		0.05		0.05330	107
7439-95-4	MAGNESIUM	250	250	279	279	112
7439-96-5	MANGANESE		0.5		0.468	94
7440-02-0	NICKEL		1		0.941	94
7440-09-7	POTASSIUM					
7782-49-2	SELENIUM		0.05		0.058	116
7440-22-4	SILVER		0.2		0.212	106
7440-23-5	SODIUM					
7440-28-0	THALLIUM		0.1		0.10800	108
7440-62-2	VANADIUM		0.5		0.48800	98
7440-66-6	ZINC		1		0.891	89

20000177

Data Package ID: *IT1003045-1*

Metals Linear Ranges

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Instrument ID: ICPTrace2
Active Date: 03/02/2010
Expiration Date: 05/31/2010

CASNO	Target Analyte	Concentration (ppm)
7429-90-5	ALUMINUM	500
7440-36-0	ANTIMONY	2
7440-38-2	ARSENIC	5
7440-39-3	BARIUM	10
7440-41-7	BERYLLIUM	1
7440-43-9	CADMIUM	5
7440-70-2	CALCIUM	500
7440-47-3	CHROMIUM	10
7440-48-4	COBALT	5
7440-50-8	COPPER	10
7439-89-6	IRON	200
7439-92-1	LEAD	10
7439-95-4	MAGNESIUM	500
7439-96-5	MANGANESE	10
7440-02-0	NICKEL	10
7440-09-7	POTASSIUM	250
7782-49-2	SELENIUM	5
7440-22-4	SILVER	2
7440-23-5	SODIUM	250
7440-28-0	THALLIUM	5
7440-62-2	VANADIUM	5
7440-66-6	ZINC	10

20000178

ICP Interelement Correction Factors

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Instrument ID: ICPTrace2
Active Date: 11/17/2009
Expiration Date: 11/17/2010

Analyte	Lamda (nm)	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Ni	Th
ALUMINUM																	
ANTIMONY									0.0103504								
BERYLLIUM																	
CADMIUM				0.0068507													
CHROMIUM																	
COBALT					-0.001400												
COPPER																	
LEAD		0.0002386										0.0000243					
SELENIUM												0.000036					
SILVER																	
THALLIUM												-0.000142			-0.000176		
VANADIUM												-0.000194					

20000179

ICP Interelement Correction Factors

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Instrument ID: ICPTrace2
Active Date: 11/17/2009
Expiration Date: 11/17/2010

Analyte	Lamda (nm)	K	Se	Ag	Na	Tl	V	Zn	Sn	Ti	Mo	Li	Sr	B	Si	U	Zr
ALUMINUM							0.0125517				0.0033239					-0.028003	
ANTIMONY											-0.008489						
BERYLLIUM							0.0010513										
CADMIUM																	
CHROMIUM																0.0005333	
COBALT										0.002105							
COPPER																0.0007767	
LEAD										0.0002142	-0.001821					0.0009113	
SELENIUM																0.0000151	
SILVER																0.0006982	
THALLIUM							0.0006359			-0.000251						-0.000582	
VANADIUM																	

20000180

ICPTrace2 Run Log -- 3/4/2010

Instrument ID: ICPTrace2
File Name: 100304A.
AnalRunID: IT100304-2A1
CalibRefID: IT100304-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		MIXBHIGH	1	3/4/2010	11:49
		MIXAHIGH	1	3/4/2010	11:51
		MIXCHIGH	1	3/4/2010	11:53
		ICV	1	3/4/2010	12:30
		ICB	1	3/4/2010	12:32
		CRI1	1	3/4/2010	12:33
		ICSA1	1	3/4/2010	12:35
		ICSAB1	1	3/4/2010	12:37
		CCV1	1	3/4/2010	12:39
		CCB1	1	3/4/2010	12:41
		IP100303-1MB	1	3/4/2010	12:43
		M100015-1	1	3/4/2010	12:44
		M100015-2	1	3/4/2010	12:46
		M100015-3	1	3/4/2010	12:48
		M100015-4	1	3/4/2010	12:50
		M100015-5	1	3/4/2010	12:51
		M100015-6	1	3/4/2010	12:53
		M100015-7	1	3/4/2010	12:55
		M100015-8	1	3/4/2010	12:57
		M100015-9	1	3/4/2010	12:59
		CCV2	1	3/4/2010	13:00
		CCB2	1	3/4/2010	13:02
		IP100303-2MB	1	3/4/2010	13:04
		M100016-1	1	3/4/2010	13:06
		M100016-2	1	3/4/2010	13:08
		M100016-3	1	3/4/2010	13:09
		M100016-4	1	3/4/2010	13:11
		M100016-5	1	3/4/2010	13:13
		M100016-6	1	3/4/2010	13:15
		M100016-7	1	3/4/2010	13:16
		M100016-8	1	3/4/2010	13:18
		M100016-9	1	3/4/2010	13:21
		CCV3	1	3/4/2010	13:23
		CCB3	1	3/4/2010	13:25
		IP100303-3MB	1	3/4/2010	13:27

20000181

Data Package ID: IT1003045-1

20000181

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

ICPTrace2 Run Log -- 3/4/2010

Instrument ID: ICPTrace2
File Name: 100304A.
AnalRunID: IT100304-2A1
CalibRefID: IT100304-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		M100017-1	1	3/4/2010	13:28
		M100017-2	1	3/4/2010	13:30
		M100017-3	1	3/4/2010	13:32
		M100017-4	1	3/4/2010	13:34
		M100017-5	1	3/4/2010	13:36
		M100017-6	1	3/4/2010	13:37
		M100017-7	1	3/4/2010	13:39
		M100017-8	1	3/4/2010	13:41
		M100017-9	1	3/4/2010	13:43
		CCV4	1	3/4/2010	13:44
		CCB4	1	3/4/2010	13:46
		IP100301-4MB	1	3/4/2010	13:48
		M100018-1	1	3/4/2010	13:50
		M100018-2	1	3/4/2010	13:52
		M100018-3	1	3/4/2010	13:53
		M100018-4	1	3/4/2010	13:55
		M100018-5	1	3/4/2010	13:57
		M100018-6	1	3/4/2010	13:59
		M100018-7	1	3/4/2010	14:01
		M100018-8	1	3/4/2010	14:03
		M100018-9	1	3/4/2010	14:04
		CCV5	1	3/4/2010	14:06
		CCB5	1	3/4/2010	14:08
		CRI2	1	3/4/2010	14:10
		ICSA2	1	3/4/2010	14:12
		ICSAB2	1	3/4/2010	14:14
		CCV6	1	3/4/2010	14:16
		CCB6	1	3/4/2010	14:17
		CCV7	1	3/4/2010	15:22
		CCB7	1	3/4/2010	15:24
		1002177-1	100	3/4/2010	15:26
- Na		1002177-2	100	3/4/2010	15:28
		1002177-3	50	3/4/2010	15:30
		1002177-4	1	3/4/2010	15:31
		1003011-1	1	3/4/2010	15:33

20000182

Data Package ID: IT1003045-1

20000182

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

ICPTrace2 Run Log -- 3/4/2010

Instrument ID: ICPTrace2
File Name: 100304A.
AnalRunID: IT100304-2A1
CalibRefID: IT100304-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
- S		1003011-2	1	3/4/2010	15:35
- S		1003011-2SER	5	3/4/2010	15:37
- S		1003011-2MS	1	3/4/2010	15:39
- S		1003011-2MSD	1	3/4/2010	15:40
		1003011-3	5	3/4/2010	15:42
		CCV8	1	3/4/2010	15:44
		CCB8	1	3/4/2010	15:46
		1003011-4	2	3/4/2010	15:48
		1003011-5	1	3/4/2010	15:49
		1003011-6	5	3/4/2010	15:51
		1003011-7	1	3/4/2010	15:53
+ Na		1002177-2	500	3/4/2010	15:55
		F100302-1MB	1	3/4/2010	15:57
		F100302-1RVS	1	3/4/2010	15:58
		F100302-1LCS	1	3/4/2010	16:00
- Na,S		1002225-1	1	3/4/2010	16:02
- Na		1002226-1	1	3/4/2010	16:04
		CCV9	1	3/4/2010	16:06
		CCB9	1	3/4/2010	16:07
		1002226-6	1	3/4/2010	16:09
- Na		1002226-11	1	3/4/2010	16:11
- Na		1002228-1	1	3/4/2010	16:13
- Na		1002228-6	1	3/4/2010	16:15
- Na		1002228-11	1	3/4/2010	16:16
		1002246-1	1	3/4/2010	16:18
		1002258-1	1	3/4/2010	16:20
		1002258-1DUP	1	3/4/2010	16:22
		1002258-1SER	5	3/4/2010	16:24
		1002258-1MS	1	3/4/2010	16:25
		CCV10	1	3/4/2010	16:27
		CCB10	1	3/4/2010	16:29
		1002258-1MSD	1	3/4/2010	16:31
		1002258-3	1	3/4/2010	16:33
		IP100304-3MB	1	3/4/2010	16:35
		IP100304-3RVS	1	3/4/2010	16:36

20000183

Data Package ID: IT1003045-1

20000183

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

ICPTrace2 Run Log -- 3/4/2010

Instrument ID: ICPTrace2
File Name: 100304A.
AnalRunID: IT100304-2A1
CalibRefID: IT100304-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		IP100304-3LCS	1	3/4/2010	16:38
	Rinsate 030210	1003045-1	1	3/4/2010	16:40
	Rinsate 030210	1003045-1DUP	1	3/4/2010	16:42
	Rinsate 030210	1003045-1SER	5	3/4/2010	16:44
	Rinsate 030210	1003045-1MS	1	3/4/2010	16:45
	Rinsate 030210	1003045-1MSD	1	3/4/2010	16:47
		CCV11	1	3/4/2010	16:49
		CCB11	1	3/4/2010	16:51
- S	RM-SW-BG	1003045-3	1	3/4/2010	16:53
- S	RSJ-SW-03	1003045-6	1	3/4/2010	16:54
- S	RSJ-SW-BG	1003045-7	1	3/4/2010	16:56
	RP-SW-BG	1003045-14	1	3/4/2010	16:58
	RP-SW-BGD	1003045-15	1	3/4/2010	17:00
- Na,S	PR-SW-01	1003045-20	1	3/4/2010	17:02
- S	RP-SW-03	1003045-22	1	3/4/2010	17:03
- S	RSJ-SW-01	1003045-24	1	3/4/2010	17:05
- S	RSJ-SW-02	1003045-25	1	3/4/2010	17:07
+ Na,S	PR-SW-01	1003045-20	100	3/4/2010	17:11
		CCV12	1	3/4/2010	17:13
		CCB12	1	3/4/2010	17:15
		CRI3	1	3/4/2010	17:17
		ICSA3	1	3/4/2010	17:19
		ICSAB3	1	3/4/2010	17:21
		CCV13	1	3/4/2010	17:23
		CCB13	1	3/4/2010	17:25

20000184

Data Package ID: IT1003045-1

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		MIXBHIGH	1	3/5/2010	11:07
		MIXAHIGH	1	3/5/2010	11:09
		MIXCHIGH	1	3/5/2010	11:11
		ICV	1	3/5/2010	11:15
		ICB	1	3/5/2010	11:16
		CRI1	1	3/5/2010	11:18
		ICSA1	1	3/5/2010	11:20
		ICSAB1	1	3/5/2010	11:22
		CCV1	1	3/5/2010	11:24
		CCB1	1	3/5/2010	11:26
		IP100304-2MB	1	3/5/2010	11:28
		IP100304-2RVS	1	3/5/2010	11:29
		IP100304-2LCS	1	3/5/2010	11:31
		1002192-1	1	3/5/2010	11:33
- S		1002192-2	1	3/5/2010	11:35
- S		1002192-3	1	3/5/2010	11:36
- S		1002192-4	1	3/5/2010	11:38
- S		1002192-4DUP	1	3/5/2010	11:40
- S		1002192-4SER	5	3/5/2010	11:42
- S		1002192-4MS	1	3/5/2010	11:43
		CCV2	1	3/5/2010	11:45
		CCB2	1	3/5/2010	11:47
- S		1002192-4MSD	1	3/5/2010	11:49
- S		1002192-5	1	3/5/2010	11:51
- S		1002192-5DUP	1	3/5/2010	11:53
- S		1002192-5SER	5	3/5/2010	11:54
- S		1002192-5MS	1	3/5/2010	11:56
- S		1002192-5MSD	1	3/5/2010	11:58
- S		1002192-6	1	3/5/2010	12:00
- S		1002192-7	1	3/5/2010	12:02
- S		1002192-8	1	3/5/2010	12:03
- S		1002192-9	1	3/5/2010	12:05
		CCV3	1	3/5/2010	12:07
		CCB3	1	3/5/2010	12:09
- S		1002192-9DUP	1	3/5/2010	12:11

20000185

20000186

Data Package ID: IT1003045-1

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
- S		1002192-9SER	5	3/5/2010	12:12
- S		1002192-9MS	1	3/5/2010	12:14
- S		1002192-9MSD	1	3/5/2010	12:16
		IP100304-4MB	1	3/5/2010	12:18
		IP100304-4RVS	1	3/5/2010	12:19
		IP100304-4LCS	1	3/5/2010	12:21
	RM-SED-BG	1003045-2	1	3/5/2010	12:23
	RSJ-SED-03	1003045-4	1	3/5/2010	12:25
	RSJ-SED-03	1003045-4DUP	1	3/5/2010	12:26
		CCV4	1	3/5/2010	12:28
		CCB4	1	3/5/2010	12:30
	RSJ-SED-03	1003045-4SER	5	3/5/2010	12:32
	RSJ-SED-03	1003045-4MS	1	3/5/2010	12:34
	RSJ-SED-03	1003045-4MSD	1	3/5/2010	12:36
	RSJ-SED-BG	1003045-5	1	3/5/2010	12:37
	MD-SED-0-2'	1003045-8	1	3/5/2010	12:39
	MD-SED-2-4'	1003045-9	1	3/5/2010	12:41
	MD-SED-4-6'	1003045-10	1	3/5/2010	12:43
	PR-SED-01	1003045-11	1	3/5/2010	12:44
	RP-SED-BG	1003045-12	1	3/5/2010	12:46
	RP-SED-BGD	1003045-13	1	3/5/2010	12:48
		CCV5	1	3/5/2010	12:50
		CCB5	1	3/5/2010	12:52
	RSJ-SED-02	1003045-16	1	3/5/2010	12:54
	WR-SED-0-2'	1003045-17	1	3/5/2010	12:55
	WR-SED-3'	1003045-18	1	3/5/2010	12:57
	WR-SED-5.5'	1003045-19	1	3/5/2010	12:59
	RP-SED-03	1003045-21	1	3/5/2010	13:01
	RSJ-SED-01	1003045-23	1	3/5/2010	13:02
- K,Li,Na		1002254-1	50	3/5/2010	13:04
- K,Li,Na		1002254-2	50	3/5/2010	13:06
- K,Li,Na		1002254-3	50	3/5/2010	13:08
- K,Li,Na		1002254-4	50	3/5/2010	13:10
		CCV6	1	3/5/2010	13:11
		CCB6	1	3/5/2010	13:15

20000186

20000187

Data Package ID: IT1003045-1

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
- K,Li,Na		1002254-5	50	3/5/2010	13:16
- K,Li,Na		1002254-6	50	3/5/2010	13:18
- K,Li,Na		1002254-7	50	3/5/2010	13:20
- K,Li,Na		1002254-8	50	3/5/2010	13:22
- K,Li,Na		1002254-9	50	3/5/2010	13:24
- K,Li,Na		1002254-10	50	3/5/2010	13:25
- K,Li,Na		1002254-11	50	3/5/2010	13:27
- K,Li,Na		1002254-12	50	3/5/2010	13:29
- K,Li,Na		1002254-13	50	3/5/2010	13:31
- K,Li,Na		1002254-14	50	3/5/2010	13:33
		CCV7	1	3/5/2010	13:34
		CCB7	1	3/5/2010	13:36
		ZZZ	50	3/5/2010	13:39
- K,Li,Na		1002254-16	50	3/5/2010	13:41
- K,Li,Na		1002254-17	50	3/5/2010	13:43
- K,Li,Na		1002254-18	50	3/5/2010	13:45
- Li,Na		1002254-19	10	3/5/2010	13:46
- K,Li,Na		1002254-20	50	3/5/2010	13:48
- K,Li,Na		1002254-21	50	3/5/2010	13:50
- K,Li,Na		1002254-22	50	3/5/2010	13:52
- K,Li,Na		1002254-23	50	3/5/2010	13:54
- K,Li,Na		1002254-24	50	3/5/2010	13:55
		CCV8	1	3/5/2010	13:57
		CCB8	1	3/5/2010	14:01
- K,Li,Na		1002254-25	50	3/5/2010	14:02
- K,Li,Na		1003054-1	10	3/5/2010	14:04
- Li,Na		1003054-2	10	3/5/2010	14:06
- K,Li,Na		1002254-15	50	3/5/2010	14:08
- Ca,Li,Na,S,Sr		1002076-4	10	3/5/2010	14:10
- Ca,Li,Na,Sr		1002076-7	10	3/5/2010	14:11
		CRI2	1	3/5/2010	14:13
		ICSA2	1	3/5/2010	14:15
		ICSAB2	1	3/5/2010	14:17
		CCV9	1	3/5/2010	14:19
		CCB9	1	3/5/2010	14:21

20000187

20000187

Data Package ID: IT1003045-1

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		CCV10	1	3/5/2010	14:59
		CCB10	1	3/5/2010	15:01
- Na,S		1002176-1	25	3/5/2010	15:03
- Na,S		1002176-2	25	3/5/2010	15:05
- Na,S		1002176-3	10	3/5/2010	15:06
- Na,S		1002176-4	10	3/5/2010	15:08
- S		1002176-5	10	3/5/2010	15:10
- S		1002176-6	10	3/5/2010	15:12
- S		1002176-7	10	3/5/2010	15:13
- S		1002176-8	10	3/5/2010	15:15
- S		1002176-9	10	3/5/2010	15:17
- S		1002176-10	10	3/5/2010	15:19
		CCV11	1	3/5/2010	15:21
		CCB11	1	3/5/2010	15:22
		1002176-11	1	3/5/2010	15:24
		1002176-11SER	5	3/5/2010	15:26
		1002176-11MS	1	3/5/2010	15:28
		1002176-11MSD	1	3/5/2010	15:30
- S		1002176-12	10	3/5/2010	15:32
- S		1002219-1	1	3/5/2010	15:33
- S		1002219-2	1	3/5/2010	15:35
- S		1002219-2SER	5	3/5/2010	15:37
- S		1002219-2MS	1	3/5/2010	15:39
- S		1002219-2MSD	1	3/5/2010	15:40
		CCV12	1	3/5/2010	15:42
		CCB12	1	3/5/2010	15:44
	RSJ-SED-03	1003045-4A	1	3/5/2010	15:46
		EX100304-1MB	1	3/5/2010	15:48
		EX100304-1RVS	1	3/5/2010	15:50
		EX100304-1LCS	1	3/5/2010	15:52
		1002133-3	1	3/5/2010	15:53
		1002133-4	1	3/5/2010	15:55
		1002174-10	1	3/5/2010	15:57
		1002174-11	1	3/5/2010	15:59
		1002174-11DUP	1	3/5/2010	16:01

20000188

Data Package ID: IT1003045-1

20000188

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		1002174-11SER	5	3/5/2010	16:02
		CCV13	1	3/5/2010	16:04
		CCB13	1	3/5/2010	16:06
		1002174-11MS	1	3/5/2010	16:08
		1002174-11MSD	1	3/5/2010	16:10
		1002174-12	1	3/5/2010	16:12
		1002174-13	1	3/5/2010	16:13
		1002174-14	1	3/5/2010	16:15
		1002174-15	1	3/5/2010	16:17
		1002174-16	1	3/5/2010	16:19
- Th,Zn		1002174-17	1	3/5/2010	16:21
- Th,Zn		1002174-18	1	3/5/2010	16:22
		1002175-2	1	3/5/2010	16:24
		CCV14	1	3/5/2010	16:26
		CCB14	1	3/5/2010	16:28
		CRI3	1	3/5/2010	16:30
		ICSA3	1	3/5/2010	16:32
		ICSAB3	1	3/5/2010	16:34
		CCV15	1	3/5/2010	16:36
		CCB15	1	3/5/2010	16:37

20000189

Data Package ID: IT1003045-1

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

Mercury

Method SW7470A

Method Blank

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: HG100304-4MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: METHOD

Prep Batch: HG100304-4
QCBatchID: HG100304-4-1
Run ID: HG100305-2A1
Cleanup: NONE
Basis: N/A
File Name: 10030501

Sample Aliquot: 20 g
Final Volume: 20 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7439-97-6	MERCURY	1	0.0002	0.0002	U	

20000190

Data Package ID: *HG1003045-1*

Mercury

Method SW7471A

Method Blank

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: HG100304-5MB

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: METHOD

Prep Batch: HG100304-5
QCBatchID: HG100304-5-1
Run ID: HG100305-3A1
Cleanup: NONE
Basis: N/A
File Name: 10030502

Sample Aliquot: 0.6 g
Final Volume: 100 g
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7439-97-6	MERCURY	1	0.033	0.033	U	

20000191

Data Package ID: *HG1003045-1*

Mercury

Method SW7470A

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003045

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: HG100304-4LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/04/2010
Date Analyzed: 03/05/2010
Prep Method: METHOD

Prep Batch: HG100304-4
QCBatchID: HG100304-4-1
Run ID: HG100305-2A1
Cleanup: NONE
Basis: N/A
File Name: 10030501

Sample Aliquot: 20 g
Final Volume: 20 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7439-97-6	MERCURY	0.001	0.000997	0.0002		100	80 - 120%

20000192

Data Package ID: *HG1003045-1*

Mercury

Method SW7471

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: HG100304-5LCS

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/04/2010
Date Analyzed: 03/05/2010
Prep Method: METHOD

Prep Batch: HG100304-5
QCBatchID: HG100304-5-1
Run ID: HG100305-3A1
Cleanup: NONE
Basis: N/A
File Name: 10030502

Sample Aliquot: 0.6 g
Final Volume: 100 g
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7439-97-6	MERCURY	0.167	0.166	0.0333		100	80 - 120%

20000193

Data Package ID: *HG1003045-1*

Mercury

Method SW7470A

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: Rinsate 030210
LabID: 1003045-1MS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: METHOD

Prep Batch: HG100304-4
QCBatchID: HG100304-4-1
Run ID: HG100305-2A1
Cleanup: NONE
Basis: As Received

Sample Aliquot: 20 g
Final Volume: 20 g
Result Units: MG/L
File Name: 10030501

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7439-97-6	MERCURY	0.0002	U	0.00202		0.0002	0.002	101	80 - 120%

Field ID: Rinsate 030210
LabID: 1003045-1MSD

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: METHOD

Prep Batch: HG100304-4
QCBatchID: HG100304-4-1
Run ID: HG100305-2A1
Cleanup: NONE
Basis: As Received

Sample Aliquot: 20 g
Final Volume: 20 g
Result Units: MG/L
File Name: 10030501

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7439-97-6	MERCURY	0.00201		0.002	100	0.0002	20	0

20000194

Data Package ID: *HG1003045-1*

Mercury

Method SW7471A

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-03
LabID: 1003045-4MS

Sample Matrix: SEDIMENT
% Moisture: 8.0
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: METHOD

Prep Batch: HG100304-5
QCBatchID: HG100304-5-1
Run ID: HG100305-3A1
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 0.604 g
Final Volume: 100 g
Result Units: MG/KG
File Name: 10030502

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7439-97-6	MERCURY	0.036	U	0.378		0.036	0.36	105	80 - 120%

Field ID: RSJ-SED-03
LabID: 1003045-4MSD

Sample Matrix: SEDIMENT
% Moisture: 8.0
Date Collected: 02-Mar-10
Date Extracted: 04-Mar-10
Date Analyzed: 05-Mar-10
Prep Method: METHOD

Prep Batch: HG100304-5
QCBatchID: HG100304-5-1
Run ID: HG100305-3A1
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 0.603 g
Final Volume: 100 g
Result Units: MG/KG
File Name: 10030502

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7439-97-6	MERCURY	0.377		0.36	105	0.036	20	0

20000195

Data Package ID: *HG1003045-1*

Mercury

Method SW7470

Duplicate Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: Rinsate 030210
Lab ID: 1003045-1D

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03/02/2010
Date Extracted: 03/04/2010
Date Analyzed: 03/05/2010

Prep Batch: HG100304-4
QCBatchID: HG100304-4-1
Run ID: HG100305-2A1
Cleanup: NONE
Basis: As Received
File Name: 10030501

Sample Aliquot: 20 g
Final Volume: 20 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Sample Result	Samp Qual	Duplicate Result	Dup Qual	Reporting Limit	Dilution Factor	RPD	RPD Limit
7439-97-6	MERCURY	0.0002	U	0.0002	U	0.0002	1		20

20000196

Data Package ID: *HG1003045-1*

Mercury

Method SW7471

Duplicate Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-03
Lab ID: 1003045-4D

Sample Matrix: SEDIMENT
% Moisture: 8.0
Date Collected: 03/02/2010
Date Extracted: 03/04/2010
Date Analyzed: 03/05/2010

Prep Batch: HG100304-5
QCBatchID: HG100304-5-1
Run ID: HG100305-3A1
Cleanup: NONE
Basis: Dry Weight
File Name: 10030502

Sample Aliquot: 0.603 g
Final Volume: 100 g
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Sample Result	Samp Qual	Duplicate Result	Dup Qual	Reporting Limit	Dilution Factor	RPD	RPD Limit
7439-97-6	MERCURY	0.036	U	0.036	U	0.036	1		20

20000197

Data Package ID: *HG1003045-1*

Prep Batch ID: HG100304-4

Start Date: 03/04/10
Start Time: 12:39
Prep Analyst: Sheri Lafferty

End Date: 03/04/10
End Time: 12:39

Concentration Method: NONE
Extract Method: METHOD
Initial Volume Units: g
Final Volume Units: g

Batch Created By: skl
Date Created: 03/04/10
Time Created: 12:40
Validated By: skl
Date Validated: 03/04/10
Time Validated: 13:13

Comments:

QC Batch ID: HG100304-4-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
HG100304-4	MB	XXXXXX	WATER	XXXXXX	20	20	NONE	1	1003045
HG100304-4	LCS	XXXXXX	WATER	XXXXXX	20	20	NONE	1	1003045
HG100304-4	LCSD	XXXXXX	WATER	XXXXXX	20	20	NONE	1	1003045
1003045-1	MS	Rinsate 030210	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-1	MSD	Rinsate 030210	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-1	DUP	Rinsate 030210	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-1	SMP	Rinsate 030210	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-14	SMP	RP-SW-BG	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-15	SMP	RP-SW-BGD	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-20	SMP	PR-SW-01	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-22	SMP	RP-SW-03	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-24	SMP	RSJ-SW-01	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-25	SMP	RSJ-SW-02	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-3	SMP	RM-SW-BG	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-6	SMP	RSJ-SW-03	WATER	3/2/2010	20	20	NONE	1	1003045
1003045-7	SMP	RSJ-SW-BG	WATER	3/2/2010	20	20	NONE	1	1003045

QC Types

CAR	Carrier reference sample		DUP	Laboratory Duplicate
LCS	Laboratory Control Sample		LCSD	Laboratory Control Sample Duplicat
MB	Method Blank		MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate		REP	Sample replicate
RVS	Reporting Level Verification Standar		SMP	Field Sample
SYS	Sample Yield Spike			

20000198

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

Prep Batch ID: HG100304-5

Start Date: 03/04/10
Start Time: 12:42
Prep Analyst: Sheri Lafferty

End Date: 03/04/10
End Time: 12:42

Concentration Method: NONE
Extract Method: METHOD
Initial Volume Units: g
Final Volume Units: g

Batch Created By: skl
Date Created: 03/04/10
Time Created: 12:42
Validated By: skl
Date Validated: 03/05/10
Time Validated: 12:28

Comments:

QC Batch ID: HG100304-5-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
HG100304-5	MB	XXXXXX	SEDIME	XXXXXX	0.6	100	NONE	1	1003045
HG100304-5	LCS	XXXXXX	SEDIME	XXXXXX	0.6	100	NONE	1	1003045
HG100304-5	LCSD	XXXXXX	SEDIME	XXXXXX	0.6	100	NONE	1	1003045
1003045-4	MS	RSJ-SED-03	SEDIME	3/2/2010	0.604	100	NONE	1	1003045
1003045-4	MSD	RSJ-SED-03	SEDIME	3/2/2010	0.603	100	NONE	1	1003045
1003045-4	DUP	RSJ-SED-03	SEDIME	3/2/2010	0.603	100	NONE	1	1003045
1003045-10	SMP	MD-SED-4-6'	SEDIME	3/2/2010	0.605	100	NONE	1	1003045
1003045-11	SMP	PR-SED-01	SEDIME	3/2/2010	0.604	100	NONE	1	1003045
1003045-12	SMP	RP-SED-BG	SEDIME	3/2/2010	0.606	100	NONE	1	1003045
1003045-13	SMP	RP-SED-BGD	SEDIME	3/2/2010	0.605	100	NONE	1	1003045
1003045-16	SMP	RSJ-SED-02	SEDIME	3/2/2010	0.604	100	NONE	1	1003045
1003045-17	SMP	WR-SED-0-2'	SEDIME	3/2/2010	0.601	100	NONE	1	1003045
1003045-18	SMP	WR-SED-3'	SEDIME	3/2/2010	0.601	100	NONE	1	1003045
1003045-19	SMP	WR-SED-5.5'	SEDIME	3/2/2010	0.601	100	NONE	1	1003045
1003045-2	SMP	RM-SED-BG	SEDIME	3/2/2010	0.607	100	NONE	1	1003045
1003045-21	SMP	RP-SED-03	SEDIME	3/2/2010	0.601	100	NONE	1	1003045
1003045-23	SMP	RSJ-SED-01	SEDIME	3/2/2010	0.601	100	NONE	1	1003045
1003045-4	SMP	RSJ-SED-03	SEDIME	3/2/2010	0.603	100	NONE	1	1003045
1003045-5	SMP	RSJ-SED-BG	SEDIME	3/2/2010	0.604	100	NONE	1	1003045
1003045-8	SMP	MD-SED-0-2'	SEDIME	3/2/2010	0.602	100	NONE	1	1003045
1003045-9	SMP	MD-SED-2-4'	SEDIME	3/2/2010	0.6	100	NONE	1	1003045

QC Types

CAR	Carrier reference sample	DUP	Laboratory Duplicate	
LCS	Laboratory Control Sample	LCSD	Laboratory Control Sample Duplicat	
MB	Method Blank	MS	Laboratory Matrix Spike	
MSD	Laboratory Matrix Spike Duplicate	REP	Sample replicate	
RVS	Reporting Level Verification Standar	SMP	Field Sample	20000199
SYS	Sample Yield Spike			

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

MERCURY

Method SW7470

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: HG100305-2A1
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
ICV	Initial Calibration	3/5/2010	9:13	0.001	0.00104	0.0002	N/A	104	90 - 110
CCV1	Continuing Calibration	3/5/2010	9:32	0.002	0.00202	0.0002	N/A	101	80 - 120
CCV2	Continuing Calibration	3/5/2010	9:50	0.002	0.00203	0.0002	N/A	101	80 - 120

Data Package ID: *HG1003045-1*

20000200

MERCURY

Method SW7471

Calibration Verifications

Lab Name: **ALS Laboratory Group -- FC**
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: HG100305-3A1
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
ICV	Initial Calibration	3/5/2010	11:28	0.001	0.00101	0.0002	N/A	101	90 - 110
CCV1	Continuing Calibration	3/5/2010	11:49	0.002	0.00196	0.0002	N/A	98	80 - 120
CCV2	Continuing Calibration	3/5/2010	12:08	0.002	0.00202	0.0002	N/A	101	80 - 120
CCV3	Continuing Calibration	3/5/2010	12:18	0.002	0.00205	0.0002	N/A	102	80 - 120

MERCURY

Method SW7470

Calibration Blanks

Lab Name: **ALS Laboratory Group -- FC**
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: HG100305-2A1
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Result	Reporting Limit	Flag
ICB	Initial Calibration	3/5/2010	9:14	0.0002	0.0002	U
CCB1	Continuing Calibration	3/5/2010	9:34	0.0002	0.0002	U
CCB2	Continuing Calibration	3/5/2010	9:51	0.0002	0.0002	U

Data Package ID: *HG1003045-1*

MERCURY

Method SW7471

Calibration Blanks

Lab Name: **ALS Laboratory Group -- FC**
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: HG100305-3A1
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Result	Reporting Limit	Flag
ICB	Initial Calibration	3/5/2010	11:29	0.0002	0.0002	U
CCB1	Continuing Calibration	3/5/2010	11:50	0.0002	0.0002	U
CCB2	Continuing Calibration	3/5/2010	12:10	0.0002	0.0002	U
CCB3	Continuing Calibration	3/5/2010	12:19	0.0002	0.0002	U

Metals Linear Ranges

Lab Name: **ALS Laboratory Group -- FC**
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Instrument ID: CETAC
Active Date: 01/28/2010
Expiration Date: 04/27/2010

CASNO	Target Analyte	Concentration (ppm)
7439-97-6	MERCURY	0.005

20000204

Mercury Run Log -- 3/5/2010

Instrument ID: CETAC
File Name: 10030501
AnalRunID: HG100305-2A1
CalibRefID: HG100305-2A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		STD0	1	3/5/2010	9:03
		STD1	1	3/5/2010	9:05
		STD2	1	3/5/2010	9:06
		STD3	1	3/5/2010	9:08
		STD4	1	3/5/2010	9:10
		STD5	1	3/5/2010	9:11
		ICV	1	3/5/2010	9:13
		ICB	1	3/5/2010	9:14
		CRA1	1	3/5/2010	9:16
		HG100304-4MB	1	3/5/2010	9:18
		HG100304-4LCS	1	3/5/2010	9:19
		HG100304-4LCSD	1	3/5/2010	9:21
	Rinsate 030210	1003045-1	1	3/5/2010	9:22
	Rinsate 030210	1003045-1DUP	1	3/5/2010	9:24
		1003045-1L	5	3/5/2010	9:26
	Rinsate 030210	1003045-1MS	1	3/5/2010	9:27
	Rinsate 030210	1003045-1MSD	1	3/5/2010	9:29
	RM-SW-BG	1003045-3	1	3/5/2010	9:30
		CCV1	1	3/5/2010	9:32
		CCB1	1	3/5/2010	9:34
	RSJ-SW-03	1003045-6	1	3/5/2010	9:35
	RSJ-SW-BG	1003045-7	1	3/5/2010	9:37
	RP-SW-BG	1003045-14	1	3/5/2010	9:38
	RP-SW-BGD	1003045-15	1	3/5/2010	9:40
	PR-SW-01	1003045-20	1	3/5/2010	9:42
	RP-SW-03	1003045-22	1	3/5/2010	9:43
	RSJ-SW-01	1003045-24	1	3/5/2010	9:45
	RSJ-SW-02	1003045-25	1	3/5/2010	9:47
		CRA2	1	3/5/2010	9:48
		CCV2	1	3/5/2010	9:50
		CCB2	1	3/5/2010	9:51
		StDUP		3/5/2010	11:16

20000205

Data Package ID: HG1003045-1

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

Mercury Run Log -- 3/5/2010

Instrument ID: CETAC
File Name: 10030502
AnalRunID: HG100305-3A1
CalibRefID: HG100305-3A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		STD0	1	3/5/2010	11:18
		STD1	1	3/5/2010	11:20
		STD2	1	3/5/2010	11:21
		STD3	1	3/5/2010	11:23
		STD4	1	3/5/2010	11:25
		STD5	1	3/5/2010	11:26
		ICV	1	3/5/2010	11:28
		ICB	1	3/5/2010	11:29
		CRA1	1	3/5/2010	11:31
		HG100304-5MB	1	3/5/2010	11:33
		HG100304-5LCS	1	3/5/2010	11:34
		HG100304-5LCSD	1	3/5/2010	11:36
	RM-SED-BG	1003045-2	1	3/5/2010	11:37
	RSJ-SED-03	1003045-4	1	3/5/2010	11:39
	RSJ-SED-03	1003045-4DUP	1	3/5/2010	11:41
		1003045-4L	5	3/5/2010	11:42
	RSJ-SED-03	1003045-4MS	1	3/5/2010	11:46
	RSJ-SED-03	1003045-4MSD	1	3/5/2010	11:47
		CCV1	1	3/5/2010	11:49
		CCB1	1	3/5/2010	11:50
	RSJ-SED-BG	1003045-5	1	3/5/2010	11:52
	MD-SED-0-2'	1003045-8	1	3/5/2010	11:54
	MD-SED-2-4'	1003045-9	1	3/5/2010	11:55
	MD-SED-4-6'	1003045-10	1	3/5/2010	11:57
	PR-SED-01	1003045-11	1	3/5/2010	11:58
	RP-SED-BG	1003045-12	1	3/5/2010	12:00
	RP-SED-BGD	1003045-13	1	3/5/2010	12:02
	RSJ-SED-02	1003045-16	1	3/5/2010	12:03
	WR-SED-0-2'	1003045-17	1	3/5/2010	12:05
	WR-SED-3'	1003045-18	1	3/5/2010	12:07
		CCV2	1	3/5/2010	12:08
		CCB2	1	3/5/2010	12:10
	WR-SED-5.5'	1003045-19	1	3/5/2010	12:11
	RP-SED-03	1003045-21	1	3/5/2010	12:13
	RSJ-SED-01	1003045-23	1	3/5/2010	12:15

20000206

20000206

Data Package ID: HG1003045-1

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

Mercury Run Log -- 3/5/2010

Instrument ID: CETAC
File Name: 10030502
AnalRunID: HG100305-3A1
CalibRefID: HG100305-3A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		CRA2	1	3/5/2010	12:16
		CCV3	1	3/5/2010	12:18
		CCB3	1	3/5/2010	12:19

20000207

Data Package ID: HG1003045-1

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

Raw Data

20000208

HEADER INFROMATION FOR ANALYTICAL SEQUENCE 100304A
STANDARD SOLUTION CODES

Stock A (ST100301-49) Exp. 5-31-15

Element	ug/ml
Al, Ca, Mg	1000
Na, K	500
Fe	400
Li	20

Standard	Dilution	Procedure
A1	1/2 of Stock A	5ml of Stock A to 10ml final volume.
A5	1/2.5 of Stock A	2ml of Stock A to a 5ml final volume.
A2	1/5 of Stock A	1ml of Stock A to a 5ml final volume.
A3	1/10 of A1	1ml of Standard A1 up to a 10ml final volume.
A4	1/10 of A2	1ml of Standard A2 up to a 10ml final volume.

Stock B (ST100301-50) Exp. 2-28-15

Element	ug/ml
P, Si	100
B, Ba, Cr, Cu, Mn, Mo, Ni, Pb, Sn, Sr, Ti ,Zn	20
As, Cd, Co, Se, Tl, V	10
Ag, Sb	4
Be	2

Stock Ag- 1000 ug/ml (ST090107-6) Exp. 4-06-10
Stock Th – 1000 ug/ml (ST090107-7) Exp. 4-06-10

The following dilutions of Stock Ag and Stock Th are made to provide the daily calibration Standards.

Standard	Dilution	Procedure
B1	1/2 of Stock B 1/500 Ag and 1/500 Th	5ml of Stock B and 0.02ml of Stock Ag and Stock Th up to a 10ml final volume.
B2	1/10 of B1	1.0ml of Standard B1 up to a 10ml final volume.
B3	1/10 of B2	1.0ml of Standard B2 up to a 10ml final volume.

Stock C (ST100301-51) Exp. 6-30-15

Element	ug/ml
S, U	100
Bi, Zr	10

Standard	Dilution	Procedure
C1	1/2 of Stock C	5ml of Stock C up to a 10ml final volume.
C2	1/10 of C1	1.0ml of Standard C1 up to a 10ml final volume.
C3	1/10 of C2	1.0ml of Standard C2 up to a 10ml final volume.

RL STD (Reporting Limit Standard) Intermediate.
(ST100301-54) Exp. 2-28-15

Element	ug/ml
K, Na	500
Ca, Mg	200
Al, U	100
B, Fe, P, S, Si	50
Li, Mo, Sn, Sr, Ti	10
Sb	8
Ni, As, Bi, Se, Tl, Zn, Zr	5
Pb	3
Ag, Ba, Co, Cr, Cu, Mn, V, Th	2
Be, Cd	1

20000209

RL STD (working standard) made daily by diluting the intermediate above 1000 fold. This working standard has concentration levels at the normal ALS-FC reporting limits for all elements except Ca, Mg and Na, K which are at 0.2ppm and 0.5ppm; this is below the normal ALS-FC reporting limit.

RL2 (working standard) made daily by diluting the intermediate above 333 fold.

Blank Solution

Double D.I. water, 3% HNO_3 and 5%HCl
Used for Std. Blank, ICB and CCB

CCV (ST100304-2) Exp. 1-1-11

Element	ug/ml
Al, Ca, Mg, K, Na	50
Fe	20
U, P, S, Si	5
B, Ba, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sn, Zn, Zr	1
As, Be, Bi, Cd, Co, Li, Sb, Sr, Ti, Tl, V	0.5
Ag, Th	0.2

ICV (ST100304-2) Exp. 1-1-11
Prepared daily by diluting the CCV (described above) ½.
The 1/2 dilution is made by diluting 5ml of the CCV to a 10ml final volume.
The resulting concentrations are:

Element	ug/ml
Al, Ca, Mg, K, Na	25
Fe	10
U, P, S, Si	2.5
B, Ba, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sn, Zn, Zr	0.5
As, Be, Bi, Cd, Co, Li, Sb, Sr, Ti, Tl, V	0.25
Ag, Th	0.1

CRI (ST100111-17) Exp. 1-1-11
Made By diluting
1.0ml of CRI Stock (ST100111-16) Exp. 1-10-10
to a 100ml final volume.

Element	ug/ml
Ca, Mg, K, Na	5.0
Al, B, Ba	0.4
Fe, U, P, S	0.2
Sb	0.12
Co, Si,, Sn, V, Th	0.1
Ni	0.08
Cu, Bi, Zr	0.05
Zn	0.04
Mn	0.03
Ag, Cr, Li, Mo, Sr, Ti, Tl	0.02
Be, Cd, As, Se,	0.01
Pb	0.006

ICSA (ST100111-7) Exp. 1-1-11

Element	ug/ml
Ca, Mg, Al	250
Fe	100

ICSAB (ST100111-8) Exp. 1-1-11

Element	ug/ml
Ca, Mg, Al	250
Fe	100
U	10
B, Si, Li, Mo, Sn, Sr, Ti, Cd, Zn, Ni, P, S	1.0
Sb	0.6
Ba, Be, Co, V, Cr, Cu, Mn, Bi, Zr	0.5
Ag	0.2
As, Tl	0.1
Se, Pb, Th	0.05

20000210

Pipette ID Numbers

1.0ml to 5.0ml --- M-55
0.1ml to 1.0ml --- M-61
0.01ml to 0.1ml --- M-57

Acid Lot Numbers

HCl – H19031
HNO_3 – H14024

Inter Element Correction Information

The following table summarizes spectral interferences that have been identified and for which IEC's are used. If a sample contains a concentration of an interfering element that exceeds the upper analytical range, and an affected element is being determined, it is necessary to dilute the sample to bring the interfering element into analytical range.

Interfering Element (ug/ml)	Affected Element
Al (500)	Pb
Mg (500)	Th
Fe (200)	Se, Tl, V, Pb, U
Si (50)	Zr
U (50)	Al, Cr, Cu, Bi, Pb, Mg, Se, Ag, Tl, Si
Ba (10)	Co
Cr (10)	Sb
Cu (10)	Bi
Mn (10)	Tl
Mo (10)	Al, Si, Pb,, Sb
Ti (10)	Co, Bi, Si, Sn, Tl, Pb, Zr
As (5)	Cd
V (5)	Al, Be, Tl
Zr (5)	Ag

The following table lists element concentrations (ug/ml) that no significant spectral interferences have been observed.

Element	Concentration	Element	Concentration	Element	Concentration
K	500	Se	10		
Na	500	Pb	10	Li	5
Ca	500	Zn	10	Cd	5
P	50	Sr	10	Co	5
S	50	Sn	10	Ag	2
Ni	10	Bi	5	Sb	2
B	10	Tl	5	Be	1

2X – Dilution made by diluting 2.5ml of sample up to a 5ml final volume.
3X - Dilution made by diluting 2.0ml of sample up to a 6ml final volume.
4X - Dilution made by diluting 2.0ml of sample up to a 8ml final volume.
5X - Dilution made by diluting 1.0ml of sample to a 5ml final volume.
10X - Dilution made by diluting 0.5ml of sample to a 5ml final volume.
20X – Dilution made by diluting 0.25ml of sample to a 5ml final volume.
25X – Dilution made by diluting 0.2ml of sample to a 5ml final volume.
50X – Dilution made by diluting 0.1ml of sample to a 5ml final volume.
100X – Dilution made by diluting 0.05ml of sample to a 5ml final volume.
500X – Dilution made by diluting 0.02ml of sample to a 10ml final volume.
1000X – Dilution made by diluting a 10X dilution 100X.

Analytical Spikes

1003011-2MS/MSD – Spiked for all requested elements at ALS-FC standard by diluting 0.1ml of Z spike (ST100302-16) and 0.1ml of Cation spike (ST100108-2) up to a 5ml final volume with sample digestate.

Comments

1. Please see run log and work orders for elements of interest.

Daily Maintenance

1. Check/ Change Peristaltic pump tubing.
2. Check the torch for deposits, clean if necessary.
3. Check/ Empty drain water.

Daily Maintenance done by RF .

Monthly Maintenance

1. Check/Clean nebulizer and spray chamber.
2. Clean air filters
3. Check/Clean entrance slit.
4. Fill water recirculating reservoir.

Monthly maintenance done by: RF 02-24-10.

Major problems / adjustments / repairs recorded in the ICP Maintenance Log (3716).

ICPTrace2 Run Log -- 3/4/2010

Instrument ID: ICPTrace2
File Name: 100304A.
AnalRunID: IT100304-2A1
CalibRefID: IT100304-2A1

Comment	Inst Sample Name	Lab ID	DF	Date Analyzed	Time Analyzed
	MIXBHIGH	MIXBHIGH	1	3/4/2010	11:49
	MIXAHIGH	MIXAHIGH	1	3/4/2010	11:51
	MIXCHIGH	MIXCHIGH	1	3/4/2010	11:53
	ICV	ICV	1	3/4/2010	12:30
	ICB	ICB	1	3/4/2010	12:32
	CRI	CRI1	1	3/4/2010	12:33
	ICSA	ICSA1	1	3/4/2010	12:35
	ICSAB	ICSAB1	1	3/4/2010	12:37
	CCV	CCV1	1	3/4/2010	12:39
	CCB	CCB1	1	3/4/2010	12:41
	IP100303-1MB	IP100303-1MB	1	3/4/2010	12:43
	M100015-1	M100015-1	1	3/4/2010	12:44
	M100015-2	M100015-2	1	3/4/2010	12:46
	M100015-3	M100015-3	1	3/4/2010	12:48
	M100015-4	M100015-4	1	3/4/2010	12:50
	M100015-5	M100015-5	1	3/4/2010	12:51
	M100015-6	M100015-6	1	3/4/2010	12:53
	M100015-7	M100015-7	1	3/4/2010	12:55
	M100015-8	M100015-8	1	3/4/2010	12:57
	M100015-9	M100015-9	1	3/4/2010	12:59
	CCV	CCV2	1	3/4/2010	13:00
	CCB	CCB2	1	3/4/2010	13:02
	IP100303-2MB	IP100303-2MB	1	3/4/2010	13:04
	M100016-1	M100016-1	1	3/4/2010	13:06
	M100016-2	M100016-2	1	3/4/2010	13:08
	M100016-3	M100016-3	1	3/4/2010	13:09
	M100016-4	M100016-4	1	3/4/2010	13:11
	M100016-5	M100016-5	1	3/4/2010	13:13
	M100016-6	M100016-6	1	3/4/2010	13:15
	M100016-7	M100016-7	1	3/4/2010	13:16
	M100016-8	M100016-8	1	3/4/2010	13:18
	M100016-9	M100016-9	1	3/4/2010	13:21
	CCV	CCV3	1	3/4/2010	13:23
	CCB	CCB3	1	3/4/2010	13:25
	IP100303-3MB	IP100303-3MB	1	3/4/2010	13:27

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Data Package ID:

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Thursday, March 04, 2010

#Name?

ICPTrace2 Run Log -- 3/4/2010

Instrument ID: ICPTrace2
File Name: 100304A.
AnalRunID: IT100304-2A1
CalibRefID: IT100304-2A1

Comment	Inst Sample Name	Lab ID	DF	Date Analyzed	Time Analyzed
	M100017-1	M100017-1	1	3/4/2010	13:28
	M100017-2	M100017-2	1	3/4/2010	13:30
	M100017-3	M100017-3	1	3/4/2010	13:32
	M100017-4	M100017-4	1	3/4/2010	13:34
	M100017-5	M100017-5	1	3/4/2010	13:36
	M100017-6	M100017-6	1	3/4/2010	13:37
	M100017-7	M100017-7	1	3/4/2010	13:39
	M100017-8	M100017-8	1	3/4/2010	13:41
	M100017-9	M100017-9	1	3/4/2010	13:43
	CCV	CCV4	1	3/4/2010	13:44
	CCB	CCB4	1	3/4/2010	13:46
	IP100301-4MB	IP100301-4MB	1	3/4/2010	13:48
	M100018-1	M100018-1	1	3/4/2010	13:50
	M100018-2	M100018-2	1	3/4/2010	13:52
	M100018-3	M100018-3	1	3/4/2010	13:53
	M100018-4	M100018-4	1	3/4/2010	13:55
	M100018-5	M100018-5	1	3/4/2010	13:57
	M100018-6	M100018-6	1	3/4/2010	13:59
	M100018-7	M100018-7	1	3/4/2010	14:01
	M100018-8	M100018-8	1	3/4/2010	14:03
	M100018-9	M100018-9	1	3/4/2010	14:04
	CCV	CCV5	1	3/4/2010	14:06
	CCB	CCB5	1	3/4/2010	14:08
	CRI	CRI2	1	3/4/2010	14:10
	ICSA	ICSA2	1	3/4/2010	14:12
	ICSAB	ICSAB2	1	3/4/2010	14:14
	CCV	CCV6	1	3/4/2010	14:16
	CCB	CCB6	1	3/4/2010	14:17
	CCV	CCV7	1	3/4/2010	15:22
	CCB	CCB7	1	3/4/2010	15:24
	1002177-1 100X	1002177-1	100	3/4/2010	15:26
- Na	1002177-2 100X	1002177-2	100	3/4/2010	15:28
	1002177-3 50X	1002177-3	50	3/4/2010	15:30
	1002177-4	1002177-4	1	3/4/2010	15:31
	1003011-1	1003011-1	1	3/4/2010	15:33

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Data Package ID: 20000214

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Thursday, March 04, 2010

#Name?

ICPTrace2 Run Log -- 3/4/2010

Instrument ID: ICPTrace2
File Name: 100304A.
AnalRunID: IT100304-2A1
CalibRefID: IT100304-2A1

Comment	Inst Sample Name	Lab ID	DF	Date Analyzed	Time Analyzed
- S	1003011-2	1003011-2	1	3/4/2010	15:35
- S	1003011-2L 5X	1003011-2SER	5	3/4/2010	15:37
- S	1003011-2MS	1003011-2MS	1	3/4/2010	15:39
- S	1003011-2MSD	1003011-2MSD	1	3/4/2010	15:40
	1003011-3 5X	1003011-3	5	3/4/2010	15:42
	CCV	CCV8	1	3/4/2010	15:44
	CCB	CCB8	1	3/4/2010	15:46
	1003011-4 2X	1003011-4	2	3/4/2010	15:48
	1003011-5	1003011-5	1	3/4/2010	15:49
	1003011-6 5X	1003011-6	5	3/4/2010	15:51
	1003011-7	1003011-7	1	3/4/2010	15:53
+ Na	1002177-2 500X	1002177-2	500	3/4/2010	15:55
	F100302-1MB	F100302-1MB	1	3/4/2010	15:57
	F100302-1RVS	F100302-1RVS	1	3/4/2010	15:58
	F100302-1LCS	F100302-1LCS	1	3/4/2010	16:00
- Na,S	1002225-1	1002225-1	1	3/4/2010	16:02
- Na	1002226-1	1002226-1	1	3/4/2010	16:04
	CCV	CCV9	1	3/4/2010	16:06
	CCB	CCB9	1	3/4/2010	16:07
	1002226-6	1002226-6	1	3/4/2010	16:09
- Na	1002226-11	1002226-11	1	3/4/2010	16:11
- Na	1002228-1	1002228-1	1	3/4/2010	16:13
- Na	1002228-6	1002228-6	1	3/4/2010	16:15
- Na	1002228-11	1002228-11	1	3/4/2010	16:16
	1002246-1	1002246-1	1	3/4/2010	16:18
	1002258-1	1002258-1	1	3/4/2010	16:20
	1002258-1D	1002258-1DUP	1	3/4/2010	16:22
	1002258-1L 5X	1002258-1SER	5	3/4/2010	16:24
	1002258-1MS	1002258-1MS	1	3/4/2010	16:25
	CCV	CCV10	1	3/4/2010	16:27
	CCB	CCB10	1	3/4/2010	16:29
	1002258-1MSD	1002258-1MSD	1	3/4/2010	16:31
	1002258-3	1002258-3	1	3/4/2010	16:33
	IP100304-3MB	IP100304-3MB	1	3/4/2010	16:35
	IP100304-3RVS	IP100304-3RVS	1	3/4/2010	16:36

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Data Package ID:

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Thursday, March 04, 2010

#Name?

ICPTrace2 Run Log -- 3/4/2010

Instrument ID: ICPTrace2
File Name: 100304A.
AnalRunID: IT100304-2A1
CalibRefID: IT100304-2A1

Comment	Inst Sample Name	Lab ID	DF	Date Analyzed	Time Analyzed
	IP100304-3LCS	IP100304-3LCS	1	3/4/2010	16:38
	1003045-1	1003045-1	1	3/4/2010	16:40
	1003045-1D	1003045-1DUP	1	3/4/2010	16:42
	1003045-1L 5X	1003045-1SER	5	3/4/2010	16:44
	1003045-1MS	1003045-1MS	1	3/4/2010	16:45
	1003045-1MSD	1003045-1MSD	1	3/4/2010	16:47
	CCV	CCV11	1	3/4/2010	16:49
	CCB	CCB11	1	3/4/2010	16:51
- S	1003045-3	1003045-3	1	3/4/2010	16:53
- S	1003045-6	1003045-6	1	3/4/2010	16:54
- S	1003045-7	1003045-7	1	3/4/2010	16:56
	1003045-14	1003045-14	1	3/4/2010	16:58
	1003045-15	1003045-15	1	3/4/2010	17:00
- Na,S	1003045-20	1003045-20	1	3/4/2010	17:02
- S	1003045-22	1003045-22	1	3/4/2010	17:03
- S	1003045-24	1003045-24	1	3/4/2010	17:05
- S	1003045-25	1003045-25	1	3/4/2010	17:07
+ Na,S	1003045-20 100X	1003045-20	100	3/4/2010	17:11
	CCV	CCV12	1	3/4/2010	17:13
	CCB	CCB12	1	3/4/2010	17:15
	CRI	CRI3	1	3/4/2010	17:17
	ICSA	ICSA3	1	3/4/2010	17:19
	ICSAB	ICSAB3	1	3/4/2010	17:21
	CCV	CCV13	1	3/4/2010	17:23
	CCB	CCB13	1	3/4/2010	17:25

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Data Package ID:

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Thursday, March 04, 2010

#Name?

Sample Id1	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu
MIXBHIGH	1.97728	0.04123	4.88903	9.80976	9.85994	0.97434	-0.00191	-0.04276	4.88458	4.90015	9.82478	9.88636
MIXAHIGH	-0.00037	486.40579	0.00237	0.01663	0.00033	0.00074	0.01301	483.35880	0.00027	0.00073	0.00437	-0.00838
MIXCHIGH	0.00052	0.12339	-0.00292	0.02105	-0.00112	0.00385	H5.04303	0.15252	-0.00088	0.00514	-0.00948	0.00127
ICV	0.09846	24.97520	0.25430	0.48443	0.49859	0.24802	0.25197	24.47380	0.24484	0.24957	0.49711	0.48848
ICB	-0.00042	0.03087	-0.00076	0.00147	-0.00048	0.00007	-0.00712	-0.01741	0.00001	-0.00019	-0.00005	-0.00132
CRI	0.01816	0.43629	0.00935	0.41684	0.42744	0.01036	0.04582	5.30866	0.01041	0.10254	0.02005	0.05091
ICSA	-0.00067	259.80310	-0.00009	-0.00071	-0.00017	0.00041	0.00083	254.85828	0.00012	0.00097	-0.00078	-0.00543
ICSAB	0.20371	262.83722	0.11276	1.00022	0.51602	0.47381	0.53462	255.71169	1.00230	0.46765	0.47114	0.51418
CCV	0.19862	50.34088	0.51817	0.98431	0.99100	0.49912	0.50644	50.07133	0.49518	0.50424	1.00198	0.97456
CCB	-0.00037	0.05829	0.00032	0.00176	-0.00027	0.00028	-0.00427	0.00652	0.00009	-0.00005	0.00027	-0.00079
IP100303-1MB	-0.00148	0.04428	0.00053	-0.00040	0.00011	0.00018	-0.00948	-0.00650	0.00000	-0.00071	-0.00043	-0.00184
M100015-1	0.00289	0.08326	0.01947	0.04184	0.00157	0.00141	0.00932	0.02730	0.00209	0.00410	0.00543	0.00335
M100015-2	0.00337	0.07314	0.02042	0.04068	0.00074	0.00133	0.00897	0.02622	0.00190	0.00397	0.00432	0.00306
M100015-3	0.00343	0.07085	0.02090	0.04050	0.00062	0.00128	0.00632	0.01839	0.00217	0.00394	0.00410	0.00303
M100015-4	0.00377	0.06849	0.02211	0.04182	0.00065	0.00136	0.00647	0.02022	0.00218	0.00410	0.00430	0.00324
M100015-5	0.00396	0.06750	0.01997	0.04056	0.00069	0.00119	0.00834	0.01451	0.00218	0.00412	0.00442	0.00313
M100015-6	0.00343	0.06670	0.02107	0.04095	0.00064	0.00125	0.00765	0.01719	0.00194	0.00397	0.00417	0.00310
M100015-7	0.00372	0.06778	0.02144	0.04007	0.00067	0.00120	0.00849	0.01674	0.00230	0.00452	0.00397	0.00298
M100015-8	0.00353	0.06274	0.01938	0.04017	0.00055	0.00118	0.00932	0.01485	0.00204	0.00384	0.00427	0.00334
M100015-9	0.00102	0.04036	0.00851	0.01883	0.00164	0.00055	0.00016	-0.00285	0.00093	0.00150	0.00229	0.00080
CCV	0.19376	49.46219	0.49765	0.95201	0.97800	0.47869	0.49596	47.84227	0.47952	0.48360	0.96377	0.95997
CCB	0.00022	0.04144	0.00073	0.00098	-0.00027	0.00016	0.00015	-0.01147	0.00033	0.00038	0.00069	-0.00020
IP100303-2MB	-0.00044	0.03039	-0.00057	-0.00034	-0.00054	-0.00003	-0.00462	-0.02066	-0.00007	-0.00036	0.00011	-0.00118
M100016-1	0.00340	0.05902	0.01997	0.03966	0.00067	0.00116	0.00726	0.01531	0.00186	0.00368	0.00425	0.00288
M100016-2	0.00313	0.06025	0.02139	0.03946	0.00079	0.00112	0.00608	0.01914	0.00210	0.00389	0.00393	0.00260
M100016-3	0.00320	0.05786	0.01659	0.03844	0.00055	0.00123	0.00303	0.01548	0.00182	0.00356	0.00369	0.00222
M100016-4	0.00464	0.06898	0.02154	0.03960	0.00079	0.00128	0.01340	0.01782	0.00258	0.00454	0.00497	0.00351
M100016-5	0.00334	0.06054	0.01910	0.03763	0.00059	0.00115	0.01133	0.01400	0.00211	0.00378	0.00389	0.00271
M100016-6	0.00353	0.06061	0.01943	0.03948	0.00061	0.00125	0.00490	0.01542	0.00223	0.00381	0.00405	0.00239
M100016-7	0.00447	0.06462	0.02022	0.03905	0.00076	0.00118	0.01030	0.01434	0.00209	0.00445	0.00458	0.00323
M100016-8	0.00372	0.07384	0.01912	0.03875	0.00064	0.00126	0.00720	0.01457	0.00232	0.00406	0.00437	0.00292
M100016-9	0.00115	0.05719	0.00901	0.01763	-0.00006	0.00061	-0.00013	-0.00713	0.00091	0.00172	0.00183	0.00059
CCV	0.20143	51.46518	0.52560	1.00079	1.02045	0.50021	0.52169	50.29397	0.50367	0.50797	1.00564	1.00423
CCB	-0.00046	0.05652	-0.00063	-0.00077	-0.00030	0.00024	-0.00452	-0.01198	0.00012	-0.00025	0.00018	-0.00114
IP100303-3MB	-0.00062	0.03511	-0.00269	-0.00207	-0.00074	0.00002	-0.00825	-0.02243	-0.00020	-0.00096	0.00004	-0.00192
M100017-1	0.00334	0.07288	0.01705	0.03822	0.00061	0.00121	0.00435	0.01691	0.00213	0.00321	0.00402	0.00204
M100017-2	0.00358	0.07883	0.02025	0.03812	0.00071	0.00119	0.00583	0.02759	0.00236	0.00384	0.00495	0.00277
M100017-3	0.00388	0.07620	0.01969	0.03814	0.00071	0.00127	0.00691	0.01520	0.00234	0.00371	0.00454	0.00231
M100017-4	0.00373	0.07300	0.01906	0.03742	0.00068	0.00126	0.00711	0.02016	0.00234	0.00374	0.00443	0.00271
M100017-5	0.00374	0.06956	0.01707	0.03755	0.00061	0.00114	0.00725	0.01645	0.00235	0.00312	0.00437	0.00235
M100017-6	0.00299	0.06734	0.01822	0.03712	0.00052	0.00120	0.00529	0.01337	0.00225	0.00304	0.00409	0.00179
M100017-7	0.00371	0.07214	0.02048	0.03661	0.00061	0.00113	0.00765	0.01251	0.00208	0.00364	0.00437	0.00239
M100017-8	0.00373	0.07032	0.01835	0.03659	0.00069	0.00123	0.00671	0.01417	0.00225	0.00360	0.00418	0.00236
M100017-9	0.00197	0.05018	0.00925	0.01702	0.00006	0.00048	0.00350	-0.00479	0.00103	0.00167	0.00296	0.00034
CCV	0.19706	49.93342	0.50781	0.96077	0.98309	0.48942	0.50502	49.35698	0.48956	0.49558	0.98505	0.97100
CCB	-0.00061	0.04845	-0.00044	-0.00052	-0.00047	0.00012	-0.00369	-0.01592	0.00007	0.00006	-0.00010	-0.00172
IP100301-4MB	-0.00025	0.04051	0.00092	-0.00097	-0.00031	-0.00005	-0.00231	-0.00422	-0.00008	-0.00040	0.00091	-0.00132
M100018-1	0.00339	0.07953	0.02012	0.03688	0.00078	0.00117	0.00873	0.03021	0.00220	0.00330	0.00429	0.00338
M100018-2	0.00368	0.08458	0.01919	0.03769	0.00075	0.00112	0.00809	0.03432	0.00226	0.00371	0.00492	0.00296
M100018-3	0.00367	0.13248	0.01828	0.03804	0.00074	0.00114	0.00848	0.03090	0.00216	0.00369	0.00478	0.00267

20000217

Sample Id1	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu
M100018-4	0.00284	0.08933	0.02066	0.03694	0.00102	0.00116	0.00411	0.02667	0.00210	0.00342	0.00444	0.00282
M100018-5	0.00398	0.08208	0.02046	0.03622	0.00065	0.00111	0.00902	0.02444	0.00229	0.00367	0.00462	0.00256
M100018-6	0.00325	0.08374	0.01858	0.03606	0.00069	0.00108	0.00465	0.03255	0.00227	0.00374	0.00456	0.00285
M100018-7	-0.00049	0.06108	0.01233	0.03360	0.00021	0.00111	-0.00853	0.01845	0.00152	0.00066	0.00186	-0.00049
M100018-8	0.00385	0.09180	0.02090	0.03781	0.00076	0.00125	0.00608	0.02701	0.00224	0.00380	0.00466	0.00309
M100018-9	0.00143	0.06992	0.00825	0.01679	0.00010	0.00052	0.00124	0.00475	0.00104	0.00108	0.00203	0.00027
CCV	0.19837	50.13405	0.50850	0.96685	0.98930	0.48444	0.51353	48.97667	0.49210	0.49283	0.97824	0.98238
CCB	-0.00041	0.06032	-0.00068	-0.00128	-0.00040	0.00014	-0.00123	-0.01707	0.00011	-0.00038	0.00016	-0.00178
CRI	0.02040	0.47183	0.01121	0.41680	0.42754	0.01042	0.05049	5.36854	0.01078	0.10400	0.02107	0.05156
ICSA	-0.00017	262.54390	0.00056	-0.00227	-0.00023	0.00052	0.00583	258.63628	0.00008	0.00145	-0.00051	-0.00596
ICSAB	0.20694	263.99416	0.11434	1.00998	0.52205	0.47211	0.54358	257.95456	1.02083	0.47000	0.47090	0.52440
CCV	0.19939	50.12027	0.51176	0.98033	0.98859	0.49118	0.51349	49.89404	0.49843	0.49953	0.99148	0.98366
CCB	-0.00043	0.07330	-0.00072	-0.00008	-0.00041	0.00024	-0.00163	-0.00919	-0.00001	-0.00017	0.00018	-0.00161
CCV	0.19936	50.76595	0.51412	0.97738	0.99367	0.50054	0.51199	50.35381	0.49322	0.50690	1.00749	0.98305
CCB	-0.00031	0.07651	-0.00078	0.00120	0.00042	0.00041	0.00010	0.02570	0.00059	0.00038	0.00108	-0.00027
1002177-1 100X	-0.00023	0.02513	0.14025	0.02412	0.04269	0.00005	-0.00257	8.59965	-0.00097	0.00044	0.00045	-0.00100
1002177-2 100X	-0.00148	0.02066	0.24049	0.18244	0.02733	0.00007	-0.00171	43.60127	-0.00188	0.00036	0.00006	-0.00151
1002177-3 50X	-0.00023	0.02833	0.00414	0.08814	0.04248	0.00005	-0.00359	29.82559	-0.00005	0.00048	0.00013	-0.00093
1002177-4	-0.00082	0.02436	0.00122	1.27863	0.00027	0.00007	-0.00236	0.45019	-0.00026	0.00008	-0.00019	0.00027
1003011-1	-0.00130	0.01921	0.00067	0.16014	0.20559	0.00009	-0.00472	96.21263	-0.00034	-0.00005	0.00130	-0.00092
1003011-2	-0.00025	0.02146	-0.00070	0.12340	0.04984	0.00000	-0.00099	43.52442	-0.00015	0.00052	0.00695	-0.00079
1003011-2L 5X	-0.00040	0.02870	0.00097	0.02517	0.00946	0.00004	-0.00172	8.83047	-0.00015	-0.00003	0.00179	-0.00094
1003011-2MS	-0.00034	2.55331	2.49362	1.30119	2.39346	0.05507	-0.00562	87.23257	0.06188	0.57080	0.23295	0.29296
1003011-2MSD	0.00048	2.49758	2.46655	1.28521	2.33022	0.05487	-0.00050	89.69556	0.06145	0.56749	0.23163	0.28597
1003011-3 5X	0.00012	0.02611	0.00151	0.06775	0.01257	0.00000	-0.00295	97.42249	0.00001	0.00016	0.00010	-0.00101
CCV	0.19579	49.93563	0.49784	0.95574	0.97894	0.48541	0.49925	48.59647	0.48025	0.49080	0.97766	0.97079
CCB	-0.00075	0.03813	-0.00145	0.00230	-0.00036	0.00017	-0.00506	-0.01198	0.00004	-0.00009	-0.00014	-0.00143
1003011-4 2X	-0.00048	0.03992	-0.00195	0.18405	0.04399	0.00016	-0.00403	141.89397	-0.00008	0.00028	0.00275	0.00070
1003011-5	-0.00513	0.00568	0.07680	0.25531	0.09441	0.00003	-0.01971	39.74475	-0.00122	-0.00276	-0.00308	-0.00288
1003011-6 5X	0.00006	0.03201	-0.00087	0.04886	0.02644	0.00001	0.00068	52.68625	-0.00015	0.00064	0.00033	-0.00346
1003011-7	-0.00114	0.16951	0.00512	0.13103	0.16071	0.00003	-0.00393	33.83640	-0.00057	0.00039	0.02597	-0.00124
1002177-2 500X	-0.00018	0.03333	0.03056	0.02652	0.00353	0.00004	-0.00393	6.54126	-0.00051	0.00000	0.00029	-0.00150
F100302-1MB	-0.00013	0.02944	0.00028	0.00017	0.00058	0.00004	-0.00260	-0.00319	0.00010	0.00009	0.00001	-0.00118
F100302-1RVS	0.00209	0.13580	0.00654	0.00468	0.00449	0.00102	0.00695	0.50440	0.00194	0.00215	0.00529	0.00398
F100302-1LCS	0.10261	2.15669	2.08539	0.98791	2.02573	0.04801	-0.00115	40.99606	0.05222	0.49541	0.19833	0.25558
1002225-1	0.00008	1.20589	0.00174	0.44917	0.32832	-0.00046	-0.00289	182.29751	0.00090	0.00308	0.00300	0.01755
1002226-1	-0.00126	0.26894	-0.00299	0.25437	0.04598	0.00013	-0.00995	51.47861	-0.00018	-0.00037	-0.00009	0.03033
CCV	0.19282	48.84201	0.49247	0.93888	0.96004	0.47957	0.48970	48.14659	0.47647	0.48427	0.96414	0.95552
CCB	-0.00014	0.05541	0.00092	0.00147	-0.00016	0.00019	-0.00054	-0.00450	0.00029	0.00017	0.00072	-0.00084
1002226-6	-0.00037	0.16334	0.00025	0.26001	0.02855	0.00009	-0.00381	47.16324	-0.00002	-0.00014	0.00052	0.03385
1002226-11	-0.00057	1.67031	0.00081	0.27265	0.20699	-0.00005	-0.00402	89.60156	0.00018	0.00451	0.00177	0.01193
1002228-1	0.00008	0.50981	-0.00087	0.25881	0.05705	0.00009	0.00112	53.14684	0.00018	0.00072	0.00126	0.03458
1002228-6	-0.00039	9.53999	0.00293	0.11970	0.12906	0.00062	-0.00147	43.74456	0.00053	0.00340	0.01143	0.03901
1002228-11	0.00019	1.03075	0.00287	0.25399	0.06447	0.00014	-0.00011	53.95767	0.00024	0.00109	0.00171	0.03409
1002246-1	0.00066	0.88607	0.00118	0.42789	0.09103	0.00015	0.00506	56.34036	0.00038	0.00070	0.00296	0.15636
1002258-1	-0.00067	0.04382	-0.00193	0.06081	0.05473	0.00012	-0.00452	3.42034	0.00010	-0.00027	0.00000	-0.00057
1002258-1D	-0.00008	0.04960	0.00049	0.06111	0.05507	0.00005	0.00113	3.34132	-0.00006	-0.00002	0.00023	-0.00022
1002258-1L 5X	-0.00022	0.04326	-0.00081	0.01071	0.01036	-0.00004	-0.00138	0.65378	0.00011	-0.00017	-0.00010	-0.00133
1002258-1MS	0.10108	2.16543	2.07495	1.04420	2.05304	0.04766	-0.00352	43.76225	0.05231	0.49138	0.19572	0.25678
CCV	0.19383	48.84688	0.48837	0.93557	0.96118	0.47346	0.49227	47.65296	0.47389	0.47997	0.95509	0.95781

20000218

Sample Id1	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu
CCB	-0.00009	0.06749	-0.00052	0.00104	-0.00006	0.00023	-0.00368	-0.00479	0.00041	0.00026	0.00081	-0.00115
1002258-1MSD	0.10195	2.20674	2.11613	1.06138	2.09483	0.04900	-0.00254	44.55589	0.05288	0.50399	0.20086	0.26115
1002258-3	0.00048	0.01360	0.00112	0.05509	0.01971	-0.00006	-0.00113	1.95103	0.00018	0.00040	0.00040	0.00048
IP100304-3MB	-0.00064	0.00299	0.00012	0.00031	-0.00050	-0.00009	-0.00339	-0.02329	-0.00022	-0.00030	0.00017	-0.00100
IP100304-3RVS	0.00184	0.10210	0.00235	0.00497	0.00432	0.00088	0.00656	0.46933	0.00196	0.00189	0.00513	0.00398
IP100304-3LCS	0.09777	2.05421	1.98965	0.94480	1.94942	0.04755	-0.00488	39.26254	0.04998	0.47568	0.19191	0.24504
1003045-1	-0.00002	0.11073	0.00248	0.00293	0.00132	-0.00007	-0.00358	0.20301	0.00012	0.00015	0.00076	0.00031
1003045-1D	-0.00119	0.11774	-0.00013	-0.00087	0.00072	-0.00016	-0.00579	0.13368	-0.00001	-0.00026	0.00056	-0.00075
1003045-1L 5X	-0.00027	0.02956	-0.00165	-0.00044	-0.00034	-0.00011	-0.00329	0.02233	-0.00012	-0.00020	-0.00008	-0.00119
1003045-1MS	0.09894	2.22695	2.01816	0.96045	1.97653	0.04830	0.00168	40.02910	0.05143	0.48430	0.19538	0.24946
1003045-1MSD	0.10050	2.26322	2.07807	0.99356	2.00498	0.04977	-0.00090	41.27464	0.05235	0.49769	0.20062	0.25272
CCV	0.19875	50.75932	0.51182	0.97094	0.99441	0.49929	0.50589	49.68556	0.48544	0.50223	1.00034	0.98548
CCB	-0.00111	0.04388	0.00014	0.00023	-0.00009	0.00024	-0.00374	-0.00348	0.00017	-0.00025	0.00008	-0.00117
1003045-3	-0.00031	0.14445	0.00038	0.08036	0.02758	0.00015	0.00094	100.82695	0.00016	0.00020	0.00032	-0.00034
1003045-6	-0.00176	0.42896	-0.00029	0.28818	0.05029	0.00014	-0.00701	101.08642	-0.00015	-0.00094	-0.00023	-0.00123
1003045-7	-0.00066	0.76738	0.00051	0.27825	0.05236	0.00010	-0.00403	98.10317	-0.00001	0.00007	0.00091	-0.00037
1003045-14	-0.00091	0.16588	0.00012	0.01704	0.03828	0.00005	-0.00559	53.91437	0.00010	0.00004	0.00003	-0.00089
1003045-15	-0.00075	0.16115	0.00109	0.01620	0.03788	0.00007	-0.00657	53.70052	-0.00021	-0.00010	0.00027	-0.00093
1003045-20	-0.00008	0.02500	0.00174	0.26231	0.01321	0.00008	-0.00074	437.53549	-0.00004	0.00063	0.00042	-0.00021
1003045-22	-0.00034	0.11697	0.00067	0.11492	0.03439	0.00003	-0.00067	149.75743	0.00018	0.00018	0.00030	0.00055
1003045-24	-0.00083	0.61219	0.00183	0.27302	0.05093	0.00007	-0.00262	98.00517	-0.00015	0.00032	0.00044	-0.00054
1003045-25	0.00015	0.72302	0.00397	0.27283	0.05169	0.00001	-0.00182	96.11939	0.00006	0.00010	0.00057	0.00027
1003045-20 100X	0.00001	0.01784	0.00025	0.00236	-0.00036	-0.00003	-0.00167	4.52809	0.00006	-0.00005	0.00032	-0.00094
CCV	0.19486	49.65944	0.49410	0.93386	0.96614	0.48638	0.49103	48.24494	0.47308	0.48918	0.97596	0.96053
CCB	-0.00028	0.03129	-0.00085	0.00045	-0.00020	0.00003	0.00079	-0.00919	0.00032	0.00029	0.00045	-0.00080
CRI	0.02040	0.44308	0.00944	0.40955	0.42305	0.01055	0.05064	5.37530	0.01035	0.10521	0.02167	0.05198
ICSA	0.00007	265.97210	0.00088	-0.00109	-0.00023	0.00047	0.00387	263.66443	-0.00014	0.00144	-0.00047	-0.00468
ICSAB	0.20579	265.28216	0.11207	0.99168	0.51460	0.48799	0.53037	261.56560	0.99527	0.47870	0.48308	0.51754
CCV	0.19541	49.68486	0.49977	0.94012	0.96510	0.49261	0.48733	48.96460	0.47493	0.49578	0.98952	0.95923
CCB	-0.00021	0.03895	-0.00122	0.00094	-0.00026	0.00013	-0.00265	0.00018	0.00032	0.00022	0.00033	-0.00107

20000219

Sample Id1	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Pb I	Pb II
MIXBHIGH	-0.01436	-0.22105	0.00414	-0.04721	9.80223	9.82608	-0.04378	9.79900	49.10645	9.80511	9.81052	9.80242
MIXAHIGH	191.40152	247.62416	9.83740	485.54582	-0.00629	0.00140	249.10701	0.00060	0.01978	0.00354	0.00599	0.00231
MIXCHIGH	0.04723	-0.24275	0.00585	-0.22885	0.00438	-0.00006	-0.04648	-0.00070	0.01363	0.00216	-0.00121	0.00385
ICV	10.13156	24.76577	0.24480	24.79349	0.49340	0.49134	24.55437	0.50154	2.41475	0.48027	0.48366	0.47857
ICB	0.00049	-0.14865	0.00400	-0.00770	0.00027	-0.00084	-0.10203	-0.00001	-0.00407	0.00059	-0.00206	0.00191
CRI	0.21915	4.04848	0.02040	5.29588	0.03115	0.01998	4.37873	0.08241	0.20975	0.00660	-0.00110	0.01045
ICSA	104.83635	-0.30060	0.00553	263.64193	-0.00041	-0.00146	-0.09486	0.00082	0.00593	0.00314	-0.00204	0.00572
ICSAB	105.38797	-0.29709	1.10084	265.96836	0.46884	0.98880	-0.10411	0.92972	1.02441	0.05482	0.05401	0.05522
CCV	20.64096	51.41823	0.52114	51.09999	0.99250	0.99765	49.55035	1.00861	4.90799	0.97522	0.98572	0.96997
CCB	0.01057	-0.10458	0.00418	0.01701	0.00049	-0.00066	-0.09353	0.00015	-0.00162	0.00125	-0.00018	0.00196
IP100303-1MB	0.00424	-0.17008	0.00390	-0.01019	0.00033	0.00060	-0.10382	-0.00105	0.00503	0.00224	L-0.00422	0.00546
M100015-1	0.05284	-0.04296	0.01653	0.02403	0.00149	0.01013	-0.03125	0.00394	0.05465	0.01023	0.00861	0.01103
M100015-2	0.04452	-0.09187	0.01634	0.02155	0.00140	0.00966	-0.02762	0.00479	0.05095	0.01072	0.00928	0.01144
M100015-3	0.04146	-0.08473	0.01635	0.01831	0.00138	0.01006	-0.03552	0.00359	0.04779	0.01027	0.00769	0.01156
M100015-4	0.04319	-0.02892	0.01658	0.02047	0.00134	0.00940	-0.03626	0.00360	0.04654	0.01045	0.00756	0.01189
M100015-5	0.04146	-0.09320	0.01625	0.02165	0.00143	0.01050	-0.04065	0.00421	0.04574	0.00968	0.00971	0.00966
M100015-6	0.04063	-0.06209	0.01639	0.01820	0.00130	0.01040	-0.03432	0.00378	0.04704	0.01005	0.00879	0.01067
M100015-7	0.05995	-0.05979	0.01627	0.02219	0.00151	0.01011	-0.03773	0.00467	0.04504	0.00956	0.00894	0.00986
M100015-8	0.04236	-0.10603	0.01623	0.01852	0.00130	0.00968	-0.04173	0.00392	0.04499	0.00974	0.00913	0.01005
M100015-9	0.01855	-0.17625	0.00992	-0.00436	0.00060	0.00418	-0.08089	0.00195	0.02679	0.00673	0.00576	0.00721
CCV	19.87497	51.06116	0.51739	48.82669	0.95783	0.96333	49.21120	0.96811	4.79739	0.93277	0.94097	0.92868
CCB	0.00339	-0.11088	0.00412	0.00417	0.00044	-0.00053	-0.09798	0.00021	-0.00087	0.00066	0.00207	-0.00005
IP100303-2MB	-0.00079	-0.23534	0.00379	-0.01699	0.00016	-0.00084	-0.11369	-0.00065	0.00728	0.00081	-0.00165	0.00203
M100016-1	0.05628	-0.07759	0.01678	0.01874	0.00140	0.00989	-0.04060	0.00408	0.04719	0.00986	0.00854	0.01051
M100016-2	0.04084	-0.11172	0.01663	0.01917	0.00140	0.00968	-0.04316	0.00408	0.04849	0.00968	0.00802	0.01051
M100016-3	0.04215	-0.02311	0.01686	0.01507	0.00130	0.00883	-0.03930	0.00331	0.04774	0.00963	0.00608	0.01140
M100016-4	0.04350	0.03305	0.01695	0.02630	0.00143	0.01005	-0.03591	0.00457	0.04985	0.01013	0.01436	0.00802
M100016-5	0.04063	-0.08388	0.01669	0.01723	0.00130	0.00957	-0.04284	0.00370	0.04874	0.01021	0.00931	0.01067
M100016-6	0.04273	-0.02517	0.01689	0.02047	0.00130	0.00932	-0.03854	0.00364	0.04854	0.01063	0.00937	0.01126
M100016-7	0.04021	-0.08872	0.01668	0.02457	0.00141	0.00967	-0.04254	0.00448	0.04980	0.01015	0.01233	0.00906
M100016-8	0.04656	-0.05313	0.01679	0.02122	0.00140	0.00949	-0.04026	0.00443	0.04960	0.01026	0.01037	0.01021
M100016-9	0.02065	-0.23994	0.01013	-0.00339	0.00062	0.00486	-0.08344	0.00163	0.02859	0.00505	0.00354	0.00581
CCV	20.79356	52.36253	0.53397	51.15299	0.99715	1.01537	50.35335	1.03228	5.01618	0.97477	0.98588	0.96923
CCB	0.00283	-0.21366	0.00393	-0.00220	0.00038	-0.00075	-0.10257	-0.00048	0.00008	0.00047	-0.00056	0.00098
IP100303-3MB	-0.00278	-0.25507	0.00375	-0.02195	0.00005	-0.00139	-0.11688	-0.00007	0.00958	0.00077	-0.00294	0.00262
M100017-1	0.04066	-0.09732	0.01633	0.01637	0.00134	0.00914	-0.03915	0.00380	0.04659	0.01062	0.00676	0.01254
M100017-2	0.04260	-0.07710	0.01643	0.02176	0.00145	0.00998	-0.02052	0.00443	0.04729	0.01034	0.01031	0.01035
M100017-3	0.04154	-0.03752	0.01654	0.01993	0.00141	0.00971	-0.03930	0.00434	0.05100	0.00958	0.00897	0.00989
M100017-4	0.04124	-0.02674	0.01666	0.01939	0.00138	0.00989	-0.03567	0.00417	0.04925	0.00996	0.00897	0.01045
M100017-5	0.04103	-0.14344	0.01635	0.01809	0.00143	0.00976	-0.04262	0.00423	0.04764	0.01037	0.00861	0.01126
M100017-6	0.04010	-0.06003	0.01638	0.01550	0.00130	0.00913	-0.04051	0.00419	0.04594	0.01047	0.00610	0.01265
M100017-7	0.03959	-0.09926	0.01632	0.01766	0.00138	0.01046	-0.04404	0.00418	0.04944	0.01017	0.00963	0.01044
M100017-8	0.04076	-0.05047	0.01645	0.01831	0.00134	0.00993	-0.04105	0.00433	0.04814	0.01059	0.00936	0.01120
M100017-9	0.02390	-0.21306	0.00990	-0.00015	0.00075	0.00414	-0.08236	0.00232	0.02704	0.00531	0.00350	0.00622
CCV	20.26592	51.14728	0.51997	50.04917	0.97261	0.98365	49.52744	0.99715	4.84898	0.95969	0.96467	0.95720
CCB	0.00137	-0.20906	0.00389	-0.00695	0.00031	-0.00150	-0.10647	0.00013	-0.00442	0.00045	-0.00090	0.00112
IP100301-4MB	0.05505	-0.26621	0.00366	-0.01860	0.00060	-0.00102	-0.10900	0.00041	0.00993	0.00096	0.00003	0.00143
M100018-1	0.09199	-0.11245	0.01597	0.01939	0.00180	0.00924	-0.03690	0.00425	0.05635	0.01083	0.00942	0.01154
M100018-2	0.08390	-0.10083	0.01582	0.02068	0.00186	0.00954	-0.03329	0.00425	0.05565	0.01102	0.01071	0.01117
M100018-3	0.10505	-0.10506	0.01586	0.02122	0.00188	0.00958	-0.03513	0.00703	0.05370	0.01049	0.01116	0.01016

20000220

Sample Id1	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Pb I	Pb II
M100018-4	0.09068	-0.12117	0.01587	0.01777	0.00171	0.00918	-0.03881	0.00419	0.05495	0.01078	0.00751	0.01240
M100018-5	0.08573	-0.11947	0.01584	0.02263	0.00175	0.00907	-0.04205	0.00457	0.05475	0.01036	0.01083	0.01012
M100018-6	0.08951	-0.14380	0.01568	0.01723	0.00224	0.00954	-0.03974	0.00434	0.05630	0.01004	0.00904	0.01053
M100018-7	0.06687	-0.16184	0.01580	-0.00770	0.00114	0.00719	-0.04247	0.00141	0.05190	0.01040	L-0.00919	0.02017
M100018-8	0.09813	-0.07371	0.01609	0.02079	0.00186	0.00932	-0.03618	0.00439	0.05665	0.01202	0.01327	0.01139
M100018-9	0.05053	-0.22032	0.00963	-0.00328	0.00095	0.00422	-0.07954	0.00189	0.03509	0.00573	0.00290	0.00714
CCV	20.12442	51.50769	0.52138	49.59001	0.96472	0.97969	49.62235	0.99865	4.83034	0.94590	0.95646	0.94062
CCB	0.00113	-0.21850	0.00388	-0.00662	0.00029	-0.00036	-0.10731	0.00034	-0.00512	-0.00002	0.00009	-0.00008
CRI	0.21838	4.02212	0.02025	5.33033	0.03108	0.01992	4.31800	0.08571	0.21321	0.00600	0.00602	0.00598
ICSA	105.25808	-0.34250	0.00547	265.47722	-0.00072	-0.00049	-0.10009	0.00104	0.00928	0.00168	0.00346	0.00080
ICSAB	105.21681	-0.34371	1.10414	266.19261	0.46555	1.00393	-0.10777	0.95168	1.02521	0.05451	0.05238	0.05557
CCV	20.36097	51.29836	0.51819	50.50477	0.97519	0.99556	49.48148	1.01769	4.87473	0.96059	0.97201	0.95489
CCB	0.00400	-0.14126	0.00405	0.00233	0.00033	-0.00015	-0.10384	-0.00024	-0.00277	0.00120	0.00039	0.00161
CCV	20.72561	51.38344	0.52583	51.35750	0.99596	1.00445	50.04064	1.01008	4.97534	0.98029	0.98905	0.97592
CCB	0.01719	-0.21875	0.00409	0.03806	0.00103	0.00002	-0.08003	0.00062	0.00083	0.00080	0.00000	0.00120
1002177-1 100X	-0.00300	0.44881	0.00817	4.07731	0.07708	-0.00026	200.20818	0.00139	-0.00257	0.00427	0.00641	0.00321
1002177-2 100X	-0.00443	3.12971	0.01766	30.15888	0.19102	0.00142	H413.14983	0.00223	-0.00437	0.00722	0.00806	0.00680
1002177-3 50X	-0.00422	1.05050	0.00736	19.39066	0.17465	-0.00013	130.22873	0.00210	0.00108	0.00096	0.00047	0.00121
1002177-4	-0.00582	0.29904	0.00473	0.27789	0.00267	-0.00106	44.45211	-0.00056	0.00033	-0.00021	0.00041	-0.00052
1003011-1	0.00011	3.45135	0.01964	56.77557	0.00090	0.00295	41.29629	0.04883	0.01248	0.00001	-0.00176	0.00089
1003011-2	-0.00076	6.88976	0.04495	10.54786	0.00090	0.00285	50.32036	0.00033	-0.00367	0.00002	-0.00035	0.00021
1003011-2L 5X	-0.00241	0.83725	0.01070	2.13621	0.00033	0.00044	9.05762	0.00041	-0.00287	-0.00018	0.00186	-0.00120
1003011-2MS	1.18577	58.66996	0.65536	56.42481	0.56371	1.17674	93.52506	0.56647	-0.00172	0.56132	0.56037	0.56180
1003011-2MSD	1.17413	59.81900	0.66947	58.76121	0.55858	1.16534	94.16580	0.56506	-0.00212	0.56047	0.56127	0.56006
1003011-3 5X	-0.00326	1.62235	0.01319	48.82171	0.00046	0.00004	36.17403	-0.00031	0.00213	0.00073	0.00074	0.00073
CCV	20.11316	50.72819	0.51687	49.68343	0.96555	0.97163	49.09096	0.97691	4.84705	0.94665	0.95086	0.94455
CCB	0.00184	-0.15228	0.00414	-0.00414	0.00035	-0.00052	-0.09093	0.00026	-0.00162	0.00008	-0.00177	0.00100
1003011-4 2X	0.01488	1.80313	0.02227	65.08589	0.00477	0.00122	72.93372	0.17528	0.00488	0.00021	-0.00147	0.00105
1003011-5	-0.00507	6.52032	0.09926	37.58948	0.00278	0.00041	99.89829	-0.00251	0.01848	0.00161	L-0.01747	0.01114
1003011-6 5X	42.75895	1.04578	0.01397	13.72732	1.61575	-0.00131	69.66512	0.03118	-0.01037	0.00068	0.00150	0.00027
1003011-7	0.00020	5.25965	0.05315	0.50843	0.00094	0.00500	62.12144	-0.00086	-0.00472	-0.00022	-0.00264	0.00099
1002177-2 500X	-0.00449	0.15783	0.00562	4.44656	0.02748	-0.00023	53.24050	0.00112	-0.00262	0.00223	0.00283	0.00192
F100302-1MB	-0.00252	-0.12819	0.00397	-0.01407	0.00025	-0.00126	-0.07522	0.00046	0.00588	0.00039	0.00167	-0.00025
F100302-1RVS	0.10292	0.55029	0.00699	0.50390	0.00512	0.00945	0.70311	0.00541	0.11278	0.00474	0.00489	0.00466
F100302-1LCS	1.03176	41.74597	0.51710	41.85510	0.48738	1.01915	39.10118	0.49779	0.00938	0.48122	0.48418	0.47975
1002225-1	0.98154	28.10617	2.10222	132.51719	0.26449	0.00994	H523.44561	0.00161	0.13644	0.00079	0.00200	0.00019
1002226-1	0.27129	23.25278	0.15307	12.61259	0.06340	0.00138	H449.34050	0.00117	4.72425	0.00195	L-0.00482	0.00533
CCV	19.80813	49.73692	0.50627	49.11212	0.94962	0.95680	46.31990	0.96768	4.73566	0.93207	0.93749	0.92936
CCB	0.00488	-0.17322	0.00478	0.00849	0.00055	-0.00043	0.08058	0.00011	-0.00077	0.00104	0.00088	0.00113
1002226-6	0.13295	18.83822	0.02392	6.04581	0.01769	0.00163	155.54321	0.00171	5.08488	0.00233	0.00027	0.00336
1002226-11	1.95386	28.14675	1.51466	78.79901	0.54783	0.00592	H842.18888	0.00395	0.26411	0.00134	0.00132	0.00135
1002228-1	0.46887	25.45210	0.19872	14.70977	0.07315	0.00194	H656.28657	0.00285	4.68805	0.00196	0.00352	0.00118
1002228-6	6.88074	17.21290	0.39232	21.84179	0.20834	0.00208	H989.33850	0.00793	0.69939	0.01500	0.01612	0.01443
1002228-11	0.06462	26.01980	0.21891	15.72817	0.08240	0.00217	H755.89011	0.00260	4.50545	0.00313	0.00544	0.00198
1002246-1	1.53941	26.54738	0.04811	19.36774	0.04437	0.00667	94.10457	0.00508	8.30542	0.00308	0.00300	0.00312
1002258-1	0.01533	0.58222	0.00811	0.07022	0.00245	-0.00052	132.67807	0.00037	0.00618	0.00132	-0.00036	0.00215
1002258-1D	0.01432	0.51812	0.00788	0.06753	0.00246	0.00004	132.41434	0.00039	0.00578	0.00083	0.00227	0.00011
1002258-1L 5X	-0.00124	-0.12673	0.00482	-0.00123	0.00057	-0.00052	25.59365	-0.00025	-0.00022	-0.00046	-0.00008	-0.00066
1002258-1MS	1.13589	50.82427	0.58584	41.09529	0.48307	1.01398	176.42079	0.49393	0.00658	0.47470	0.47890	0.47260
CCV	19.60876	50.01009	0.50781	48.58548	0.93926	0.94941	47.75894	0.96237	4.70881	0.92164	0.92932	0.91780

20000221

Sample Id1	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Pb I	Pb II
CCB	0.00482	-0.21826	0.00419	0.00838	0.00057	-0.00019	-0.02970	0.00033	-0.00032	0.00070	0.00189	0.00010
1002258-1MSD	1.06405	52.00673	0.60437	42.43278	0.49982	1.02808	181.72545	0.49219	0.00428	0.48964	0.48968	0.48962
1002258-3	0.05436	0.52864	0.00805	0.07853	0.00411	-0.00006	139.74695	0.00123	0.00518	0.00147	0.00237	0.00101
IP100304-3MB	-0.00364	-0.16015	0.00419	-0.01850	0.00007	-0.00054	-0.02698	-0.00025	0.00298	0.00003	-0.00101	0.00056
IP100304-3RVS	0.10018	0.46441	0.00725	0.48210	0.00490	0.00940	0.69432	0.00456	0.10467	0.00438	0.00371	0.00472
IP100304-3LCS	0.99661	38.06547	0.51255	40.31149	0.47464	0.97663	37.34433	0.46899	0.00643	0.46676	0.46494	0.46766
1003045-1	0.09465	-0.10155	0.00422	0.04583	0.00132	-0.00023	0.08776	0.00077	0.00623	0.00018	0.00163	-0.00055
1003045-1D	0.07751	-0.20446	0.00396	0.02813	0.00106	-0.00109	0.00099	-0.00008	0.00318	0.00049	-0.00054	0.00101
1003045-1L 5X	0.01440	-0.15591	0.00401	-0.00932	0.00027	-0.00091	-0.04758	-0.00002	0.00098	0.00054	-0.00037	0.00100
1003045-1MS	1.09292	38.50005	0.51888	40.96480	0.48209	0.99356	37.87844	0.47862	0.00998	0.47175	0.47684	0.46921
1003045-1MSD	1.12089	38.74788	0.52176	42.17946	0.49410	1.02020	38.11685	0.49503	0.00963	0.48435	0.48868	0.48220
CCV	20.60625	51.09283	0.52424	51.11039	0.98923	0.99160	49.40900	0.99594	4.91190	0.96577	0.97768	0.95982
CCB	0.00474	-0.20519	0.00410	0.00395	0.00051	-0.00019	-0.06079	0.00037	-0.00062	0.00085	-0.00174	0.00214
1003045-3	0.18030	5.94429	0.04388	55.68643	0.02728	0.00130	93.64444	0.00049	0.01023	0.00004	0.00079	-0.00034
1003045-6	0.32307	7.98736	0.32457	54.94171	0.02254	0.00220	182.23892	-0.00017	0.01763	0.00137	L-0.00556	0.00482
1003045-7	0.53412	7.81232	0.31472	52.50392	0.05621	0.00233	173.65700	0.00132	0.02599	0.00025	-0.00063	0.00069
1003045-14	0.26527	3.72408	0.01514	19.39963	0.04472	0.00060	20.80695	0.00039	0.02354	0.00105	-0.00023	0.00170
1003045-15	0.26261	3.73805	0.01505	19.32861	0.04411	0.00033	20.71848	0.00018	0.02308	0.00029	-0.00127	0.00107
1003045-20	0.06301	19.28422	0.12232	226.83058	0.24510	0.00244	H492.73379	0.00221	-0.01898	0.00043	0.00101	0.00014
1003045-22	0.09172	12.95815	0.05296	90.87560	0.00569	0.00177	141.33824	0.00098	0.02854	0.00037	0.00032	0.00040
1003045-24	0.46005	7.79506	0.31206	52.78662	0.04505	0.00246	174.40951	0.00075	0.01983	0.00073	-0.00030	0.00124
1003045-25	0.52182	7.85317	0.31307	51.92241	0.04179	0.00226	174.42674	0.00115	0.02254	0.00143	0.00117	0.00156
1003045-20 100X	-0.00305	-0.02360	0.00481	2.35967	0.00287	-0.00058	4.23937	0.00004	-0.00377	0.00032	0.00156	-0.00029
CCV	20.06479	50.28210	0.51519	49.80859	0.96490	0.96043	49.05595	0.95946	4.83024	0.94685	0.94883	0.94586
CCB	0.00328	-0.21173	0.00399	0.00579	0.00051	-0.00014	-0.07043	0.00033	-0.00162	0.00038	0.00171	-0.00028
CRI	0.22224	4.00900	0.02047	5.43744	0.03168	0.02066	4.34416	0.08398	0.21461	0.00643	0.00691	0.00620
ICSA	108.69682	-0.24006	0.00576	275.87382	-0.00047	-0.00093	-0.07053	0.00140	0.00738	0.00187	0.00299	0.00131
ICSAB	108.02623	-0.23485	1.09762	275.02327	0.47752	1.00467	-0.08190	0.93587	1.03419	0.05590	0.05773	0.05499
CCV	20.28904	50.22139	0.51311	50.52948	0.97549	0.97220	49.06495	0.96893	4.84507	0.96320	0.96272	0.96343
CCB	0.00735	-0.12032	0.00418	0.01043	0.00047	-0.00039	-0.07343	-0.00037	-0.00132	0.00070	-0.00028	0.00118

20000222

Sample Id1	S	Sb	Se	Se I	Se II	Si	Sn	Sr	Th	Ti	Tl	U
MIXBHIGH	-0.00334	1.94469	4.88247	4.88573	4.88085	49.17098	9.80314	9.86275	1.96382	9.82431	4.90491	-0.05952
MIXAHIGH	0.01848	0.00867	-0.00258	0.01078	L-0.00925	0.00286	0.00221	0.00313	0.00847	-0.00155	-0.00149	0.09653
MIXCHIGH	H50.67893	0.00125	-0.00441	L-0.01148	-0.00089	-0.02815	0.01569	-0.00028	L-0.46795	0.00898	0.00451	H50.04968
ICV	2.44338	0.24563	0.49664	0.50074	0.49459	2.38626	0.49490	0.24859	0.06019	0.23908	0.25271	2.45456
ICB	-0.00685	-0.00171	-0.00031	-0.00423	0.00165	-0.00697	-0.00150	-0.00204	-0.00149	-0.00042	-0.00294	-0.01869
CRI	0.20010	0.12005	0.00994	-0.00019	0.01499	0.10032	0.10384	0.01939	0.09722	0.02060	0.01691	0.17750
ICSA	0.00581	0.00347	-0.00151	-0.00470	0.00008	-0.01302	-0.00329	0.01101	-0.00702	-0.00080	-0.00597	0.03466
ICSAB	1.02032	0.60768	0.05601	0.05548	0.05627	0.95950	0.99571	1.01153	-0.04701	0.95346	0.10929	10.27553
CCV	4.97525	0.49316	1.01210	1.02070	1.00781	4.81585	1.01218	0.49770	0.12692	0.47802	0.50675	4.90431
CCB	-0.00404	0.00014	0.00033	-0.00169	0.00134	-0.00417	-0.00156	-0.00193	0.00042	-0.00021	-0.00165	-0.01279
IP100303-1MB	-0.01037	-0.00341	0.00423	-0.00136	0.00702	-0.00973	-0.00233	-0.00193	-0.00121	0.00016	-0.00063	-0.03197
M100015-1	0.03326	0.01896	0.02203	0.01936	0.02337	0.04255	0.02190	0.00012	-0.00049	0.00419	0.02405	0.08952
M100015-2	0.03960	0.01834	0.02071	0.01826	0.02194	0.04187	0.01903	0.00007	0.00264	0.00430	0.02275	0.09027
M100015-3	0.02974	0.01909	0.02114	0.01907	0.02218	0.04011	0.01838	0.00000	-0.00021	0.00417	0.01830	0.08781
M100015-4	0.02904	0.01876	0.02231	0.01901	0.02396	0.04136	0.01975	0.00003	0.00174	0.00435	0.02240	0.08830
M100015-5	0.03326	0.01864	0.01876	0.01587	0.02021	0.03999	0.01897	0.00000	-0.00090	0.00410	0.02048	0.09839
M100015-6	0.03186	0.01886	0.02069	0.01853	0.02178	0.03876	0.02011	0.00000	-0.00145	0.00415	0.02145	0.08683
M100015-7	0.03256	0.01942	0.01824	0.01587	0.01943	0.03877	0.01886	0.00000	0.00059	0.00417	0.02010	0.10305
M100015-8	0.03115	0.01974	0.02051	0.01961	0.02096	0.03956	0.01778	-0.00004	-0.00222	0.00399	0.02177	0.09224
M100015-9	0.00652	0.00800	0.01010	0.00546	0.01242	0.01570	0.00859	-0.00109	-0.00202	0.00172	0.01123	0.03321
CCV	4.83595	0.47870	0.98012	0.98857	0.97591	4.68950	0.96230	0.48891	0.12106	0.46481	0.49540	4.83888
CCB	0.00018	0.00034	-0.00115	-0.00367	0.00010	-0.00413	-0.00096	-0.00196	-0.00133	-0.00032	0.00340	0.00813
IP100303-2MB	-0.00826	0.00144	0.00033	0.00044	0.00028	-0.00353	-0.00144	-0.00212	0.00023	-0.00031	0.00082	-0.01327
M100016-1	0.03467	0.01947	0.01971	0.01735	0.02089	0.03677	0.01665	-0.00006	0.00025	0.00414	0.02248	0.10109
M100016-2	0.02974	0.02004	0.02121	0.02090	0.02136	0.03736	0.01683	-0.00009	-0.00078	0.00394	0.02204	0.08830
M100016-3	0.02482	0.01736	0.01961	0.01402	0.02241	0.03598	0.01796	-0.00009	-0.00026	0.00413	0.02119	0.08191
M100016-4	0.02834	0.02134	0.01958	0.02248	0.01814	0.04150	0.02202	0.00000	0.00127	0.00431	0.02345	0.11192
M100016-5	0.02693	0.01980	0.01757	0.01216	0.02026	0.03641	0.01671	-0.00009	0.00031	0.00412	0.01843	0.08732
M100016-6	0.03467	0.02057	0.02195	0.02041	0.02272	0.03956	0.01987	-0.00005	-0.00492	0.00387	0.02146	0.09002
M100016-7	0.03256	0.02205	0.01843	0.02213	0.01659	0.04106	0.02035	-0.00002	-0.00032	0.00406	0.02427	0.10872
M100016-8	0.03256	0.02191	0.02186	0.01947	0.02305	0.03994	0.01939	-0.00003	-0.00045	0.00405	0.02392	0.08707
M100016-9	0.01356	0.00962	0.01034	0.00527	0.01288	0.01842	0.00728	-0.00113	0.00004	0.00175	0.00879	0.03419
CCV	5.08329	0.50477	1.03530	1.04712	1.02939	4.87895	1.02148	0.51027	0.12882	0.48047	0.52138	5.00500
CCB	-0.00897	-0.00004	0.00145	0.00084	0.00176	-0.00305	-0.00060	-0.00200	-0.00048	-0.00045	-0.00100	-0.01377
IP100303-3MB	-0.00756	-0.00290	0.00082	-0.00474	0.00359	-0.00593	-0.00370	-0.00218	-0.00083	-0.00089	-0.00283	-0.01426
M100017-1	0.02482	0.01706	0.01892	0.01602	0.02037	0.03479	0.01772	-0.00007	0.00014	0.00378	0.01791	0.08658
M100017-2	0.03115	0.01947	0.01726	0.01293	0.01943	0.03871	0.01814	0.00007	0.00012	0.00383	0.01752	0.09568
M100017-3	0.02834	0.01980	0.02045	0.01732	0.02201	0.03759	0.01790	0.00000	-0.00063	0.00383	0.01831	0.09790
M100017-4	0.02552	0.01864	0.01802	0.01575	0.01915	0.03750	0.01742	0.00022	0.00160	0.00390	0.01731	0.09101
M100017-5	0.02411	0.01926	0.01895	0.01417	0.02134	0.03670	0.01844	-0.00002	-0.00145	0.00365	0.01717	0.09839
M100017-6	0.02271	0.01816	0.01798	0.01024	0.02185	0.03280	0.01814	-0.00008	-0.00052	0.00353	0.01689	0.08117
M100017-7	0.02904	0.01829	0.01761	0.01457	0.01913	0.03414	0.01486	-0.00006	-0.00072	0.00365	0.01829	0.09446
M100017-8	0.02763	0.01826	0.01812	0.01526	0.01955	0.03506	0.01826	-0.00005	0.00201	0.00402	0.01650	0.08609
M100017-9	0.01004	0.00966	0.00826	0.00477	0.01000	0.01316	0.00734	-0.00111	-0.00055	0.00159	0.00955	0.03862
CCV	4.88356	0.48802	0.99759	1.00253	0.99512	4.72964	0.99091	0.49279	0.12409	0.46928	0.50052	4.85665
CCB	-0.00052	0.00031	-0.00069	-0.00384	0.00089	-0.00731	-0.00096	-0.00203	-0.00151	-0.00052	0.00140	-0.00221
IP100301-4MB	-0.00967	-0.00085	-0.00102	-0.00487	0.00090	0.00437	0.00018	-0.00195	-0.00205	-0.00052	-0.00437	-0.01405
M100018-1	0.03045	0.01661	0.01864	0.01499	0.02046	0.04563	0.01778	-0.00002	0.00127	0.00406	0.01721	0.08655
M100018-2	0.02622	0.01810	0.01719	0.01422	0.01867	0.04430	0.01659	-0.00003	-0.00063	0.00392	0.01954	0.09147
M100018-3	0.02763	0.02071	0.01945	0.01840	0.01998	0.04534	0.01921	-0.00002	-0.00092	0.00386	0.01574	0.09835

20000223

Sample Id1	S	Sb	Se	Se I	Se II	Si	Sn	Sr	Th	Ti	Tl	U
M100018-4	0.02411	0.01771	0.01830	0.01513	0.01989	0.04140	0.01498	-0.00002	0.00277	0.00411	0.01544	0.08532
M100018-5	0.02834	0.01917	0.01805	0.01618	0.01898	0.04115	0.01808	-0.00004	-0.00035	0.00374	0.01559	0.09295
M100018-6	0.03045	0.01950	0.01807	0.01766	0.01827	0.04078	0.01736	-0.00004	0.00017	0.00395	0.01606	0.08950
M100018-7	0.01778	0.00687	0.02002	-0.00256	0.03129	0.03018	0.01104	-0.00028	0.00390	0.00399	0.01040	0.01472
M100018-8	0.02693	0.01822	0.02097	0.02101	0.02095	0.04599	0.01927	-0.00001	0.00030	0.00397	0.02020	0.09466
M100018-9	0.00652	0.00872	0.00875	0.00571	0.01027	0.01906	0.00770	-0.00113	-0.00031	0.00172	0.01012	0.03589
CCV	4.86438	0.48868	0.98872	0.99863	0.98377	4.70714	0.98668	0.49661	0.12039	0.46679	0.50365	4.87873
CCB	-0.01319	0.00056	-0.00049	-0.00233	0.00044	-0.00817	-0.00072	-0.00205	-0.00057	-0.00033	-0.00145	-0.00811
CRI	0.20644	0.12553	0.00955	0.00792	0.01036	0.10088	0.10652	0.01953	0.08995	0.02004	0.01994	0.20702
ICSA	0.00793	0.00675	0.00278	0.00851	-0.00008	-0.01322	0.00161	0.01128	-0.00437	-0.00083	-0.00107	0.03561
ICSAB	1.02173	0.61186	0.05606	0.05830	0.05494	0.95139	1.00478	1.02763	-0.04219	0.94552	0.10475	10.32255
CCV	4.91057	0.49482	0.99736	1.00710	0.99249	4.72920	1.00337	0.49764	0.12090	0.46893	0.50820	4.86152
CCB	-0.00967	-0.00090	-0.00096	L-0.00511	0.00111	-0.00756	-0.00126	-0.00202	-0.00104	-0.00040	-0.00062	-0.00885
CCV	4.99941	0.48820	1.01941	1.01999	1.01912	4.84085	1.00675	0.49918	0.12723	0.47908	0.50777	4.92081
CCB	-0.00967	0.00007	-0.00033	-0.00252	0.00077	-0.00107	-0.00030	-0.00160	-0.00098	-0.00007	0.00031	-0.00148
1002177-1 100X	1.34060	-0.00111	-0.00284	L-0.00861	0.00003	0.11871	0.00059	2.03693	-0.00284	-0.00057	0.00276	-0.06174
1002177-2 100X	5.87233	-0.00142	-0.00276	L-0.01331	0.00251	0.31234	0.00041	5.50347	-0.00671	-0.00062	0.00035	-0.13799
1002177-3 50X	5.19208	-0.00298	-0.00066	-0.00344	0.00073	0.57841	-0.00036	1.86594	-0.00928	-0.00053	-0.00274	-0.01254
1002177-4	0.11140	-0.00084	-0.00137	-0.00299	-0.00056	0.06543	0.00083	0.02634	-0.00316	-0.00034	0.00152	-0.01327
1003011-1	15.05164	-0.00121	0.01392	0.01422	0.01376	14.69410	0.01062	4.16944	-0.01877	-0.00094	-0.00233	-0.03197
1003011-2	H63.95263	0.00022	0.00337	0.00200	0.00406	1.39329	0.00024	3.94645	-0.00695	-0.00041	0.00383	-0.01451
1003011-2L 5X	11.76881	0.00052	-0.00048	-0.00096	-0.00025	0.26743	-0.00162	0.79681	-0.00270	-0.00054	0.00048	-0.00540
1003011-2MS	H61.92861	0.57719	2.66513	2.66010	2.66764	3.70672	0.60154	4.36086	-0.01368	0.56323	2.39726	-0.02540
1003011-2MSD	H60.97562	0.57260	2.63254	2.62657	2.63552	3.64874	0.60071	4.29286	-0.01681	0.55454	2.37884	-0.00842
1003011-3 5X	17.23970	0.00101	0.00645	0.00772	0.00582	2.17905	0.00603	1.17504	-0.01746	-0.00071	0.00136	-0.00712
CCV	4.92265	0.47630	0.99077	0.99767	0.98732	4.72688	0.97964	0.49012	0.12216	0.46832	0.49523	4.85156
CCB	-0.00615	-0.00188	0.00179	-0.00094	0.00315	-0.00596	-0.00174	-0.00191	-0.00236	-0.00041	-0.00180	-0.01402
1003011-4 2X	43.53353	-0.00219	0.01074	0.01214	0.01004	7.84686	0.00847	7.81434	-0.01782	-0.00102	-0.00109	-0.01181
1003011-5	20.87084	-0.00865	0.01560	-0.00128	0.02402	11.41074	0.01170	1.03994	-0.01122	-0.00035	-0.00821	-0.10429
1003011-6 5X	17.01343	-0.00017	0.00279	0.00154	0.00342	0.39528	0.00125	3.60093	-0.00263	-0.00063	-0.00513	0.00435
1003011-7	15.19661	-0.00133	0.00305	0.00310	0.00303	7.77546	-0.00042	1.72091	-0.00314	-0.00039	0.00260	-0.02287
1002177-2 500X	0.88212	0.00017	0.00038	-0.00021	0.00068	0.05666	-0.00078	0.80927	-0.00552	-0.00063	0.00169	-0.01598
F100302-1MB	-0.00122	-0.00040	-0.00006	0.00031	-0.00025	-0.00482	-0.00114	-0.00157	0.00050	-0.00034	-0.00021	-0.00737
F100302-1RVS	0.09380	0.01096	0.00419	0.00342	0.00458	0.02851	0.01050	0.00309	-0.00356	0.00441	0.00967	0.04767
F100302-1LCS	0.00089	0.50087	2.08212	2.09488	2.07575	1.99426	0.52044	0.50672	-0.01516	0.48941	2.07711	-0.00783
1002225-1	H92.16212	-0.00019	0.00109	0.00036	0.00145	4.24893	0.00205	1.88055	-0.01925	0.03296	0.00397	-0.00681
1002226-1	45.19263	-0.00261	0.00380	-0.00431	0.00785	13.20564	-0.00241	0.33845	-0.00179	0.01854	-0.00151	-0.04618
CCV	4.80611	0.46632	0.97052	0.97624	0.96767	4.64349	0.96231	0.48175	0.12144	0.45962	0.49078	4.75247
CCB	-0.00545	0.00082	0.00209	0.00102	0.00263	-0.00562	-0.00090	-0.00187	-0.00083	-0.00021	0.00108	0.00345
1002226-6	45.25220	-0.00092	0.00311	0.00043	0.00444	14.21989	0.00076	0.31174	-0.00432	0.01370	0.00305	-0.01902
1002226-11	37.59192	0.00083	-0.00004	-0.00214	0.00101	4.96677	0.00016	0.61685	-0.02157	0.06382	0.00356	-0.01830
1002228-1	46.04672	-0.00030	0.00355	0.00503	0.00280	13.37713	0.00397	0.36160	-0.00842	0.02530	0.00028	-0.00228
1002228-6	17.32703	0.00114	0.00047	0.00111	0.00014	23.34656	0.00041	0.24766	-0.00842	0.36519	0.00088	-0.00735
1002228-11	45.03831	0.00083	0.00316	0.00454	0.00246	14.06089	0.00101	0.36604	-0.00905	0.05098	0.00143	-0.00057
1002246-1	30.28214	0.00100	0.00142	0.00013	0.00206	6.75339	0.00562	0.44000	-0.00957	0.09363	0.00219	-0.02072
1002258-1	26.83770	-0.00019	0.00041	-0.00313	0.00218	6.24383	-0.00150	0.10582	-0.00195	-0.00029	-0.00041	-0.02017
1002258-1D	26.37794	-0.00018	0.00053	0.00273	-0.00057	6.14637	0.00131	0.10500	-0.00253	-0.00051	0.00380	-0.01181
1002258-1L 5X	5.10818	-0.00078	-0.00186	-0.00374	-0.00092	1.21067	-0.00060	0.01951	-0.00006	-0.00037	0.00155	-0.00614
1002258-1MS	26.76291	0.49621	2.04921	2.07113	2.03826	8.24871	0.52200	0.60628	-0.01514	0.47957	2.07175	-0.00470
CCV	4.78337	0.46751	0.96293	0.96824	0.96028	4.61103	0.95587	0.48140	0.11978	0.45626	0.48791	4.75088

20000224 20000224

Sample Id1	S	Sb	Se	Se I	Se II	Si	Sn	Sr	Th	Ti	Tl	U
CCB	-0.00545	-0.00025	-0.00037	-0.00066	-0.00023	-0.00330	-0.00138	-0.00188	-0.00239	-0.00029	0.00102	-0.00664
1002258-1MSD	27.89417	0.50295	2.10743	2.11450	2.10391	8.60208	0.52920	0.61568	-0.01553	0.49875	2.08923	-0.02359
1002258-3	38.06395	0.00038	0.00175	0.00223	0.00151	6.33395	-0.00036	0.04974	-0.00315	-0.00008	0.00291	-0.00126
IP100304-3MB	0.00229	-0.00046	0.00019	-0.00323	0.00190	-0.00044	-0.00120	-0.00210	-0.00249	-0.00045	0.00035	-0.01254
IP100304-3RVS	0.09661	0.00778	0.00535	0.00485	0.00561	0.02936	0.00912	0.00275	-0.00445	0.00437	0.01044	0.04398
IP100304-3LCS	-0.00334	0.47505	2.01833	2.00760	2.02369	1.94221	0.49260	0.48641	-0.01506	0.47722	1.96931	-0.01592
1003045-1	0.07409	0.00019	0.00002	-0.00331	0.00169	0.22066	-0.00090	-0.00071	-0.00312	0.00262	0.00127	-0.00744
1003045-1D	0.06775	-0.00064	0.00000	-0.00358	0.00179	0.24788	-0.00168	-0.00100	-0.00222	0.00259	-0.00034	-0.01234
1003045-1L 5X	0.00793	0.00014	-0.00120	-0.00260	-0.00050	0.03963	-0.00150	-0.00170	-0.00156	0.00003	-0.00069	-0.00320
1003045-1MS	0.07902	0.48219	2.03885	2.04730	2.03464	2.25236	0.50219	0.49419	-0.01702	0.48613	2.00711	-0.00935
1003045-1MSD	0.07409	0.49397	2.08671	2.09652	2.08181	2.29661	0.51584	0.50262	-0.00173	0.49618	2.06296	-0.01453
CCV	5.05415	0.48512	1.01536	1.03341	1.00635	4.85241	0.99996	0.49804	0.12643	0.47835	0.50637	4.92855
CCB	-0.00474	-0.00286	0.00017	L-0.00507	0.00279	-0.00137	-0.00132	-0.00191	-0.00030	-0.00025	0.00150	-0.02386
1003045-3	H150.65513	0.00081	-0.00015	-0.00171	0.00064	9.60272	-0.00108	1.14407	-0.01820	0.00367	0.00112	-0.00307
1003045-6	H182.77202	-0.00516	0.00157	L-0.00665	0.00567	8.34501	-0.00348	1.55281	-0.00201	0.01264	-0.00061	-0.04203
1003045-7	H169.53540	-0.00053	0.00140	-0.00169	0.00294	9.32689	-0.00147	1.46810	-0.01622	0.02393	0.00079	-0.00774
1003045-14	19.01240	-0.00259	-0.00201	-0.00440	-0.00081	19.93112	-0.00126	0.38698	-0.01244	0.00427	-0.00050	-0.02354
1003045-15	18.74159	-0.00211	0.00176	-0.00331	0.00429	19.88617	-0.00180	0.38234	-0.00918	0.00447	-0.00031	-0.01124
1003045-20	H982.72668	-0.00034	0.01026	0.00754	0.01163	1.60199	0.00131	6.36231	-0.01735	-0.00229	-0.00112	0.19704
1003045-22	H305.64539	0.00042	0.00102	-0.00141	0.00223	8.60517	-0.00222	1.85048	-0.02121	0.00255	0.00114	0.04054
1003045-24	H168.68592	-0.00195	0.00164	-0.00219	0.00355	8.89329	-0.00200	1.45481	-0.01804	0.01844	0.00164	-0.01925
1003045-25	H167.30845	0.00135	0.00064	0.00058	0.00067	9.01447	-0.00051	1.44764	-0.01754	0.02207	0.00074	-0.00133
1003045-20 100X	8.69258	0.00061	-0.00005	0.00139	-0.00077	0.01303	-0.00048	0.06853	-0.00411	-0.00044	0.00153	-0.00270
CCV	4.91270	0.46806	0.98538	0.98486	0.98565	4.73819	0.96790	0.48235	0.12431	0.46766	0.48418	4.79528
CCB	-0.00052	0.00115	0.00134	0.00406	-0.00002	-0.00477	-0.00036	-0.00193	-0.00230	-0.00029	0.00088	0.00222
CRI	0.21982	0.12182	0.01004	0.00970	0.01020	0.10840	0.10688	0.01934	0.08895	0.02032	0.02558	0.21120
ICSA	0.00793	0.00356	-0.00163	-0.00060	-0.00214	-0.00854	-0.00072	0.01123	-0.00611	-0.00082	-0.00290	0.02908
ICSAB	1.03936	0.59448	0.05808	0.05701	0.05861	0.97622	1.01590	1.00400	-0.04171	0.96753	0.10848	10.27969
CCV	4.92336	0.46879	0.99595	0.99320	0.99732	4.75917	0.98190	0.48244	0.12653	0.47142	0.49124	4.79191
CCB	-0.00404	-0.00093	-0.00093	-0.00423	0.00071	-0.00441	-0.00012	-0.00193	-0.00244	-0.00039	0.00057	-0.01279

20000225

Sample Id1	V	Zn	Zr
MIXBHIGH	4.91590	9.74615	L-0.03370
MIXAHIGH	-0.00525	0.02347	0.00273
MIXCHIGH	-0.00671	-0.00073	H5.05711
ICV	0.24394	0.50627	0.48606
ICB	-0.00048	0.00019	-0.00043
CRI	0.10470	0.04121	0.05068
ICSA	-0.00332	0.00096	0.00196
ICSAB	0.48197	0.88019	0.50002
CCV	0.48999	1.03581	0.97889
CCB	-0.00015	0.00059	-0.00036
IP100303-1MB	-0.00043	0.00211	-0.00119
M100015-1	0.00402	0.01380	0.00894
M100015-2	0.00391	0.01343	0.00896
M100015-3	0.00391	0.01151	0.00916
M100015-4	0.00333	0.01232	0.00911
M100015-5	0.00403	0.01039	0.00906
M100015-6	0.00374	0.01046	0.00912
M100015-7	0.00426	0.01107	0.00897
M100015-8	0.00361	0.01059	0.00904
M100015-9	0.00181	0.00742	0.00384
CCV	0.47455	0.97656	0.95277
CCB	0.00035	0.00069	-0.00008
IP100303-2MB	-0.00029	0.00177	-0.00076
M100016-1	0.00382	0.01357	0.00897
M100016-2	0.00355	0.01036	0.00878
M100016-3	0.00336	0.01083	0.00871
M100016-4	0.00472	0.01113	0.00952
M100016-5	0.00350	0.01053	0.00895
M100016-6	0.00372	0.00992	0.00935
M100016-7	0.00400	0.01434	0.00940
M100016-8	0.00400	0.01026	0.00916
M100016-9	0.00156	0.00525	0.00373
CCV	0.49509	1.02391	0.99789
CCB	-0.00036	0.00076	-0.00037
IP100303-3MB	-0.00018	0.00296	-0.00075
M100017-1	0.00374	0.01161	0.00889
M100017-2	0.00404	0.01387	0.00934
M100017-3	0.00416	0.01046	0.00953
M100017-4	0.00394	0.01414	0.00910
M100017-5	0.00392	0.01080	0.00927
M100017-6	0.00389	0.01066	0.00888
M100017-7	0.00405	0.00975	0.00907
M100017-8	0.00401	0.01005	0.00913
M100017-9	0.00212	0.00711	0.00408
CCV	0.48339	1.00583	0.96923
CCB	-0.00034	0.00039	-0.00035
IP100301-4MB	-0.00018	0.00188	-0.00052
M100018-1	0.00372	0.01306	0.00911
M100018-2	0.00378	0.01445	0.00920
M100018-3	0.00406	0.01266	0.00934

20000226

Sample Id1	V	Zn	Zr
M100018-4	0.00372	0.01245	0.00913
M100018-5	0.00419	0.01029	0.00969
M100018-6	0.00362	0.01188	0.00922
M100018-7	0.00101	0.01070	0.00720
M100018-8	0.00408	0.01171	0.00953
M100018-9	0.00172	0.00698	0.00429
CCV	0.48186	0.98270	0.97050
CCB	-0.00019	0.00073	-0.00046
CRI	0.10499	0.04043	0.05217
ICSA	-0.00189	0.00083	0.00186
ICSAB	0.48368	0.86870	0.50525
CCV	0.48569	1.00688	0.97754
CCB	-0.00014	0.00049	-0.00036
CCV	0.49259	1.05003	0.98373
CCB	0.00047	0.00137	0.00029
1002177-1 100X	-0.00518	0.00482	-0.00018
1002177-2 100X	-0.00960	0.00637	-0.00022
1002177-3 50X	0.00051	0.00275	-0.00009
1002177-4	-0.00027	0.00218	-0.00086
1003011-1	0.00122	0.00411	-0.00280
1003011-2	0.00017	0.00022	-0.00078
1003011-2L 5X	0.00004	0.00049	-0.00050
1003011-2MS	0.57869	0.55415	-0.00149
1003011-2MSD	0.57303	0.55686	-0.00101
1003011-3 5X	0.00056	0.00323	-0.00001
CCV	0.47946	1.00077	0.96261
CCB	-0.00035	0.00015	-0.00044
1003011-4 2X	0.00014	0.00809	-0.00124
1003011-5	-0.00322	0.00454	-0.00456
1003011-6 5X	-0.00172	0.00056	0.00018
1003011-7	0.00467	0.00012	-0.00253
1002177-2 500X	-0.00117	0.00120	-0.00026
F100302-1MB	0.00012	0.00678	-0.00059
F100302-1RVS	0.00497	0.00732	0.00392
F100302-1LCS	0.50355	0.48159	-0.00042
1002225-1	0.00302	0.04398	0.00089
1002226-1	-0.00017	0.05750	-0.00129
CCV	0.47304	0.98775	0.94829
CCB	0.00007	0.00066	0.00001
1002226-6	0.00014	0.04550	-0.00001
1002226-11	0.00344	0.26686	0.00176
1002228-1	0.00132	0.06595	0.00026
1002228-6	0.02628	0.20094	0.00681
1002228-11	0.00261	0.07575	0.00032
1002246-1	0.00160	0.15912	0.00291
1002258-1	-0.00034	0.00421	-0.00170
1002258-1D	-0.00001	0.00475	-0.00162
1002258-1L 5X	0.00000	0.00106	-0.00095
1002258-1MS	0.49762	0.47709	-0.00168
CCV	0.47011	0.96730	0.94611

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Sample Id1	V	Zn	Zr
CCB	0.00043	0.00025	0.00021
1002258-1MSD	0.50950	0.49703	-0.00145
1002258-3	0.00027	0.00732	-0.00118
IP100304-3MB	-0.00013	0.00059	-0.00042
IP100304-3RVS	0.00478	0.00546	0.00420
IP100304-3LCS	0.48610	0.46670	-0.00084
1003045-1	0.00039	0.01759	-0.00034
1003045-1D	-0.00015	0.03526	-0.00052
1003045-1L 5X	-0.00017	0.00407	-0.00058
1003045-1MS	0.49415	0.47553	-0.00036
1003045-1MSD	0.50495	0.49659	-0.00139
CCV	0.48964	1.03642	0.98177
CCB	-0.00051	0.00059	-0.00061
1003045-3	0.00045	0.00252	-0.00072
1003045-6	0.00119	0.00302	-0.00189
1003045-7	0.00283	0.00694	-0.00007
1003045-14	0.00313	0.00265	-0.00355
1003045-15	0.00338	0.00127	-0.00364
1003045-20	0.00081	0.00083	0.00036
1003045-22	0.00146	0.00147	-0.00065
1003045-24	0.00247	0.00218	-0.00049
1003045-25	0.00303	0.00404	0.00026
1003045-20 100X	0.00033	0.00039	-0.00030
CCV	0.47743	1.00966	0.95495
CCB	0.00013	0.00032	-0.00009
CRI	0.10622	0.04226	0.05242
ICSA	-0.00317	0.00123	0.00224
ICSAB	0.48939	0.92389	0.50584
CCV	0.48146	1.03039	0.96092
CCB	-0.00008	0.00039	-0.00010

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:01
SampleId1 : BLANK **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:14:43
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE1

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.964	2.344	4.435	1.472	0.346	5.287	3.042	0.841	2.199
#2	1.958	2.347	4.414	1.492	0.345	5.288	3.051	0.837	2.178
Mean	**1.961**	**2.346**	**4.425**	**1.482**	**0.346**	**5.287**	**3.047**	**0.839**	**2.189**
%RSD	0.216	0.090	0.336	0.954	0.205	0.013	0.209	0.337	0.679

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.024	3.729	1.029	0.856	10.624	1.695	2.077	0.222	1.586
#2	2.021	3.709	1.025	0.854	10.590	1.691	2.082	0.222	1.607
Mean	**2.023**	**3.719**	**1.027**	**0.855**	**10.607**	**1.693**	**2.080**	**0.222**	**1.597**
%RSD	0.105	0.380	0.275	0.165	0.227	0.167	0.170	0.000	0.930

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.205	4.247	1.308	47.603	13.296	0.146	3.870	8.426	6.229
#2	2.208	4.226	1.280	47.797	13.351	0.146	3.847	8.328	6.161
Mean	**2.207**	**4.236**	**1.294**	**47.700**	**13.324**	**0.146**	**3.859**	**8.377**	**6.195**
%RSD	0.096	0.351	1.530	0.288	0.292	0.000	0.421	0.827	0.776

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	4.904	1.478	0.588	9.925	3.592	5.296	2.695	2.588	0.444
#2	4.915	1.495	0.587	9.953	3.601	5.346	2.685	2.587	0.448
Mean	**4.909**	**1.487**	**0.587**	**9.939**	**3.597**	**5.321**	**2.690**	**2.588**	**0.446**
%RSD	0.158	0.809	0.120	0.199	0.177	0.664	0.263	0.027	0.634

	Zr	Pb	Se
	Reading	Reading	Reading
#1	4.482		
#2	4.496		
Mean	**4.489**	**0.000**	**0.000**
%RSD	0.221	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:02
SampleId1 : BL **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:17:26
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE2

Raw intensities

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.016	2.722	4.558	2.973	0.449	6.935	3.064	2.861	2.308
#2	2.034	2.724	4.629	2.958	0.450	6.939	3.092	2.865	2.318
Mean	**2.025**	**2.723**	**4.594**	**2.966**	**0.450**	**6.937**	**3.078**	**2.863**	**2.313**
%RSD	0.629	0.052	1.093	0.358	0.157	0.041	0.643	0.099	0.306

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.095	3.892	1.065	1.901	14.370	5.568	3.179	0.284	2.059
#2	2.110	3.918	1.068	1.900	14.406	5.548	3.186	0.284	2.082
Mean	**2.103**	**3.905**	**1.067**	**1.901**	**14.388**	**5.558**	**3.183**	**0.284**	**2.071**
%RSD	0.504	0.471	0.199	0.037	0.177	0.254	0.156	0.000	0.785

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	14.944	4.718	1.855	47.794	13.613	0.188	3.988	8.445	6.324
#2	14.879	4.751	1.803	47.981	13.617	0.194	4.006	8.485	6.318
Mean	**14.912**	**4.735**	**1.829**	**47.888**	**13.615**	**0.191**	**3.997**	**8.465**	**6.321**
%RSD	0.308	0.493	2.010	0.276	0.021	2.221	0.318	0.334	0.067

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.736	1.574	2.674	10.172	5.726	5.465	2.908	2.696	0.529
#2	5.744	1.574	2.664	10.236	5.752	5.488	2.950	2.698	0.532
Mean	**5.740**	**1.574**	**2.669**	**10.204**	**5.739**	**5.477**	**2.929**	**2.697**	**0.531**
%RSD	0.099	0.000	0.265	0.444	0.320	0.297	1.014	0.052	0.400

	Zr	Pb	Se
	Reading	Reading	Reading
#1	5.257		
#2	5.271		
Mean	**5.264**	**0.000**	**0.000**
%RSD	0.188	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:02
SampleId1 : RL2 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:19:20
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE3

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.243	3.509	4.990	6.010	0.637	10.361	3.358	6.910	2.743
#2	2.243	3.502	5.019	5.975	0.639	10.322	3.411	6.935	2.733
Mean	**2.243**	**3.505**	**5.005**	**5.993**	**0.638**	**10.342**	**3.385**	**6.923**	**2.738**
%RSD	0.000	0.141	0.410	0.413	0.222	0.267	1.107	0.255	0.258

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.356	4.456	1.175	3.951	19.882	13.135	5.500	0.411	3.015
#2	2.366	4.450	1.172	3.951	19.884	13.080	5.512	0.412	3.029
Mean	**2.361**	**4.453**	**1.174**	**3.951**	**19.883**	**13.108**	**5.506**	**0.412**	**3.022**
%RSD	0.299	0.095	0.181	0.000	0.007	0.297	0.154	0.172	0.328

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	39.099	5.928	2.907	50.773	14.589	0.269	4.408	8.929	6.893
#2	38.912	5.920	2.914	50.958	14.563	0.268	4.463	8.936	6.886
Mean	**39.006**	**5.924**	**2.911**	**50.866**	**14.576**	**0.269**	**4.436**	**8.933**	**6.890**
%RSD	0.339	0.095	0.170	0.257	0.126	0.263	0.877	0.055	0.072

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	7.482	1.804	6.109	11.210	10.071	6.023	3.480	3.053	0.713
#2	7.482	1.804	6.098	11.247	10.092	6.026	3.502	3.064	0.714
Mean	**7.482**	**1.804**	**6.104**	**11.229**	**10.082**	**6.025**	**3.491**	**3.059**	**0.714**
%RSD	0.000	0.000	0.127	0.233	0.147	0.035	0.446	0.254	0.099

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	7.034		
#2	7.044		
Mean	**7.039**	**0.000**	**0.000**
%RSD	0.100	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:02
SampleId1 : B3 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:21:10
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE4

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.515	2.330	5.851	4.330	4.353	18.791	2.950	0.806	8.589
#2	2.498	2.318	5.718	4.306	4.394	18.832	2.949	0.793	8.612
Mean	**2.507**	**2.324**	**5.785**	**4.318**	**4.374**	**18.812**	**2.950**	**0.800**	**8.601**
%RSD	0.480	0.365	1.626	0.393	0.663	0.154	0.024	1.150	0.189

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	3.907	11.657	2.568	0.848	10.396	1.666	2.039	2.931	5.793
#2	3.904	11.653	2.572	0.833	10.305	1.650	2.019	2.947	5.816
Mean	**3.906**	**11.655**	**2.570**	**0.841**	**10.351**	**1.658**	**2.029**	**2.939**	**5.805**
%RSD	0.054	0.024	0.110	1.262	0.622	0.682	0.697	0.385	0.280

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading

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#1	2.053	13.663	6.232	60.429	20.400	0.149	4.191	9.123	7.594
#2	2.024	13.712	6.284	60.241	20.396	0.143	4.153	9.083	7.504
Mean	**2.039**	**13.688**	**6.258**	**60.335**	**20.398**	**0.146**	**4.172**	**9.103**	**7.549**
%RSD	1.006	0.253	0.588	0.220	0.014	2.906	0.644	0.311	0.843

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	12.280	2.300	16.790	10.533	23.307	6.756	2.656	5.265	1.959
#2	12.358	2.322	16.931	10.493	23.441	6.753	2.623	5.262	1.962
Mean	**12.319**	**2.311**	**16.861**	**10.513**	**23.374**	**6.755**	**2.640**	**5.263**	**1.961**
%RSD	0.448	0.673	0.591	0.269	0.405	0.031	0.884	0.040	0.108

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.578		
#2	4.533		
Mean	**4.556**	**0.000**	**0.000**
%RSD	0.698	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:03
SampleId1 : B2 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:23:01
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE5

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	7.984	2.544	19.110	30.731	40.206	144.086	3.211	0.870	67.531
#2	8.029	2.554	19.247	30.848	40.412	144.880	3.220	0.866	67.934
Mean	**8.006**	**2.549**	**19.179**	**30.790**	**40.309**	**144.483**	**3.216**	**0.868**	**67.733**
%RSD	0.397	0.277	0.505	0.269	0.361	0.389	0.198	0.326	0.421

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	21.631	84.961	16.625	0.923	10.808	1.732	2.151	27.616	43.893
#2	21.752	85.409	16.695	0.922	10.793	1.734	2.144	27.787	44.076
Mean	**21.691**	**85.185**	**16.660**	**0.923**	**10.801**	**1.733**	**2.148**	**27.702**	**43.985**
%RSD	0.394	0.372	0.297	0.077	0.098	0.082	0.230	0.436	0.294

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.412	100.682	51.824	189.013	88.280	0.158	8.063	18.025	21.141
#2	2.410	101.106	51.848	190.158	87.597	0.154	8.096	18.092	21.096
Mean	**2.411**	**100.894**	**51.836**	**189.586**	**87.939**	**0.156**	**8.080**	**18.059**	**21.118**
%RSD	0.059	0.297	0.033	0.427	0.549	1.813	0.289	0.262	0.151

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	79.930	10.163	159.906	18.503	203.058	21.444	2.778	30.249	15.983

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#2	80.391	10.222	160.281	18.549	203.974	21.238	2.788	30.425	16.106
Mean	**80.161**	**10.192**	**160.094**	**18.526**	**203.516**	**21.341**	**2.783**	**30.337**	**16.045**
%RSD	0.407	0.409	0.166	0.176	0.318	0.683	0.254	0.410	0.542

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	6.295		
#2	6.290		
Mean	**6.293**	**0.000**	**0.000**
%RSD	0.056	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:03
SampleId1 : B1 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:24:51
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE6

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	62.990	4.309	152.649	294.390	390.418	1396.112	4.412	1.009	643.414
#2	63.155	4.306	153.334	296.358	392.735	1400.162	4.404	1.006	645.021
Mean	**63.073**	**4.308**	**152.992**	**295.374**	**391.577**	**1398.137**	**4.408**	**1.007**	**644.218**
%RSD	0.185	0.049	0.317	0.471	0.418	0.205	0.128	0.211	0.176

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	199.541	827.725	159.112	1.396	10.876	1.851	2.437	265.547	422.682
#2	199.967	830.251	160.020	1.394	10.808	1.844	2.424	266.506	424.315
Mean	**199.754**	**828.988**	**159.566**	**1.395**	**10.842**	**1.848**	**2.431**	**266.027**	**423.499**
%RSD	0.151	0.215	0.402	0.101	0.443	0.268	0.378	0.255	0.273

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	3.490	973.777	474.612	1469.795	762.139	0.218	46.119	104.837	155.071
#2	3.487	976.835	476.589	1472.668	759.440	0.223	46.332	105.366	154.740
Mean	**3.489**	**975.306**	**475.601**	**1471.232**	**760.790**	**0.221**	**46.225**	**105.102**	**154.906**
%RSD	0.061	0.222	0.294	0.138	0.251	1.603	0.326	0.356	0.151

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	745.003	88.647	1432.446	95.006	2049.654	166.013	3.076	281.835	153.779
#2	750.777	89.090	1452.665	95.294	2057.319	167.198	3.066	282.603	154.196
Mean	**747.890**	**88.869**	**1442.556**	**95.150**	**2053.487**	**166.606**	**3.071**	**282.219**	**153.988**
%RSD	0.546	0.352	0.991	0.214	0.264	0.503	0.230	0.192	0.191

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	21.656		
#2	21.735		

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Mean	**21.696**	**0.000**	**0.000CH**
%RSD	0.257	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:03
SampleId1 : ZZZ **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:26:41
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE7

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.956	2.355	4.577	2.064	0.452	5.614	3.024	0.797	2.356
#2	1.961	2.354	4.541	2.061	0.514	5.828	3.023	0.796	2.430
Mean	**1.959**	**2.354**	**4.559**	**2.063**	**0.483**	**5.721**	**3.024**	**0.797**	**2.393**
%RSD	0.181	0.030	0.558	0.103	9.077	2.645	0.023	0.089	2.187

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.068	3.883	1.060	0.839	11.671	1.686	2.064	0.282	1.749
#2	2.069	3.972	1.080	0.837	11.598	1.674	2.037	0.322	1.802
Mean	**2.069**	**3.928**	**1.070**	**0.838**	**11.635**	**1.680**	**2.051**	**0.302**	**1.776**
%RSD	0.034	1.602	1.322	0.169	0.444	0.505	0.931	9.366	2.111

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.291	4.470	1.378	47.809	13.416	0.149	3.881	8.458	6.167
#2	2.280	4.528	1.482	47.778	13.514	0.153	3.844	8.460	6.214
Mean	**2.286**	**4.499**	**1.430**	**47.793**	**13.465**	**0.151**	**3.863**	**8.459**	**6.191**
%RSD	0.340	0.912	5.143	0.046	0.515	1.873	0.677	0.017	0.537

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.394	1.504	1.268	9.900	4.090	5.390	2.678	2.637	0.484
#2	5.416	1.513	1.524	9.847	4.360	5.421	2.645	2.644	0.504
Mean	**5.405**	**1.509**	**1.396**	**9.874**	**4.225**	**5.406**	**2.662**	**2.641**	**0.494**
%RSD	0.288	0.422	12.967	0.380	4.519	0.406	0.877	0.187	2.863

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.450		
#2	4.427		
Mean	**4.438**	**0.000**	**0.000**
%RSD	0.366	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:04
SampleId1 : A3 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:28:32
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE8

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Raw intensities **17:29:06** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.045	167.383	5.147	1.903	0.364	5.582	3.106	456.660	2.278
#2	2.022	168.655	5.219	1.902	0.378	5.642	3.127	457.959	2.323
Mean	**2.034**	**168.019**	**5.183**	**1.903**	**0.371**	**5.612**	**3.117**	**457.310**	**2.301**
%RSD	0.800	0.535	0.982	0.037	2.668	0.756	0.476	0.201	1.383

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.087	4.224	1.052	375.581	117.879	366.648	249.029	0.269	1.979
#2	2.096	4.237	1.058	376.812	118.615	369.012	249.779	0.281	2.023
Mean	**2.092**	**4.231**	**1.055**	**376.197**	**118.247**	**367.830**	**249.404**	**0.275**	**2.001**
%RSD	0.304	0.217	0.402	0.231	0.440	0.454	0.213	3.086	1.555

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	495.833	4.383	1.473	56.619	16.102	0.162	4.785	10.092	7.431
#2	499.762	4.420	1.502	56.585	16.050	0.166	4.769	10.035	7.473
Mean	**497.798**	**4.402**	**1.488**	**56.602**	**16.076**	**0.164**	**4.777**	**10.064**	**7.452**
%RSD	0.558	0.594	1.379	0.042	0.229	1.725	0.237	0.401	0.399

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.635	1.742	0.742	16.898	4.108	6.317	3.270	2.932	0.606
#2	5.651	1.766	0.813	16.900	4.193	6.185	3.266	2.931	0.612
Mean	**5.643**	**1.754**	**0.778**	**16.899**	**4.150**	**6.251**	**3.268**	**2.932**	**0.609**
%RSD	0.200	0.968	6.457	0.008	1.448	1.493	0.087	0.024	0.697

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.746		
#2	4.730		
Mean	**4.738**	**0.000**	**0.000**
%RSD	0.239	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:04
SampleId1 : A2 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:30:22
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE9

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.063	329.072	5.873	1.951	0.367	5.726	3.179	890.279	2.361
#2	2.032	332.009	5.863	1.917	0.357	5.710	3.142	892.051	2.367
Mean	**2.048**	**330.541**	**5.868**	**1.934**	**0.362**	**5.718**	**3.161**	**891.165**	**2.364**
%RSD	1.071	0.628	0.121	1.243	1.953	0.198	0.828	0.141	0.179

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ted: 3/4/2010 17:29:06 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.155	4.480	1.069	718.006	234.776	780.255	489.272	0.305	2.319
#2	2.130	4.430	1.055	721.021	236.978	788.430	490.971	0.302	2.308
Mean	**2.143**	**4.455**	**1.062**	**719.514**	**235.877**	**784.343**	**490.122**	**0.304**	**2.314**
%RSD	0.825	0.794	0.932	0.296	0.660	0.737	0.245	0.699	0.336

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	945.055	4.502	1.653	65.545	18.692	0.186	5.723	11.628	8.527
#2	952.483	4.423	1.585	64.709	18.504	0.188	5.680	11.604	8.580
Mean	**948.769**	**4.463**	**1.619**	**65.127**	**18.598**	**0.187**	**5.701**	**11.616**	**8.554**
%RSD	0.554	1.252	2.970	0.908	0.715	0.756	0.533	0.146	0.438

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.934	1.969	0.832	20.291	4.348	7.161	3.584	3.123	0.756
#2	5.893	1.956	0.816	20.102	4.269	7.080	3.552	3.073	0.752
Mean	**5.914**	**1.963**	**0.824**	**20.197**	**4.309**	**7.121**	**3.568**	**3.098**	**0.754**
%RSD	0.490	0.468	1.373	0.662	1.297	0.804	0.634	1.141	0.375

	Zr	Pb	Se
	Reading	Reading	Reading
#1	4.903		
#2	4.818		
Mean	**4.861**	**0.000**	**0.000**
%RSD	1.237	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:04
SampleId1 : A5 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:32:12
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE10

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.125	641.045	7.174	2.143	0.380	6.027	3.333	1716.354	2.551
#2	2.105	644.720	7.195	2.118	0.378	6.039	3.323	1719.583	2.578
Mean	**2.115**	**642.883**	**7.185**	**2.130**	**0.379**	**6.033**	**3.328**	**1717.969**	**2.564**
%RSD	0.669	0.404	0.207	0.830	0.373	0.141	0.212	0.133	0.744

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.283	4.877	1.106	1340.458	457.817	1633.292	968.015	0.380	3.024
#2	2.289	4.880	1.098	1345.071	460.199	1642.591	971.074	0.381	3.019
Mean	**2.286**	**4.879**	**1.102**	**1342.765**	**459.008**	**1637.942**	**969.545**	**0.381**	**3.022**
%RSD	0.186	0.043	0.513	0.243	0.367	0.401	0.223	0.186	0.117

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	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1698.303	4.715	1.865	83.084	23.824	0.220	7.600	14.852	10.871
#2	1702.717	4.736	1.848	82.975	23.806	0.218	7.551	14.842	10.792
Mean	**1700.510**	**4.726**	**1.857**	**83.030**	**23.815**	**0.219**	**7.576**	**14.847**	**10.832**
%RSD	0.184	0.314	0.647	0.093	0.053	0.646	0.457	0.048	0.516

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	6.377	2.412	1.038	24.540	4.694	8.899	4.098	3.451	1.042
#2	6.403	2.418	1.038	24.541	4.680	8.755	4.073	3.419	1.041
Mean	**6.390**	**2.415**	**1.038**	**24.541**	**4.687**	**8.827**	**4.086**	**3.435**	**1.042**
%RSD	0.288	0.176	0.000	0.003	0.211	1.154	0.433	0.659	0.068

	Zr	Pb	Se
	Reading	Reading	Reading
#1	5.131		
#2	5.102		
Mean	**5.117**	**0.000**	**0.000**
%RSD	0.401	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:04
SampleId1 : A1 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:34:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE11

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.149	1509.469	10.903	2.721	0.398	6.631	3.603	3864.890	2.987
#2	2.119	1528.678	10.917	2.692	0.392	6.619	3.601	3867.211	2.955
Mean	**2.134**	**1519.074**	**10.910**	**2.707**	**0.395**	**6.625**	**3.602**	**3866.051**	**2.971**
%RSD	0.994	0.894	0.091	0.758	1.074	0.128	0.039	0.042	0.762

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.588	5.644	1.146	2795.691	1047.963	4128.827	2316.268	0.569	4.967
#2	2.547	5.585	1.128	2802.168	1061.081	4185.580	2325.442	0.566	4.994
Mean	**2.568**	**5.614**	**1.137**	**2798.930**	**1054.522**	**4157.203**	**2320.855**	**0.567**	**4.980**
%RSD	1.129	0.743	1.119	0.164	0.880	0.965	0.280	0.374	0.383

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	3258.708	5.168	2.526	130.878	38.170	0.302	12.816	23.511	17.380
#2	3270.998	5.145	2.593	130.131	38.032	0.310	12.860	23.603	17.262
Mean	**3264.853**	**5.156**	**2.560**	**130.505**	**38.101**	**0.306**	**12.838**	**23.557**	**17.321**
%RSD	0.439	0.315	1.851	0.405	0.256	1.849	0.242	0.276	0.482

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

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	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	7.230	3.657	1.538	32.161	5.330	13.650	5.339	4.147	1.878
#2	7.193	3.680	1.541	32.026	5.268	13.651	5.315	4.092	1.880
Mean	**7.212**	**3.669**	**1.540**	**32.094**	**5.299**	**13.651**	**5.327**	**4.120**	**1.879**
%RSD	0.363	0.443	0.138	0.297	0.827	0.005	0.319	0.944	0.075

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	5.450		
#2	5.396		
Mean	**5.423**	**0.000**	**0.000**
%RSD	0.704	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:05
SampleId1 : C3 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:35:54
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE12

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.006	2.634	4.485	1.601	0.346	5.451	3.698	1.463	2.205
#2	1.996	2.596	4.442	1.585	0.345	5.440	3.681	1.333	2.179
Mean	**2.001**	**2.615**	**4.464**	**1.593**	**0.346**	**5.446**	**3.690**	**1.398**	**2.192**
%RSD	0.353	1.028	0.681	0.710	0.205	0.143	0.326	6.575	0.839

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.049	3.820	1.036	1.421	10.659	2.060	2.514	0.228	1.623
#2	2.038	3.819	1.044	1.306	10.597	1.992	2.428	0.226	1.622
Mean	**2.044**	**3.819**	**1.040**	**1.364**	**10.628**	**2.026**	**2.471**	**0.227**	**1.623**
%RSD	0.381	0.019	0.544	5.964	0.413	2.373	2.461	0.623	0.044

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.768	4.263	1.304	48.164	13.560	0.516	3.876	8.502	6.300
#2	2.649	4.313	1.276	48.008	13.640	0.514	3.878	8.488	6.348
Mean	**2.709**	**4.288**	**1.290**	**48.086**	**13.600**	**0.515**	**3.877**	**8.495**	**6.324**
%RSD	3.107	0.825	1.535	0.229	0.416	0.275	0.036	0.117	0.537

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.031	1.516	0.592	10.887	3.675	5.416	3.795	2.619	0.453
#2	5.013	1.503	0.592	10.862	3.658	5.380	3.784	2.613	0.449
Mean	**5.022**	**1.510**	**0.592**	**10.875**	**3.667**	**5.398**	**3.790**	**2.616**	**0.451**
%RSD	0.253	0.609	0.000	0.163	0.328	0.472	0.205	0.162	0.627

	Zr	**Pb**	**Se**
	Reading	Reading	Reading

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#1	11.729		**CH**
#2	11.705		
Mean	**11.717**	**0.000**	**0.000**
%RSD	0.145	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:05
SampleId1 : C2 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:37:46
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE13

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.378	2.660	4.474	1.689	0.349	5.935	9.129	1.025	2.235
#2	2.367	2.648	4.485	1.700	0.348	5.890	9.144	1.034	2.242
Mean	**2.373**	**2.654**	**4.480**	**1.695**	**0.349**	**5.913**	**9.137**	**1.030**	**2.239**
%RSD	0.328	0.320	0.174	0.459	0.203	0.538	0.116	0.618	0.221

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.108	4.664	1.170	1.010	10.609	1.750	2.836	0.258	1.626
#2	2.094	4.667	1.170	1.015	10.587	1.755	2.839	0.257	1.616
Mean	**2.101**	**4.666**	**1.170**	**1.013**	**10.598**	**1.753**	**2.838**	**0.258**	**1.621**
%RSD	0.471	0.045	0.000	0.349	0.147	0.202	0.075	0.275	0.436

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.393	4.434	1.321	49.746	14.238	3.748	3.891	8.627	6.359
#2	2.392	4.391	1.322	49.414	14.046	3.767	3.919	8.546	6.366
Mean	**2.393**	**4.412**	**1.321**	**49.580**	**14.142**	**3.758**	**3.905**	**8.587**	**6.363**
%RSD	0.030	0.689	0.054	0.473	0.960	0.358	0.507	0.667	0.078

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.645	1.530	0.621	18.796	4.153	5.439	13.430	2.923	0.461
#2	5.660	1.540	0.618	18.722	4.119	5.483	13.412	2.903	0.459
Mean	**5.653**	**1.535**	**0.620**	**18.759**	**4.136**	**5.461**	**13.421**	**2.913**	**0.460**
%RSD	0.188	0.461	0.342	0.279	0.581	0.570	0.095	0.485	0.307

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	76.072		
#2	76.045		
Mean	**76.059**	**0.000**	**0.000**
%RSD	0.025	0.000	0.000

20000239

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:05
SampleId1 : C1 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:39:37

20000239

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE14

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.942	4.895	4.910	2.784	0.367	10.708	62.076	2.052	2.629
#2	5.977	4.904	4.855	2.784	0.365	10.725	62.379	2.053	2.613
Mean	**5.960**	**4.900**	**4.883**	**2.784**	**0.366**	**10.717**	**62.228**	**2.053**	**2.621**
%RSD	0.415	0.130	0.797	0.000	0.386	0.112	0.344	0.034	0.432

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.670	12.804	2.399	2.012	10.437	1.794	9.125	0.555	1.759
#2	2.674	12.814	2.403	2.012	10.412	1.790	9.120	0.557	1.777
Mean	**2.672**	**12.809**	**2.401**	**2.012**	**10.425**	**1.792**	**9.122**	**0.556**	**1.768**
%RSD	0.106	0.055	0.118	0.000	0.170	0.158	0.039	0.254	0.720

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.283	5.579	1.600	64.110	19.477	34.625	4.263	9.564	6.829
#2	2.273	5.546	1.562	64.023	19.465	34.787	4.264	9.599	6.798
Mean	**2.278**	**5.563**	**1.581**	**64.066**	**19.471**	**34.706**	**4.264**	**9.582**	**6.814**
%RSD	0.310	0.419	1.700	0.096	0.044	0.330	0.017	0.258	0.322

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	11.935	1.791	0.915	95.239	8.583	6.040	107.388	5.736	0.490
#2	11.992	1.787	0.915	95.550	8.602	5.928	107.737	5.705	0.501
Mean	**11.964**	**1.789**	**0.915**	**95.395**	**8.593**	**5.984**	**107.563**	**5.720**	**0.496**
%RSD	0.337	0.158	0.000	0.231	0.156	1.323	0.229	0.383	1.570

	Zr	Pb	Se
	Reading	Reading	Reading
#1	704.286		
#2	706.177		
Mean	**705.232**	**0.000**	**0.000**
%RSD	0.190	0.000	0.000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:05
SampleId1 : A4 **SampleId2 :** **[STD]**
Analysis commenced : 3/4/2010 11:47:31
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE7

Raw intensities

20000240

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.938	17.708	4.426	1.480	0.351	5.262	2.996	42.950	2.133
#2	1.931	17.917	4.371	1.462	0.351	5.229	2.982	43.531	2.129

20000240

Mean	**1.935**	**17.813**	**4.399**	**1.471**	**0.351**	**5.246**	**2.989**	**43.241**	**2.131**
%RSD	0.256	0.830	0.884	0.865	0.000	0.445	0.331	0.950	0.133

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.990	3.713	1.012	36.196	22.662	34.786	24.885	0.222	1.600
#2	1.973	3.704	1.009	36.645	22.839	35.221	25.139	0.221	1.586
Mean	**1.982**	**3.709**	**1.011**	**36.421**	**22.751**	**35.004**	**25.012**	**0.222**	**1.593**
%RSD	0.607	0.172	0.210	0.872	0.550	0.879	0.718	0.319	0.621

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	55.341	4.201	1.266	47.420	13.398	0.161	3.868	8.330	6.155
#2	56.037	4.167	1.277	47.296	13.240	0.154	3.847	8.351	6.169
Mean	**55.689**	**4.184**	**1.272**	**47.358**	**13.319**	**0.158**	**3.858**	**8.341**	**6.162**
%RSD	0.884	0.575	0.612	0.185	0.839	3.143	0.385	0.178	0.161

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	4.926	1.484	0.877	10.757	3.596	5.337	2.736	2.571	0.455
#2	4.935	1.484	0.881	10.747	3.601	5.293	2.724	2.571	0.455
Mean	**4.931**	**1.484**	**0.879**	**10.752**	**3.599**	**5.315**	**2.730**	**2.571**	**0.455**
%RSD	0.129	0.000	0.322	0.066	0.098	0.585	0.311	0.000	0.000

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.486		
#2	4.469		
Mean	**4.478**	**0.000**	**0.000**
%RSD	0.268	0.000	0.000

Method report Paragon

Line calibration information

Analyte	Reporting name	C0	C1	C2	C3	Correlation coefficient	Low limit	High limit	Date of last regression
Ag 328.068	Ag	0.0003841	0.0357028	-0.0000132	0	1.0000	-0.009	57.219	3/4/2010 11:49:09
Al 308.215	Al	-0.0247187	0.3169674	0.0000162	0	0.99991	0.052	1456.991	3/4/2010 11:49:09
As 189.042/2	As	0.0045648	0.0372204	-0.0000031	0	1.0000	-0.137	135.755	3/4/2010 11:49:10
B 249.678/2	B	-0.0041928	0.0393279	-0.0000009	0	1.0000	0.095	255.931	3/4/2010 11:49:10
Ba 493.409	Ba	-0.000625	0.0283539	0.0000018	0	1.0000	0.001	345.217	3/4/2010 11:49:10
Be 313.042	Be	-0.0039518	0.0007198	0.0	0	1.0000	5.287	1398.137	3/4/2010 11:49:10
Bi 223.061	Bi	-0.0003909	0.0981388	0.000045	0	1.0000	0.013	49.814	3/4/2010 11:49:10
Ca 317.933	Ca	-0.0361922	0.1141909	0.0000055	0	0.99969	0.126	3686.701	3/4/2010 11:49:11
Cd 226.502/2	Cd	-0.0002751	0.0091141	0.0000004	0	1.0000	0.050	537.261	3/4/2010 11:49:11
Co 228.616	Co	0.0006117	0.0261609	-0.0000011	0	1.0000	-0.030	192.700	3/4/2010 11:49:11
Cr 267.716	Cr	0.0000133	0.0125379	-0.0000002	0	1.0000	0.013	810.417	3/4/2010 11:49:11
Cu 324.753	Cu	-0.012735	0.0708389	-0.0000094	0	1.0000	0.174	144.094	3/4/2010 11:49:11
Fe 259.94	Fe	-0.0064554	0.0531991	0.0000066	0	0.99993	0.025	2745.293	3/4/2010 11:49:12
K 766.491	K	-2.7323885	0.242994	-0.0000413	4.516370766	0.99999	10.607	1054.522	3/4/2010 11:49:12
Li 670.784	Li	-0.000928	0.0028501	-0.0000003	4.217358996	0.99999	1.693	4157.203	3/4/2010 11:49:12
Mg 279.078	Mg	-0.0174169	0.2158619	0.0000019	0	0.99971	-0.004	2248.566	3/4/2010 11:49:12
Mn 257.61	Mn	-0.0000237	0.0368643	0.0000053	0	1.0000	0.003	261.407	3/4/2010 11:49:12
Mo 202.03/2	Mo	-0.0011003	0.025955	0.0000002	0	1.0000	0.005	384.238	3/4/2010 11:49:12
Na 588.995	Na	-0.2108263	0.0490775	0.0000038	1.491737238	1.0000	2.207	3268.853	3/4/2010 11:49:13
Ni 231.604	Ni	-0.0007329	0.0124436	-0.0000001	0	1.0000	0.046	811.073	3/4/2010 11:49:13
P 178.287/2	P	-0.0059734	0.1000242	0.0000159	0	1.0000	0.056	465.497	3/4/2010 11:49:13
Pb 220.351	Pb I	0.0023289	0.0073433	0.0000000	0	1.0000	-0.195	1374.024	3/4/2010 11:49:13
Pb 220.352/2	Pb II	-0.0018563	0.0140948	-0.0000001	0	1.0000	0.085	712.725	3/4/2010 11:49:13
S 182.04/2	S	-0.0195225	1.4075397	0.0019847	0	1.0000	0.010	33.915	3/4/2010 11:49:14
Sb 206.838/2	Sb	-0.0007174	0.0594516	-0.0000223	0	1.0000	0.038	34.089	3/4/2010 11:49:14
Se 196.021	Se I	-0.000145	0.0539157	-0.0000071	0	1.0000	0.034	93.899	3/4/2010 11:49:14
Se 196.021/2	Se II	-0.0016732	0.0348407	-0.0000007	0	1.0000	0.019	143.973	3/4/2010 11:49:14
Si 288.158	Si	-0.0957756	0.0677676	0.0000011	0	1.0000	1.372	730.255	3/4/2010 11:49:14
Sn 189.989	Sn	-0.0001832	0.1193916	-0.0000099	0	1.0000	0.003	84.351	3/4/2010 11:49:15
Sr 421.552	Sr	-0.0021625	0.0071709	0.0000007	0	1.0000	0.011	1250.710	3/4/2010 11:49:15

20000242

Th 283.73/2	Th	-0.0132418	0.0262353	-0.00001	0	0.99999	0.377	79.125	3/4/2010 11:49:15
Ti 334.941	Ti	-0.0000361	0.0051297	-0.0000001	0	1.0000	-0.103	2006.820	3/4/2010 11:49:15
Tl 190.864/2	Tl	0.0064591	0.0361044	-0.0000042	0	1.0000	-0.170	140.601	3/4/2010 11:49:15
U 385.958	U	0.0022232	0.4920266	0.0001021	0	1.0000	-0.028	99.560	3/4/2010 11:49:16
V 292.402	V	-0.0000467	0.0186492	-0.0000008	0	1.0000	0.013	271.102	3/4/2010 11:49:16
Zn 206.2	Zn	-0.0001521	0.0675803	0.0000086	0	1.0000	0.006	145.278	3/4/2010 11:49:16
Zr 339.198	Zr	-0.0009106	0.0072494	0.0000002	0	1.0000	0.054	674.762	3/4/2010 11:49:16

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:17
SampleId1 : MIXBHIGH **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 11:49:46
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.96798	0.03643	4.86453	9.75932	9.79745	0.97189	-0.00441	-0.04236	4.86902
#2	1.98657	0.04602	4.91352	9.86020	9.92243	0.97679	0.00060	-0.04316	4.90013
Mean	**1.97728**	**0.04123**	**4.88903**	**9.80976**	**9.85994**	**0.97434**	**-0.00190**	**-0.04276**	**4.88458**
%RSD	0.66481	16.44102	0.70849	0.72717	0.89631	0.35624	185.97947	1.32188	0.45032

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.88709	9.79272	9.83458	-0.01396	-0.21756	0.00415	-0.04591	9.76521	9.77409
#2	4.91320	9.85683	9.93814	-0.01475	-0.22453	0.00412	-0.04850	9.83925	9.87807
Mean	**4.90014**	**9.82478**	**9.88636**	**-0.01436**	**-0.22104**	**0.00414**	**-0.04721**	**9.80223**	**9.82608**
%RSD	0.37668	0.46143	0.74069	3.93053	2.22759	0.56390	3.88012	0.53408	0.74826

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04366	9.75660	48.93097	9.76971	9.82629	-0.00263	1.93267	4.85569	4.89654
#2	-0.04390	9.84141	49.28192	9.85133	9.77855	-0.00404	1.95671	4.91576	4.86515
Mean	**-0.04378**	**9.79900**	**49.10644**	**9.81052**	**9.80242**	**-0.00334**	**1.94469**	**4.88573**	**4.88085**
%RSD	0.38845	0.61196	0.50535	0.58831	0.34439	29.83959	0.87415	0.86945	0.45473

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	48.88935	9.77410	9.80397	1.95316	9.79080	4.89056	-0.05140	4.90030	9.72615
#2	49.45261	9.83219	9.92152	1.97447	9.85782	4.91926	-0.06763	4.93151	9.76614
Mean	**49.17098**	**9.80314**	**9.86275**	**1.96382**	**9.82431**	**4.90491**	**-0.05951**	**4.91591**	**9.74614**
%RSD	0.81000	0.41901	0.84273	0.76765	0.48233	0.41366	19.28972	0.44902	0.29010

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.03324	9.80745	4.88294
#2	-0.03416	9.80278	4.88200
Mean	**-0.03370**	**9.80511**	**4.88247**
%RSD	1.93931	0.03363	0.01349

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:18
SampleId1 : MIXAHIGH **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 11:51:37
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE11

Final concentrations

20000244 20000244

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00059	485.63450	-0.00076	0.01807	0.00034	0.00076	0.01198	482.75811	0.00031
#2	-0.00015	487.17709	0.00550	0.01520	0.00031	0.00072	0.01403	483.95950	0.00023
Mean	**-0.00037**	**486.40580**	**0.00237**	**0.01663**	**0.00032**	**0.00074**	**0.01301**	**483.35881**	**0.00027**
%RSD	82.67661	0.22425	186.66570	12.20612	6.17097	3.10828	11.18644	0.17575	20.47856

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00067	0.00433	-0.00828	191.13290	247.23056	9.82467	484.73208	-0.00629	0.00111
#2	0.00080	0.00442	-0.00849	191.67015	248.01776	9.85013	486.35955	-0.00629	0.00170
Mean	**0.00073**	**0.00438**	**-0.00838**	**191.40152**	**247.62416**	**9.83740**	**485.54581**	**-0.00629**	**0.00140**
%RSD	12.66860	1.29954	1.72897	0.19848	0.22479	0.18298	0.23701	0.00000	30.05739

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	249.22685	0.00042	0.02273	0.00625	0.00279	0.01426	0.00715	0.01658	-0.00763
#2	248.98718	0.00077	0.01683	0.00574	0.00184	0.02271	0.01019	0.00497	-0.01086
Mean	**249.10701**	**0.00060**	**0.01978**	**0.00599**	**0.00231**	**0.01848**	**0.00867**	**0.01078**	**-0.00925**
%RSD	0.06803	41.15807	21.09435	6.08548	29.10397	32.31237	24.75510	76.13407	24.68893

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00682	0.00316	0.00320	0.00799	-0.00141	-0.00372	0.10139	-0.00530	0.02357
#2	-0.00110	0.00125	0.00307	0.00896	-0.00169	0.00075	0.09167	-0.00520	0.02337
Mean	**0.00286**	**0.00221**	**0.00313**	**0.00847**	**-0.00155**	**-0.00149**	**0.09653**	**-0.00525**	**0.02347**
%RSD	195.64518	61.20827	3.07487	8.10529	12.85491	212.34794	7.11733	1.40189	0.61092

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00274	0.00394	0.00043
#2	0.00272	0.00313	-0.00559
Mean	**0.00273**	**0.00354**	**-0.00258**
%RSD	0.44262	16.11993	164.93792

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:18
SampleId1 : MIXCHIGH **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 11:53:28
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE14

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00021	0.11922	-0.00325	0.02082	-0.00131	0.00384	5.05095	0.14447	-0.00092
#2	0.00126	0.12756	-0.00258	0.02129	-0.00094	0.00386	5.03511	0.16058	-0.00084
Mean	**0.00052**	**0.12339**	**-0.00292**	**0.02106**	**-0.00112**	**0.00385**	**5.04303**	**0.15252**	**-0.00088**
%RSD	198.35747	4.78007	16.24303	1.58486	23.24746	0.37046	0.22210	7.46567	6.22663

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

20000245

	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00491	-0.00962	0.00118	0.04239	-0.25308	0.00578	-0.23457	0.00429	-0.00022
#2	0.00538	-0.00934	0.00135	0.05207	-0.23242	0.00591	-0.22313	0.00447	0.00009
Mean	**0.00514**	**-0.00948**	**0.00127**	**0.04723**	**-0.24275**	**0.00585**	**-0.22885**	**0.00438**	**-0.00006**
%RSD	6.48266	2.06812	9.17192	14.49967	6.01786	1.56287	3.53488	2.97465	354.73990

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04794	-0.00066	0.01263	-0.00278	0.00425	50.72371	0.00063	-0.01267	0.00197
#2	-0.04501	-0.00075	0.01463	0.00036	0.00345	50.63416	0.00188	-0.01029	-0.00374
Mean	**-0.04648**	**-0.00070**	**0.01363**	**-0.00121**	**0.00385**	**50.67893**	**0.00125**	**-0.01148**	**-0.00089**
%RSD	4.46435	8.77689	10.37742	183.02280	14.79761	0.12494	70.44290	14.68474	454.45709

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.02861	0.01389	-0.00032	-0.46709	0.00901	0.00494	50.10988	-0.00705	-0.00069
#2	-0.02768	0.01748	-0.00024	-0.46881	0.00896	0.00408	49.98947	-0.00636	-0.00076
Mean	**-0.02815**	**0.01569**	**-0.00028**	**-0.46795**	**0.00898**	**0.00451**	**50.04968**	**-0.00670**	**-0.00073**
%RSD	2.33275	16.14680	19.91715	0.25976	0.44409	13.53633	0.17012	7.29721	6.57690

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	5.06577	0.00191	-0.00291
#2	5.04846	0.00242	-0.00592
Mean	**5.05711**	**0.00216**	**-0.00441**
%RSD	0.24208	16.56218	48.29909

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:18
SampleId1 : ICV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 12:30:22
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD1

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09825	24.93697	0.25384	0.48368	0.49822	0.24777	0.25236	24.43901	0.24489
#2	0.09866	25.01343	0.25477	0.48518	0.49896	0.24826	0.25158	24.50858	0.24479
Mean	**0.09846**	**24.97520**	**0.25430**	**0.48443**	**0.49859**	**0.24802**	**0.25197**	**24.47380**	**0.24484**
%RSD	0.29140	0.21646	0.25844	0.21801	0.10478	0.14012	0.21926	0.20102	0.03085

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.24910	0.49711	0.48898	10.11943	24.74319	0.24476	24.75293	0.49303	0.49009
#2	0.25004	0.49712	0.48797	10.14370	24.78836	0.24483	24.83405	0.49377	0.49258
Mean	**0.24957**	**0.49711**	**0.48848**	**10.13156**	**24.76577**	**0.24480**	**24.79349**	**0.49340**	**0.49134**
%RSD	0.26648	0.00154	0.14628	0.16937	0.12898	0.01945	0.23133	0.10607	0.35869

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

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#1	24.53911	0.50006	2.40840	0.48168	0.47836	2.46248	0.24541	0.50005	0.49320
#2	24.56963	0.50303	2.42110	0.48565	0.47878	2.42429	0.24584	0.50142	0.49599
Mean	**24.55437**	**0.50154**	**2.41475**	**0.48366**	**0.47857**	**2.44339**	**0.24563**	**0.50074**	**0.49459**
%RSD	0.08788	0.41892	0.37188	0.58156	0.06242	1.10522	0.12549	0.19290	0.39873

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.38027	0.49401	0.24860	0.06056	0.23873	0.25178	2.44125	0.24380	0.50556
#2	2.39225	0.49580	0.24858	0.05983	0.23944	0.25364	2.46786	0.24408	0.50698
Mean	**2.38626**	**0.49490**	**0.24859**	**0.06019**	**0.23908**	**0.25271**	**2.45456**	**0.24394**	**0.50627**
%RSD	0.35497	0.25558	0.00821	0.85922	0.21060	0.52008	0.76652	0.08237	0.19860

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.48565	0.47946	0.49548
#2	0.48647	0.48107	0.49780
Mean	**0.48606**	**0.48026**	**0.49664**
%RSD	0.11982	0.23652	0.32962

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:19
SampleId1 : ICB **SampleId2 :** **[CB]**
Analysis commenced : 3/4/2010 12:32:14
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00074	0.03378	0.00017	0.00135	-0.00037	0.00009	-0.00540	-0.01427	-0.00008
#2	-0.00010	0.02796	-0.00169	0.00159	-0.00060	0.00004	-0.00884	-0.02055	0.00010
Mean	**-0.00042**	**0.03087**	**-0.00076**	**0.00147**	**-0.00048**	**0.00007**	**-0.00712**	**-0.01741**	**0.00001**
%RSD	108.01679	13.33550	173.65247	11.34741	33.19477	46.79758	34.11979	25.51215	1618.68921

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00049	-0.00005	-0.00118	0.00179	-0.13872	0.00404	-0.00295	0.00034	-0.00056
#2	0.00011	-0.00005	-0.00146	-0.00082	-0.15857	0.00396	-0.01245	0.00020	-0.00113
Mean	**-0.00019**	**-0.00005**	**-0.00132**	**0.00049**	**-0.14865**	**0.00400**	**-0.00770**	**0.00027**	**-0.00084**
%RSD	228.75990	3.21365	15.04312	378.34946	9.44472	1.45944	87.18602	38.44274	48.02531

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.09876	0.00000	-0.00437	-0.00247	0.00049	-0.00404	-0.00310	-0.00539	0.00199
#2	-0.10529	-0.00002	-0.00377	-0.00165	0.00332	-0.00967	-0.00031	-0.00307	0.00132
Mean	**-0.10203**	**-0.00001**	**-0.00407**	**-0.00206**	**0.00191**	**-0.00685**	**-0.00170**	**-0.00423**	**0.00165**
%RSD	4.52537	157.96498	10.41921	27.97204	105.24951	58.08200	115.68831	38.68886	28.30685

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00637	-0.00090	-0.00200	-0.00112	-0.00037	-0.00225	-0.01647	-0.00025	0.00039

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#2	-0.00758	-0.00209	-0.00208	-0.00187	-0.00047	-0.00363	-0.02090	-0.00070	-0.00002
Mean	**-0.00697**	**-0.00150**	**-0.00204**	**-0.00149**	**-0.00042**	**-0.00294**	**-0.01869**	**-0.00048**	**0.00019**
%RSD	12.32522	56.42633	2.72861	35.33117	17.23848	33.08042	16.74826	66.62652	154.35389

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00050	-0.00050	-0.00047
#2	-0.00036	0.00167	-0.00014
Mean	**-0.00043**	**0.00058**	**-0.00031**
%RSD	24.58198	261.68651	76.20713

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:19
SampleId1 : CRI **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/4/2010 12:33:53
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD3

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01993	0.44865	0.01130	0.42229	0.42926	0.01053	0.05157	5.38488	0.01129
#2	0.01640	0.42393	0.00739	0.41140	0.42562	0.01018	0.04006	5.23244	0.00954
Mean	**0.01816**	**0.43629**	**0.00935**	**0.41684**	**0.42744**	**0.01035**	**0.04582**	**5.30866**	**0.01041**
%RSD	13.74519	4.00551	29.56306	1.84702	0.60152	2.43564	17.76160	2.03058	11.88965

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10496	0.02151	0.05241	0.22301	4.09616	0.02051	5.37773	0.03161	0.02099
#2	0.10012	0.01860	0.04941	0.21529	4.00081	0.02028	5.21404	0.03069	0.01896
Mean	**0.10254**	**0.02005**	**0.05091**	**0.21915**	**4.04849**	**0.02040**	**5.29588**	**0.03115**	**0.01998**
%RSD	3.33868	10.25637	4.17937	2.49159	1.66539	0.78940	2.18565	2.09264	7.16659

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.39286	0.08441	0.21466	0.00677	0.00616	0.20996	0.12464	0.00638	0.01038
#2	4.36461	0.08041	0.20485	-0.00898	0.01473	0.19024	0.11545	-0.00676	0.01961
Mean	**4.37873**	**0.08241**	**0.20975**	**-0.00110**	**0.01045**	**0.20010**	**0.12005**	**-0.00019**	**0.01499**
%RSD	0.45623	3.43753	3.30679	1011.48831	57.97688	6.96648	5.41197	4851.14970	43.53954

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10669	0.10819	0.01961	0.10346	0.02104	0.01920	0.20087	0.10657	0.04256
#2	0.09394	0.09948	0.01917	0.09100	0.02015	0.01462	0.15412	0.10282	0.03986
Mean	**0.10032**	**0.10384**	**0.01939**	**0.09723**	**0.02060**	**0.01691**	**0.17749**	**0.10470**	**0.04121**
%RSD	8.98441	5.93367	1.62206	9.06247	3.04629	19.13277	18.62204	2.53154	4.63904

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.05146	0.00637	0.00905
#2	0.04989	0.00684	0.01083

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Mean	**0.05068**	**0.00660**	**0.00994CH**
%RSD	2.19523	5.01263	12.68395

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:19
SampleId1 : ICSA **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/4/2010 12:35:45
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD4

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00143	259.31381	-0.00046	-0.00089	-0.00014	0.00042	0.00019	254.49008	-0.00001
#2	0.00010	260.29239	0.00028	-0.00054	-0.00020	0.00040	0.00147	255.22647	0.00024
Mean	**-0.00067**	**259.80310**	**-0.00009**	**-0.00071**	**-0.00017**	**0.00041**	**0.00083**	**254.85827**	**0.00012**
%RSD	162.78791	0.26634	599.28987	35.13785	23.40877	2.49479	109.03852	0.20431	150.55926

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00064	-0.00083	-0.00568	104.71532	-0.30072	0.00553	263.22955	-0.00050	-0.00089
#2	0.00129	-0.00073	-0.00518	104.95737	-0.30048	0.00553	264.05430	-0.00032	-0.00203
Mean	**0.00097**	**-0.00078**	**-0.00543**	**104.83635**	**-0.30060**	**0.00553**	**263.64193**	**-0.00041**	**-0.00146**
%RSD	47.84729	8.88199	6.41875	0.16326	0.05697	0.03643	0.22120	31.73016	55.17219

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.09483	0.00072	0.00693	-0.00339	0.00691	0.00018	0.00142	-0.00613	0.00417
#2	-0.09488	0.00092	0.00493	-0.00068	0.00454	0.01144	0.00552	-0.00327	-0.00402
Mean	**-0.09486**	**0.00082**	**0.00593**	**-0.00203**	**0.00572**	**0.00581**	**0.00347**	**-0.00470**	**0.00008**
%RSD	0.03660	17.11481	23.85638	94.40284	29.31217	136.95947	83.38144	43.00707	7477.73927

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01396	-0.00567	0.01097	-0.00791	-0.00081	-0.00769	0.03278	-0.00372	0.00086
#2	-0.01208	-0.00090	0.01106	-0.00612	-0.00079	-0.00425	0.03655	-0.00292	0.00106
Mean	**-0.01302**	**-0.00329**	**0.01101**	**-0.00702**	**-0.00080**	**-0.00597**	**0.03466**	**-0.00332**	**0.00096**
%RSD	10.24980	102.75223	0.55270	18.03969	1.81265	40.77430	7.69431	16.88329	14.88790

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00182	0.00348	0.00074
#2	0.00209	0.00280	-0.00377
Mean	**0.00196**	**0.00314**	**-0.00151**
%RSD	9.73185	15.26165	210.54533

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:20
SampleId1 : ICSAB **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/4/2010 12:37:36
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD5

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Final concentrations:**56** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20303	262.17643	0.11266	0.99853	0.51473	0.47318	0.53328	255.35062	1.00150
#2	0.20438	263.49800	0.11285	1.00191	0.51731	0.47445	0.53597	256.07275	1.00311
Mean	**0.20371**	**262.83722**	**0.11276**	**1.00022**	**0.51602**	**0.47381**	**0.53462**	**255.71168**	**1.00230**
%RSD	0.47098	0.35554	0.11665	0.23881	0.35438	0.18949	0.35483	0.19969	0.11340

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.46675	0.47042	0.51331	105.22377	-0.29491	1.09770	265.49516	0.46801	0.98871
#2	0.46855	0.47186	0.51505	105.55217	-0.29927	1.10398	266.44156	0.46968	0.98890
Mean	**0.46765**	**0.47114**	**0.51418**	**105.38797**	**-0.29709**	**1.10084**	**265.96836**	**0.46884**	**0.98880**
%RSD	0.27204	0.21703	0.23932	0.22035	1.03755	0.40363	0.25161	0.25111	0.01300

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.10421	0.92909	1.02335	0.05426	0.05576	1.01609	0.60713	0.06364	0.05492
#2	-0.10402	0.93035	1.02546	0.05375	0.05468	1.02455	0.60824	0.04733	0.05762
Mean	**-0.10411**	**0.92972**	**1.02441**	**0.05401**	**0.05522**	**1.02032**	**0.60768**	**0.05548**	**0.05627**
%RSD	0.13337	0.09543	0.14546	0.67410	1.38294	0.58649	0.12887	20.78073	3.38885

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.95640	0.99649	1.00878	-0.04658	0.95185	0.11114	10.25803	0.48128	0.87931
#2	0.96259	0.99493	1.01429	-0.04744	0.95506	0.10744	10.29304	0.48265	0.88107
Mean	**0.95950**	**0.99571**	**1.01153**	**-0.04701**	**0.95346**	**0.10929**	**10.27553**	**0.48197**	**0.88019**
%RSD	0.45565	0.11034	0.38511	1.29431	0.23878	2.39729	0.24095	0.20048	0.14163

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.49938	0.05526	0.05783
#2	0.50067	0.05437	0.05419
Mean	**0.50002**	**0.05482**	**0.05601**
%RSD	0.18164	1.15040	4.58403

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:20
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 12:39:28
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19776	50.31463	0.51720	0.98585	0.99138	0.49903	0.50235	50.03481	0.49521
#2	0.19949	50.36713	0.51914	0.98278	0.99061	0.49920	0.51053	50.10784	0.49514
Mean	**0.19862**	**50.34088**	**0.51817**	**0.98431**	**0.99100**	**0.49911**	**0.50644**	**50.07133**	**0.49518**
%RSD	0.61729	0.07375	0.26351	0.22010	0.05486	0.02370	1.14262	0.10314	0.00973

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	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50365	1.00133	0.97520	20.63109	51.38182	0.52104	51.06390	0.99191	0.99637
#2	0.50483	1.00264	0.97392	20.65084	51.45464	0.52125	51.13608	0.99310	0.99892
Mean	**0.50424**	**1.00198**	**0.97456**	**20.64096**	**51.41823**	**0.52114**	**51.09999**	**0.99250**	**0.99765**
%RSD	0.16466	0.09213	0.09290	0.06768	0.10014	0.02957	0.09988	0.08469	0.18039

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.52297	1.00787	4.89631	0.98284	0.96977	4.96814	0.49283	1.01756	1.00414
#2	49.57772	1.00934	4.91967	0.98860	0.97017	4.98235	0.49349	1.02385	1.01148
Mean	**49.55035**	**1.00861**	**4.90799**	**0.98572**	**0.96997**	**4.97524**	**0.49316**	**1.02070**	**1.00781**
%RSD	0.07814	0.10275	0.33658	0.41378	0.02944	0.20204	0.09434	0.43555	0.51539

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.81484	1.01433	0.49784	0.12736	0.47801	0.51071	4.89790	0.48929	1.03293
#2	4.81687	1.01003	0.49756	0.12647	0.47803	0.50280	4.91073	0.49070	1.03870
Mean	**4.81585**	**1.01218**	**0.49770**	**0.12692**	**0.47802**	**0.50675**	**4.90432**	**0.48999**	**1.03581**
%RSD	0.02979	0.29984	0.03921	0.49808	0.00303	1.10334	0.18501	0.20465	0.39367

	Zr	Pb	Se
	ppm	calc	calc
#1	0.97901	0.97412	1.00861
#2	0.97877	0.97631	1.01560
Mean	**0.97889**	**0.97522**	**1.01210**
%RSD	0.01704	0.15881	0.48858

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:20
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/4/2010 12:41:20
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00028	0.06467	0.00144	0.00175	-0.00009	0.00032	-0.00216	0.01497	0.00047
#2	-0.00102	0.05191	-0.00080	0.00179	-0.00045	0.00024	-0.00639	-0.00193	-0.00029
Mean	**-0.00037**	**0.05829**	**0.00032**	**0.00177**	**-0.00027**	**0.00028**	**-0.00427**	**0.00652**	**0.00009**
%RSD	246.25650	15.47554	491.03937	1.57525	96.34228	20.70664	69.97900	183.40463	584.50565

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00040	0.00073	-0.00041	0.01387	-0.08666	0.00424	0.02943	0.00064	-0.00097
#2	-0.00051	-0.00020	-0.00117	0.00727	-0.12250	0.00412	0.00460	0.00034	-0.00035
Mean	**-0.00006**	**0.00026**	**-0.00079**	**0.01057**	**-0.10458**	**0.00418**	**0.01701**	**0.00049**	**-0.00066**
%RSD	1171.20081	247.54899	68.01538	44.13784	24.22783	1.87973	103.17546	42.34968	66.83435

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	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.08988	0.00067	-0.00167	0.00399	0.00039	-0.00826	0.00170	-0.00090	0.00143
#2	-0.09719	-0.00037	-0.00157	-0.00435	0.00353	0.00018	-0.00143	-0.00248	0.00125
Mean	**-0.09353**	**0.00015**	**-0.00162**	**-0.00018**	**0.00196**	**-0.00404**	**0.00014**	**-0.00169**	**0.00134**
%RSD	5.53029	490.69298	4.35969	3275.17641	113.24680	147.84343	1626.43306	66.22148	9.20866

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00266	-0.00233	-0.00184	-0.00009	-0.00015	-0.00047	0.00025	0.00065	0.00052
#2	-0.00567	-0.00078	-0.00202	0.00093	-0.00027	-0.00283	-0.02583	-0.00094	0.00066
Mean	**-0.00417**	**-0.00156**	**-0.00193**	**0.00042**	**-0.00021**	**-0.00165**	**-0.01279**	**-0.00015**	**0.00059**
%RSD	51.01617	70.54138	6.57018	171.24296	37.90694	101.12756	144.13738	761.88264	16.16496

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00005	0.00159	0.00065
#2	-0.00076	0.00090	0.00001
Mean	**-0.00036**	**0.00125**	**0.00033**
%RSD	159.34113	38.92101	137.27324

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:20
SampleId1 : IP100303-1MB SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 12:43:12
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE1

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00130	0.04336	0.00270	-0.00002	0.00006	0.00018	-0.01149	-0.00673	-0.00010
#2	-0.00166	0.04520	-0.00165	-0.00077	0.00017	0.00018	-0.00747	-0.00627	0.00010
Mean	**-0.00148**	**0.04428**	**0.00053**	**-0.00040**	**0.00011**	**0.00018**	**-0.00948**	**-0.00650**	**0.00000**
%RSD	17.41560	2.93515	585.09156	132.86987	71.44988	0.32472	30.02330	4.96741	21249.00686

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00078	-0.00071	-0.00187	0.00408	-0.15785	0.00392	-0.01094	0.00031	0.00041
#2	-0.00064	-0.00016	-0.00180	0.00440	-0.18230	0.00388	-0.00943	0.00034	0.00079
Mean	**-0.00071**	**-0.00043**	**-0.00184**	**0.00424**	**-0.17008**	**0.00390**	**-0.01019**	**0.00033**	**0.00060**
%RSD	13.07902	89.16648	2.44763	5.32614	10.16771	0.77474	10.48999	7.98314	45.90008

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.10328	-0.00117	0.00173	-0.00474	0.00615	-0.01389	-0.00534	-0.00411	0.00760
#2	-0.10436	-0.00093	0.00833	-0.00371	0.00478	-0.00685	-0.00148	0.00140	0.00645
Mean	**-0.10382**	**-0.00105**	**0.00503**	**-0.00423**	**0.00547**	**-0.01037**	**-0.00341**	**-0.00136**	**0.00702**
%RSD	0.73563	15.91919	92.81717	17.21755	17.61190	47.97357	80.01836	286.94794	11.58086

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

20000252

20000252

	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01162	-0.00090	-0.00193	0.00045	0.00023	-0.00158	-0.03665	-0.00072	0.00235
#2	-0.00783	-0.00377	-0.00193	-0.00286	0.00009	0.00031	-0.02730	-0.00014	0.00188
Mean	**-0.00973**	**-0.00233**	**-0.00193**	**-0.00120**	**0.00016**	**-0.00063**	**-0.03198**	**-0.00043**	**0.00211**
%RSD	27.50114	86.86394	0.00000	194.43266	59.37904	209.64968	20.67252	95.47794	15.83994

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00135	0.00252	0.00370
#2	-0.00103	0.00196	0.00476
Mean	**-0.00119**	**0.00224**	**0.00423**
%RSD	18.98503	17.85979	17.83111

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:21
SampleId1 : M100015-1 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 12:44:58
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00289	0.08537	0.02042	0.04206	0.00162	0.00141	0.01231	0.02764	0.00205
#2	0.00290	0.08114	0.01852	0.04162	0.00153	0.00142	0.00632	0.02696	0.00214
Mean	**0.00289**	**0.08326**	**0.01947**	**0.04184**	**0.00157**	**0.00141**	**0.00932**	**0.02730**	**0.00209**
%RSD	0.29136	3.59287	6.89316	0.73109	3.82506	0.13518	45.46481	1.77473	3.20998

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00419	0.00578	0.00327	0.05308	-0.03703	0.01650	0.02576	0.00149	0.01053
#2	0.00401	0.00509	0.00342	0.05260	-0.04890	0.01655	0.02230	0.00149	0.00972
Mean	**0.00410**	**0.00543**	**0.00335**	**0.05284**	**-0.04297**	**0.01653**	**0.02403**	**0.00149**	**0.01013**
%RSD	3.16721	9.03369	3.24406	0.64086	19.52304	0.20704	10.16374	0.00000	5.61905

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03145	0.00397	0.05595	0.00900	0.01035	0.03256	0.01762	0.02198	0.02161
#2	-0.03105	0.00391	0.05335	0.00821	0.01172	0.03397	0.02030	0.01674	0.02513
Mean	**-0.03125**	**0.00394**	**0.05465**	**0.00861**	**0.01103**	**0.03326**	**0.01896**	**0.01936**	**0.02337**
%RSD	0.88892	1.11670	3.36574	6.52474	8.75452	2.99247	9.97706	19.14197	10.64912

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04271	0.02226	0.00013	-0.00089	0.00412	0.02421	0.09715	0.00394	0.01370
#2	0.04239	0.02154	0.00011	-0.00009	0.00426	0.02388	0.08190	0.00410	0.01390
Mean	**0.04255**	**0.02190**	**0.00012**	**-0.00049**	**0.00419**	**0.02405**	**0.08953**	**0.00402**	**0.01380**
%RSD	0.53056	2.31350	8.59836	114.20195	2.33548	0.98193	12.04794	2.95085	1.03862

	Zr	**Pb**	**Se**
	ppm	calc	calc

20000253

#1	0.00911	0.00990	0.02173	**CH**
#2	0.00878	0.01055	0.02233	
Mean	**0.00894**	**0.01023**	**0.02203**	
%RSD	2.57770	4.47148	1.93098	

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:21
SampleId1 : M100015-2 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 12:46:43
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE3

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00339	0.07472	0.02064	0.04064	0.00085	0.00135	0.00956	0.02684	0.00217
#2	0.00336	0.07155	0.02020	0.04072	0.00062	0.00132	0.00838	0.02559	0.00162
Mean	**0.00337**	**0.07314**	**0.02042**	**0.04068**	**0.00074**	**0.00133**	**0.00897**	**0.02621**	**0.00190**
%RSD	0.73204	3.06352	1.54653	0.13672	21.79185	1.65517	9.30126	3.38833	20.62603

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00387	0.00439	0.00349	0.04483	-0.08666	0.01635	0.02209	0.00149	0.01022
#2	0.00406	0.00425	0.00264	0.04420	-0.09708	0.01632	0.02101	0.00130	0.00910
Mean	**0.00397**	**0.00432**	**0.00306**	**0.04452**	**-0.09187**	**0.01634**	**0.02155**	**0.00140**	**0.00966**
%RSD	3.26424	2.25634	19.62755	1.01429	8.01296	0.13556	3.54210	9.33911	8.17120

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.02742	0.00492	0.05355	0.00973	0.01199	0.04241	0.01870	0.02015	0.02202
#2	-0.02781	0.00467	0.04834	0.00882	0.01089	0.03678	0.01798	0.01637	0.02185
Mean	**-0.02762**	**0.00479**	**0.05095**	**0.00928**	**0.01144**	**0.03960**	**0.01834**	**0.01826**	**0.02194**
%RSD	1.00590	3.67227	7.22048	6.94925	6.80315	10.05513	2.78066	14.61509	0.56183

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04217	0.02011	0.00007	0.00309	0.00436	0.02385	0.09027	0.00380	0.01343
#2	0.04156	0.01796	0.00006	0.00220	0.00424	0.02165	0.09027	0.00401	0.01343
Mean	**0.04187**	**0.01903**	**0.00007**	**0.00264**	**0.00430**	**0.02275**	**0.09027**	**0.00391**	**0.01343**
%RSD	1.03767	7.98309	14.96920	23.73456	1.93965	6.84646	0.00034	3.71121	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00906	0.01124	0.02140
#2	0.00886	0.01020	0.02003
Mean	**0.00896**	**0.01072**	**0.02071**
%RSD	1.95475	6.84526	4.68723

20000254

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:21
SampleId1 : M100015-3 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 12:48:29

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE4

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00361	0.06870	0.02191	0.04123	0.00059	0.00127	0.00976	0.01885	0.00231
#2	0.00325	0.07300	0.01990	0.03977	0.00065	0.00127	0.00289	0.01794	0.00203
Mean	**0.00343**	**0.07085**	**0.02090**	**0.04050**	**0.00062**	**0.00127**	**0.00632**	**0.01839**	**0.00217**
%RSD	7.31481	4.29631	6.79830	2.54031	6.44037	0.04103	76.87593	3.51228	9.05445

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00406	0.00432	0.00327	0.04207	-0.07843	0.01631	0.02209	0.00138	0.01074
#2	0.00382	0.00388	0.00278	0.04084	-0.09102	0.01639	0.01453	0.00138	0.00939
Mean	**0.00394**	**0.00410**	**0.00303**	**0.04146**	**-0.08473**	**0.01635**	**0.01831**	**0.00138**	**0.01006**
%RSD	4.21782	7.52709	11.48686	2.08751	10.50683	0.34473	29.17983	0.00000	9.48630

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03537	0.00376	0.04674	0.00918	0.00975	0.03115	0.01912	0.01626	0.02094
#2	-0.03567	0.00342	0.04884	0.00621	0.01336	0.02834	0.01906	0.02187	0.02342
Mean	**-0.03552**	**0.00359**	**0.04779**	**0.00769**	**0.01156**	**0.02974**	**0.01909**	**0.01906**	**0.02218**
%RSD	0.58650	6.61521	3.10820	27.30217	22.10374	6.69302	0.24586	20.78030	7.88569

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04075	0.01903	-0.00001	0.00178	0.00426	0.02027	0.09027	0.00392	0.01161
#2	0.03947	0.01772	0.00000	-0.00220	0.00408	0.01634	0.08535	0.00390	0.01140
Mean	**0.04011**	**0.01838**	**0.00000**	**-0.00021**	**0.00417**	**0.01830**	**0.08781**	**0.00391**	**0.01151**
%RSD	2.26639	5.05233	255.96437	1323.56303	3.13121	15.21333	3.96172	0.34193	1.24604

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00902	0.00956	0.01938
#2	0.00931	0.01098	0.02290
Mean	**0.00916**	**0.01027**	**0.02114**
%RSD	2.24502	9.77873	11.75763

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:22
SampleId1 : M100015-4 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 12:50:14
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE5

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00332	0.06951	0.02169	0.04154	0.00062	0.00136	0.00465	0.02022	0.00218
#2	0.00421	0.06748	0.02254	0.04209	0.00068	0.00137	0.00829	0.02022	0.00217

20000255

Mean	**0.00377**	**0.06849**	**0.02211**	**0.04182**	**0.00065**	**0.00136**	**0.00647**	**0.02022**	**0.00218**
%RSD	16.64444	2.09586	2.73717	0.93092	6.15985	0.47450	39.71989	0.00000	0.48684

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00416	0.00422	0.00307	0.04319	-0.03122	0.01658	0.02014	0.00130	0.00915
#2	0.00403	0.00439	0.00342	0.04319	-0.02662	0.01658	0.02079	0.00138	0.00965
Mean	**0.00410**	**0.00430**	**0.00324**	**0.04319**	**-0.02892**	**0.01658**	**0.02047**	**0.00134**	**0.00940**
%RSD	2.26253	2.82320	7.61068	0.00000	11.24494	0.03642	2.23734	3.88976	3.71024

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03655	0.00361	0.04734	0.00754	0.01170	0.02552	0.01899	0.02424	0.02450
#2	-0.03596	0.00359	0.04574	0.00757	0.01209	0.03256	0.01852	0.01378	0.02342
Mean	**-0.03626**	**0.00360**	**0.04654**	**0.00756**	**0.01189**	**0.02904**	**0.01876**	**0.01901**	**0.02396**
%RSD	1.14917	0.48917	2.43177	0.22183	2.31079	17.13806	1.78354	38.87932	3.18809

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04109	0.01796	0.00002	0.00065	0.00427	0.02233	0.08486	0.00323	0.01242
#2	0.04163	0.02154	0.00005	0.00282	0.00443	0.02248	0.09175	0.00343	0.01222
Mean	**0.04136**	**0.01975**	**0.00003**	**0.00174**	**0.00435**	**0.02240**	**0.08830**	**0.00333**	**0.01232**
%RSD	0.91235	12.82275	63.59597	88.14480	2.58655	0.46818	5.51651	4.35886	1.16400

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00901	0.01031	0.02441
#2	0.00921	0.01058	0.02021
Mean	**0.00911**	**0.01045**	**0.02231**
%RSD	1.57153	1.80770	13.31595

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:22
SampleId1 : M100015-5 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 12:51:59
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00383	0.06506	0.02009	0.04005	0.00059	0.00119	0.00671	0.01371	0.00205
#2	0.00409	0.06993	0.01986	0.04107	0.00079	0.00119	0.00996	0.01531	0.00230
Mean	**0.00396**	**0.06750**	**0.01997**	**0.04056**	**0.00069**	**0.00119**	**0.00834**	**0.01451**	**0.00218**
%RSD	4.72522	5.09834	0.79056	1.78248	20.23726	0.21249	27.54920	7.79121	8.34053

20000256

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00356	0.00403	0.00278	0.04100	-0.09974	0.01625	0.01863	0.00141	0.01003
#2	0.00469	0.00482	0.00347	0.04191	-0.08666	0.01625	0.02468	0.00145	0.01097
Mean	**0.00412**	**0.00442**	**0.00313**	**0.04146**	**-0.09320**	**0.01625**	**0.02165**	**0.00143**	**0.01050**

20000256

%RSD	19.29438	12.59376	15.54339	1.54295	9.91904	0.01239	19.73692	1.81975	6.29150

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04092	0.00376	0.04354	0.00619	0.01057	0.03256	0.01817	0.01696	0.02220
#2	-0.04038	0.00467	0.04794	0.01323	0.00876	0.03397	0.01912	0.01477	0.01823
Mean	**-0.04065**	**0.00421**	**0.04574**	**0.00971**	**0.00966**	**0.03326**	**0.01865**	**0.01587**	**0.02021**
%RSD	0.93951	15.24450	6.80434	51.29177	13.26875	2.99247	3.60569	9.75381	13.89640

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03730	0.01844	-0.00004	-0.00175	0.00404	0.01977	0.08486	0.00367	0.01032
#2	0.04269	0.01951	0.00005	-0.00005	0.00416	0.02119	0.11192	0.00438	0.01046
Mean	**0.03999**	**0.01897**	**0.00000**	**-0.00090**	**0.00410**	**0.02048**	**0.09839**	**0.00403**	**0.01039**
%RSD	9.52031	4.00380	1896.15577	133.22052	2.03428	4.91549	19.44957	12.44709	0.91984

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00877	0.00911	0.02045
#2	0.00935	0.01025	0.01708
Mean	**0.00906**	**0.00968**	**0.01876**
%RSD	4.51914	8.29955	12.73000

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:22
SampleId1 : M100015-6 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 12:53:45
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE7

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00361	0.06522	0.02020	0.04150	0.00059	0.00126	0.00780	0.01794	0.00201
#2	0.00325	0.06818	0.02195	0.04040	0.00068	0.00125	0.00750	0.01645	0.00186
Mean	**0.00343**	**0.06670**	**0.02107**	**0.04095**	**0.00064**	**0.00125**	**0.00765**	**0.01719**	**0.00194**
%RSD	7.24587	3.13314	5.87000	1.90116	9.44548	0.70058	2.76445	6.10549	5.42933

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00400	0.00442	0.00342	0.04068	-0.05374	0.01641	0.01755	0.00134	0.01037
#2	0.00393	0.00392	0.00278	0.04058	-0.07044	0.01638	0.01885	0.00127	0.01042
Mean	**0.00397**	**0.00417**	**0.00310**	**0.04063**	**-0.06209**	**0.01639**	**0.01820**	**0.00130**	**0.01040**
%RSD	1.38248	8.43860	14.40034	0.18521	19.02396	0.12282	5.03192	3.99977	0.35302

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03375	0.00372	0.04724	0.01057	0.01031	0.03678	0.02019	0.01686	0.02192
#2	-0.03488	0.00383	0.04684	0.00700	0.01104	0.02693	0.01752	0.02019	0.02164
Mean	**-0.03432**	**0.00378**	**0.04704**	**0.00878**	**0.01067**	**0.03186**	**0.01886**	**0.01852**	**0.02178**
%RSD	2.32708	2.09613	0.60148	28.79191	4.81006	21.87288	10.00954	12.73408	0.90459

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ted: 3/4/2010 17:29:56 User: ROY FRENCH

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03933	0.02202	0.00002	0.00076	0.00434	0.02320	0.09076	0.00399	0.01059
#2	0.03819	0.01820	-0.00003	-0.00365	0.00395	0.01969	0.08289	0.00349	0.01032
Mean	**0.03876**	**0.02011**	**0.00000**	**-0.00144**	**0.00415**	**0.02144**	**0.08683**	**0.00374**	**0.01046**
%RSD	2.07932	13.43289	767.89415	215.84652	6.73459	11.56108	6.41158	9.52638	1.82779

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00912	0.01040	0.02023
#2	0.00911	0.00969	0.02116
Mean	**0.00912**	**0.01005**	**0.02070**
%RSD	0.11865	4.97529	3.16077

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:22
SampleId1 : M100015-7 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 12:55:30
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE8

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00357	0.06574	0.01994	0.04017	0.00068	0.00121	0.00731	0.01668	0.00239
#2	0.00388	0.06983	0.02295	0.03997	0.00065	0.00119	0.00966	0.01679	0.00222
Mean	**0.00372**	**0.06778**	**0.02144**	**0.04007**	**0.00067**	**0.00120**	**0.00848**	**0.01674**	**0.00230**
%RSD	5.96626	4.26129	9.94079	0.34699	3.01428	1.03308	19.64863	0.48247	5.11117

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00416	0.00382	0.00306	0.06000	-0.06294	0.01624	0.02057	0.00149	0.01014
#2	0.00487	0.00412	0.00291	0.05989	-0.05664	0.01631	0.02381	0.00152	0.01009
Mean	**0.00451**	**0.00397**	**0.00298**	**0.05995**	**-0.05979**	**0.01627**	**0.02219**	**0.00151**	**0.01011**
%RSD	11.06118	5.26541	3.54115	0.12554	7.44418	0.29688	10.31625	1.73068	0.36298

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03778	0.00482	0.04154	0.00944	0.01026	0.03397	0.01996	0.01821	0.01903
#2	-0.03768	0.00453	0.04854	0.00844	0.00946	0.03115	0.01888	0.01353	0.01983
Mean	**-0.03773**	**0.00467**	**0.04504**	**0.00894**	**0.00986**	**0.03256**	**0.01942**	**0.01587**	**0.01943**
%RSD	0.18405	4.32992	10.99336	7.90181	5.72000	6.11431	3.90834	20.86358	2.91558

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03687	0.01700	0.00000	-0.00035	0.00417	0.01866	0.09813	0.00448	0.01107
#2	0.04065	0.02071	-0.00001	0.00152	0.00418	0.02155	0.10797	0.00405	0.01107
Mean	**0.03876**	**0.01885**	**0.00000**	**0.00059**	**0.00417**	**0.02010**	**0.10305**	**0.00426**	**0.01107**
%RSD	6.89536	13.87996	255.96437	225.32153	0.26077	10.17930	6.75284	7.11409	0.00000

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	0.00893	0.00999	0.01876
#2	0.00902	0.00912	0.01773
Mean	**0.00897**	**0.00956**	**0.01824**
%RSD	0.71204	6.39985	3.97209

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:23
SampleId1 : M100015-8 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 12:57:15
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE9

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00339	0.06276	0.02001	0.04001	0.00054	0.00119	0.00622	0.01451	0.00174
#2	0.00368	0.06271	0.01875	0.04033	0.00057	0.00117	0.01241	0.01519	0.00234
Mean	**0.00353**	**0.06274**	**0.01938**	**0.04017**	**0.00055**	**0.00118**	**0.00932**	**0.01485**	**0.00204**
%RSD	5.73452	0.05636	4.61750	0.55383	3.63390	0.94403	46.93632	3.26207	20.84187

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00353	0.00421	0.00306	0.04260	-0.10749	0.01625	0.01712	0.00130	0.01035
#2	0.00414	0.00433	0.00363	0.04212	-0.10458	0.01621	0.01993	0.00130	0.00902
Mean	**0.00383**	**0.00427**	**0.00334**	**0.04236**	**-0.10603**	**0.01623**	**0.01852**	**0.00130**	**0.00968**
%RSD	11.09201	1.88561	12.01466	0.79941	1.93751	0.19844	10.71193	0.00000	9.66544

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04171	0.00393	0.04394	0.00883	0.00996	0.03115	0.01930	0.02052	0.02059
#2	-0.04176	0.00391	0.04604	0.00943	0.01014	0.03115	0.02018	0.01869	0.02133
Mean	**-0.04173**	**0.00392**	**0.04499**	**0.00913**	**0.01005**	**0.03115**	**0.01974**	**0.01961**	**0.02096**
%RSD	0.08320	0.44881	3.30168	4.70110	1.29495	0.00000	3.14918	6.61591	2.46804

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03932	0.01784	-0.00005	-0.00238	0.00395	0.02219	0.09322	0.00364	0.01026
#2	0.03979	0.01772	-0.00004	-0.00206	0.00403	0.02136	0.09125	0.00358	0.01093
Mean	**0.03956**	**0.01778**	**-0.00004**	**-0.00222**	**0.00399**	**0.02177**	**0.09224**	**0.00361**	**0.01059**
%RSD	0.84356	0.47515	11.68287	9.92649	1.36425	2.70039	1.50863	1.09847	4.51118

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00898	0.00958	0.02057
#2	0.00910	0.00991	0.02045
Mean	**0.00904**	**0.00974**	**0.02051**
%RSD	0.86428	2.35786	0.42382

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SampleId1 : M100015-9 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 12:59:01
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE10

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00043	0.03891	0.00836	0.01874	0.00159	0.00054	-0.00009	-0.00342	0.00071
#2	0.00162	0.04181	0.00866	0.01893	0.00170	0.00055	0.00041	-0.00228	0.00115
Mean	**0.00102**	**0.04036**	**0.00851**	**0.01883**	**0.00164**	**0.00054**	**0.00016**	**-0.00285**	**0.00093**
%RSD	82.46328	5.09036	2.47408	0.73827	4.88010	0.81793	217.51291	28.35286	33.83878

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00134	0.00185	0.00000	0.01834	-0.17819	0.00993	-0.00770	0.00057	0.00417
#2	0.00166	0.00273	0.00161	0.01876	-0.17431	0.00992	-0.00101	0.00064	0.00419
Mean	**0.00150**	**0.00229**	**0.00080**	**0.01855**	**-0.17625**	**0.00992**	**-0.00436**	**0.00060**	**0.00418**
%RSD	14.80946	27.46871	141.52355	1.62254	1.55431	0.10148	108.59478	8.64567	0.43890

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.08079	0.00214	0.03024	0.00486	0.00794	0.00863	0.00661	0.00235	0.01394
#2	-0.08099	0.00177	0.02334	0.00666	0.00648	0.00441	0.00940	0.00857	0.01091
Mean	**-0.08089**	**0.00195**	**0.02679**	**0.00576**	**0.00721**	**0.00652**	**0.00800**	**0.00546**	**0.01242**
%RSD	0.17167	13.50256	18.22102	22.09047	14.31103	45.81401	24.60444	80.52553	17.25580

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01494	0.00853	-0.00111	-0.00111	0.00173	0.01110	0.02091	0.00173	0.00762
#2	0.01647	0.00865	-0.00108	-0.00293	0.00171	0.01136	0.04551	0.00190	0.00721
Mean	**0.01570**	**0.00859**	**-0.00109**	**-0.00202**	**0.00172**	**0.01123**	**0.03321**	**0.00181**	**0.00742**
%RSD	6.85181	0.98298	1.85404	63.68694	0.84189	1.68147	52.38390	6.55130	3.86583

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00357	0.00692	0.01008
#2	0.00412	0.00654	0.01013
Mean	**0.00384**	**0.00673**	**0.01010**
%RSD	10.26807	3.93418	0.34517

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:23
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 13:00:47
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

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#1	0.19388	49.51111	0.49607	0.95513	0.97828	0.47932	0.49586	47.89256	0.48040
#2	0.19363	49.41326	0.49923	0.94888	0.97771	0.47805	0.49606	47.79198	0.47863
Mean	**0.19376**	**49.46219**	**0.49765**	**0.95200**	**0.97800**	**0.47869**	**0.49596**	**47.84227**	**0.47952**
%RSD	0.08979	0.13988	0.44853	0.46392	0.04118	0.18766	0.02753	0.14865	0.26096

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.48423	0.96443	0.96064	19.88998	51.10855	0.51765	48.87394	0.95837	0.96469
#2	0.48297	0.96311	0.95930	19.85997	51.01376	0.51712	48.77945	0.95729	0.96196
Mean	**0.48360**	**0.96377**	**0.95997**	**19.87497**	**51.06116**	**0.51739**	**48.82669**	**0.95783**	**0.96333**
%RSD	0.18334	0.09632	0.09881	0.10676	0.13127	0.07240	0.13684	0.07951	0.20015

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.26497	0.96953	4.81445	0.94251	0.92645	4.83169	0.47918	0.99342	0.97229
#2	49.15743	0.96670	4.78033	0.93942	0.93091	4.84021	0.47823	0.98371	0.97952
Mean	**49.21120**	**0.96811**	**4.79739**	**0.94097**	**0.92868**	**4.83595**	**0.47870**	**0.98857**	**0.97591**
%RSD	0.15453	0.20686	0.50287	0.23267	0.34004	0.12468	0.14107	0.69463	0.52417

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.69437	0.96129	0.48891	0.12183	0.46497	0.49189	4.83862	0.47487	0.97717
#2	4.68464	0.96331	0.48891	0.12030	0.46465	0.49890	4.83914	0.47423	0.97595
Mean	**4.68951**	**0.96230**	**0.48891**	**0.12106**	**0.46481**	**0.49539**	**4.83888**	**0.47455**	**0.97656**
%RSD	0.14664	0.14897	0.00000	0.89316	0.04826	1.00103	0.00752	0.09515	0.08841

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.95318	0.93180	0.97933
#2	0.95236	0.93375	0.98092
Mean	**0.95277**	**0.93277**	**0.98012**
%RSD	0.06100	0.14766	0.11481

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:24
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/4/2010 13:02:39
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00015	0.04543	0.00110	0.00072	-0.00026	0.00019	0.00089	-0.00890	0.00034
#2	0.00059	0.03744	0.00036	0.00123	-0.00028	0.00012	-0.00059	-0.01404	0.00031
Mean	**0.00022**	**0.04144**	**0.00073**	**0.00098**	**-0.00027**	**0.00015**	**0.00015**	**-0.01147**	**0.00033**
%RSD	240.24486	13.63858	72.00601	36.93414	7.41094	32.77565	693.77961	31.68042	4.82406

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00038	0.00061	-0.00013	0.00440	-0.11039	0.00414	0.00590	0.00046	0.00048

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#2	0.00038	0.00077	-0.00028	0.00238	-0.11136	0.00410	0.00244	0.00042	-0.00154
Mean	**0.00038**	**0.00069**	**-0.00020**	**0.00339**	**-0.11088**	**0.00412**	**0.00417**	**0.00044**	**-0.00053**
%RSD	0.09798	16.16529	51.70393	42.21055	0.61764	0.63568	58.57600	5.96337	270.47089

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.09547	0.00021	0.00303	0.00085	-0.00050	-0.00122	-0.00054	-0.00559	-0.00164
#2	-0.10048	0.00020	-0.00477	0.00329	0.00040	0.00159	0.00122	-0.00175	0.00185
Mean	**-0.09798**	**0.00021**	**-0.00087**	**0.00207**	**-0.00005**	**0.00018**	**0.00034**	**-0.00367**	**0.00010**
%RSD	3.61410	4.25847	632.58193	83.39375	1314.55131	1085.22346	365.82000	73.89453	2367.39418

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00456	-0.00150	-0.00195	-0.00003	-0.00018	0.00328	0.00370	0.00012	0.00073
#2	-0.00370	-0.00042	-0.00197	-0.00262	-0.00045	0.00351	0.01255	0.00057	0.00066
Mean	**-0.00413**	**-0.00096**	**-0.00196**	**-0.00133**	**-0.00032**	**0.00340**	**0.00813**	**0.00035**	**0.00069**
%RSD	14.71153	79.26277	0.77687	137.86111	59.26918	4.60330	77.08681	91.50317	6.89952

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00022	-0.00005	-0.00295
#2	0.00005	0.00137	0.00065
Mean	**-0.00008**	**0.00066**	**-0.00115**
%RSD	235.59263	152.45922	220.87873

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:24
SampleId1 : IP100303-2MB SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 13:04:30
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE11

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00032	0.03335	-0.00120	0.00013	-0.00051	-0.00002	-0.00020	-0.02078	-0.00018
#2	-0.00056	0.02742	0.00006	-0.00081	-0.00057	-0.00004	-0.00904	-0.02055	0.00004
Mean	**-0.00044**	**0.03039**	**-0.00057**	**-0.00034**	**-0.00054**	**-0.00003**	**-0.00462**	**-0.02066**	**-0.00007**
%RSD	38.85090	13.81380	156.52295	197.07042	7.42704	63.73178	135.29334	0.78159	234.59156

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00038	0.00016	-0.00097	-0.00087	-0.22468	0.00380	-0.01396	0.00020	-0.00071
#2	-0.00033	0.00006	-0.00139	-0.00071	-0.24599	0.00378	-0.02001	0.00012	-0.00097
Mean	**-0.00036**	**0.00011**	**-0.00118**	**-0.00079**	**-0.23533**	**0.00379**	**-0.01699**	**0.00016**	**-0.00084**
%RSD	10.19936	62.65477	25.11692	14.29234	6.40295	0.37243	25.16219	32.45462	21.82969

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.11320	-0.00060	0.00903	-0.00091	0.00178	-0.01108	0.00350	-0.00031	0.00007
#2	-0.11418	-0.00071	0.00553	-0.00239	0.00229	-0.00545	-0.00061	0.00119	0.00049

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Mean	**-0.11369**	**-0.00065**	**0.00728**	**-0.00165**	**0.00203**	**-0.00826**	**0.00144**	**0.00044**	**0.00028**
%RSD	0.61069	12.14607	34.00483	63.42255	17.87087	48.18667	200.88669	243.00143	106.40122

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00285	-0.00138	-0.00211	0.00090	-0.00027	-0.00051	-0.00909	-0.00018	0.00201
#2	-0.00420	-0.00150	-0.00213	-0.00044	-0.00034	0.00215	-0.01746	-0.00040	0.00154
Mean	**-0.00352**	**-0.00144**	**-0.00212**	**0.00023**	**-0.00031**	**0.00082**	**-0.01327**	**-0.00029**	**0.00177**
%RSD	26.95653	5.87278	0.71894	417.50395	17.81477	230.28809	44.55414	54.68956	18.85722

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00065	0.00088	-0.00006
#2	-0.00087	0.00073	0.00072
Mean	**-0.00076**	**0.00081**	**0.00033**
%RSD	20.37059	13.22655	166.49696

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:24
SampleId1 : M100016-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:06:16
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE12

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00173	0.05132	0.01856	0.03911	0.00045	0.00118	0.00052	0.01417	0.00150
#2	0.00507	0.06671	0.02139	0.04021	0.00088	0.00115	0.01399	0.01645	0.00222
Mean	**0.00340**	**0.05902**	**0.01997**	**0.03966**	**0.00067**	**0.00116**	**0.00726**	**0.01531**	**0.00186**
%RSD	69.44754	18.44487	10.01373	1.96338	45.21416	1.87124	131.21594	10.54914	27.29832

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00293	0.00321	0.00209	0.05601	-0.09005	0.01680	0.01065	0.00127	0.00939
#2	0.00442	0.00528	0.00367	0.05654	-0.06512	0.01675	0.02683	0.00152	0.01040
Mean	**0.00368**	**0.00425**	**0.00288**	**0.05628**	**-0.07759**	**0.01678**	**0.01874**	**0.00140**	**0.00989**
%RSD	28.67126	34.49885	38.82388	0.66865	22.72718	0.21596	61.08771	13.07475	7.23607

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04078	0.00334	0.04514	0.00242	0.01381	0.03397	0.01651	0.01258	0.02370
#2	-0.04043	0.00482	0.04924	0.01466	0.00721	0.03537	0.02244	0.02212	0.01809
Mean	**-0.04060**	**0.00408**	**0.04719**	**0.00854**	**0.01051**	**0.03467**	**0.01947**	**0.01735**	**0.02089**
%RSD	0.59860	25.68504	6.14555	101.42595	44.36563	2.87098	21.53474	38.88007	18.98706

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03278	0.01557	-0.00014	0.00034	0.00403	0.02019	0.06910	0.00289	0.01350
#2	0.04075	0.01772	0.00002	0.00015	0.00426	0.02478	0.13307	0.00474	0.01363
Mean	**0.03677**	**0.01665**	**-0.00006**	**0.00024**	**0.00414**	**0.02248**	**0.10109**	**0.00382**	**0.01357**

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%RSD	15.33201	9.12760	181.89243	54.38535	3.94067	14.41875	44.74622	34.21986	0.70449

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00830	0.01002	0.02000
#2	0.00963	0.00970	0.01943
Mean	**0.00897**	**0.00986**	**0.01971**
%RSD	10.54637	2.29706	2.02698

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:24
SampleId1 : M100016-2 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:08:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE13

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00322	0.05999	0.02198	0.03938	0.00074	0.00112	0.00534	0.01919	0.00203
#2	0.00303	0.06050	0.02079	0.03954	0.00085	0.00112	0.00681	0.01908	0.00218
Mean	**0.00313**	**0.06025**	**0.02139**	**0.03946**	**0.00079**	**0.00112**	**0.00608**	**0.01913**	**0.00210**
%RSD	4.15787	0.59710	3.93748	0.28188	10.11649	0.09461	17.16409	0.42200	5.17749

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00401	0.00387	0.00250	0.04095	-0.11354	0.01662	0.01755	0.00138	0.00962
#2	0.00377	0.00399	0.00271	0.04074	-0.10991	0.01664	0.02079	0.00141	0.00975
Mean	**0.00389**	**0.00393**	**0.00260**	**0.04084**	**-0.11172**	**0.01663**	**0.01917**	**0.00140**	**0.00968**
%RSD	4.28141	2.19077	5.62650	0.36848	2.29857	0.07263	11.94242	1.86782	0.94759

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04313	0.00385	0.05005	0.00742	0.01095	0.03397	0.02013	0.01664	0.02025
#2	-0.04318	0.00432	0.04694	0.00863	0.01007	0.02552	0.01995	0.02516	0.02248
Mean	**-0.04316**	**0.00408**	**0.04849**	**0.00803**	**0.01051**	**0.02974**	**0.02004**	**0.02090**	**0.02136**
%RSD	0.08045	8.18945	4.52204	10.61486	5.92027	20.07904	0.62970	28.83950	7.38060

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03601	0.01736	-0.00010	-0.00146	0.00392	0.01977	0.08486	0.00352	0.01046
#2	0.03871	0.01629	-0.00008	-0.00009	0.00397	0.02432	0.09175	0.00358	0.01026
Mean	**0.03736**	**0.01683**	**-0.00009**	**-0.00077**	**0.00394**	**0.02204**	**0.08830**	**0.00355**	**0.01036**
%RSD	5.11175	4.51598	17.60064	125.79628	0.91955	14.60529	5.51653	1.11320	1.38426

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00871	0.00978	0.01904
#2	0.00885	0.00959	0.02337
Mean	**0.00878**	**0.00968**	**0.02121**
%RSD	1.09723	1.35655	14.42240

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ted: 3/4/2010 17:29:56 User: ROY FRENCH
Method : Paragon File : 100304A Printed : 3/4/2010 17:29:25
SampleId1 : M100016-3 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 13:09:49
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE14

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00226	0.05367	0.01737	0.03828	0.00048	0.00122	0.00308	0.01519	0.00147
#2	0.00414	0.06205	0.01581	0.03859	0.00062	0.00123	0.00298	0.01577	0.00216
Mean	**0.00320**	**0.05786**	**0.01659**	**0.03844**	**0.00055**	**0.00123**	**0.00303**	**0.01548**	**0.00182**
%RSD	41.46343	10.24270	6.66398	0.57876	18.16952	0.86087	2.18743	2.60810	26.66469

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00325	0.00337	0.00223	0.04154	-0.02323	0.01687	0.01086	0.00119	0.00861
#2	0.00387	0.00400	0.00221	0.04276	-0.02299	0.01686	0.01928	0.00141	0.00905
Mean	**0.00356**	**0.00369**	**0.00222**	**0.04215**	**-0.02311**	**0.01686**	**0.01507**	**0.00130**	**0.00883**
%RSD	12.47417	12.09169	0.41410	2.05326	0.74060	0.07162	39.50060	11.99932	3.53442

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03935	0.00251	0.04304	0.00239	0.01299	0.02693	0.01602	0.01124	0.02356
#2	-0.03925	0.00410	0.05245	0.00976	0.00980	0.02271	0.01870	0.01680	0.02126
Mean	**-0.03930**	**0.00331**	**0.04774**	**0.00608**	**0.01140**	**0.02482**	**0.01736**	**0.01402**	**0.02241**
%RSD	0.17669	33.81051	13.92745	85.76818	19.76456	12.03253	10.88273	28.07591	7.25675

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03284	0.01748	-0.00014	-0.00022	0.00412	0.02026	0.07354	0.00293	0.01107
#2	0.03912	0.01844	-0.00003	-0.00029	0.00414	0.02212	0.09027	0.00378	0.01059
Mean	**0.03598**	**0.01796**	**-0.00009**	**-0.00026**	**0.00413**	**0.02119**	**0.08191**	**0.00336**	**0.01083**
%RSD	12.34094	3.76045	88.00324	18.87588	0.26336	6.17556	14.44265	18.08210	3.08886

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00839	0.00946	0.01945
#2	0.00903	0.00979	0.01977
Mean	**0.00871**	**0.00963**	**0.01961**
%RSD	5.14793	2.42685	1.15319

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:25
SampleId1 : M100016-4 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 13:11:35
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE15

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00572	0.07175	0.02049	0.04005	0.00088	0.00128	0.01802	0.01862	0.00295
#2	0.00357	0.06620	0.02258	0.03915	0.00071	0.00129	0.00878	0.01702	0.00221
Mean	**0.00464**	**0.06898**	**0.02154**	**0.03960**	**0.00079**	**0.00128**	**0.01340**	**0.01782**	**0.00258**
%RSD	32.70725	5.69219	6.84295	1.61518	15.17474	0.69360	48.77619	6.34342	20.12119

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00505	0.00556	0.00416	0.04350	0.05157	0.01695	0.03007	0.00152	0.01040
#2	0.00403	0.00438	0.00285	0.04350	0.01453	0.01695	0.02252	0.00134	0.00970
Mean	**0.00454**	**0.00497**	**0.00351**	**0.04350**	**0.03305**	**0.01695**	**0.02630**	**0.00143**	**0.01005**
%RSD	15.88204	16.82256	26.51258	0.00000	79.24447	0.00000	20.31675	9.09876	4.93194

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03562	0.00518	0.05165	0.01753	0.00552	0.02834	0.02202	0.02622	0.01666
#2	-0.03621	0.00396	0.04804	0.01120	0.01052	0.02834	0.02066	0.01874	0.01962
Mean	**-0.03591**	**0.00457**	**0.04985**	**0.01436**	**0.00802**	**0.02834**	**0.02134**	**0.02248**	**0.01814**
%RSD	1.16017	18.87641	5.10914	31.17342	44.03758	0.00000	4.50873	23.50289	11.54706

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04333	0.02321	0.00004	0.00174	0.00445	0.02485	0.13210	0.00522	0.01134
#2	0.03966	0.02082	-0.00005	0.00080	0.00418	0.02204	0.09175	0.00421	0.01093
Mean	**0.04150**	**0.02202**	**0.00000**	**0.00127**	**0.00431**	**0.02344**	**0.11192**	**0.00472**	**0.01113**
%RSD	6.25244	7.66716	1535.79520	52.51146	4.45900	8.45297	25.49277	15.09540	2.57527

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00980	0.00952	0.01984
#2	0.00923	0.01075	0.01933
Mean	**0.00952**	**0.01013**	**0.01958**
%RSD	4.23471	8.54354	1.85068

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:25
SampleId1 : M100016-5 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 13:13:21
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE16

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00347	0.05676	0.01852	0.03753	0.00059	0.00116	0.01025	0.01394	0.00207
#2	0.00321	0.06432	0.01968	0.03773	0.00059	0.00115	0.01241	0.01405	0.00215
Mean	**0.00334**	**0.06054**	**0.01910**	**0.03763**	**0.00059**	**0.00115**	**0.01133**	**0.01400**	**0.00211**
%RSD	5.44339	8.83693	4.27161	0.36947	0.00000	0.44383	13.48838	0.57695	2.79001

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00380	0.00414	0.00300	0.04036	-0.08352	0.01667	0.01604	0.00130	0.00959
#2	0.00377	0.00364	0.00242	0.04090	-0.08424	0.01672	0.01842	0.00130	0.00954
Mean	**0.00378**	**0.00389**	**0.00271**	**0.04063**	**-0.08388**	**0.01669**	**0.01723**	**0.00130**	**0.00957**
%RSD	0.49330	9.20903	14.98324	0.92604	0.61229	0.22911	9.74531	0.00000	0.38366

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04294	0.00413	0.05105	0.00889	0.01023	0.02834	0.01876	0.01297	0.01833
#2	-0.04274	0.00327	0.04644	0.00972	0.01110	0.02552	0.02084	0.01136	0.02220
Mean	**-0.04284**	**0.00370**	**0.04874**	**0.00931**	**0.01067**	**0.02693**	**0.01980**	**0.01216**	**0.02026**
%RSD	0.32421	16.39430	6.67570	6.29364	5.73929	7.39273	7.44555	9.35592	13.49462

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03608	0.01581	-0.00010	0.00117	0.00406	0.01789	0.08240	0.00349	0.01046
#2	0.03675	0.01760	-0.00008	-0.00055	0.00417	0.01898	0.09224	0.00352	0.01059
Mean	**0.03641**	**0.01671**	**-0.00009**	**0.00031**	**0.00412**	**0.01843**	**0.08732**	**0.00350**	**0.01053**
%RSD	1.28658	7.57956	11.26637	394.53607	1.85044	4.17756	7.96910	0.75465	0.90803

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00890	0.00979	0.01654
#2	0.00900	0.01064	0.01859
Mean	**0.00895**	**0.01021**	**0.01757**
%RSD	0.81396	5.90749	8.22560

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:26
SampleId1 : M100016-6 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:15:06
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE17

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00343	0.06096	0.01651	0.03970	0.00059	0.00125	0.00259	0.01497	0.00210
#2	0.00364	0.06026	0.02236	0.03926	0.00062	0.00125	0.00721	0.01588	0.00236
Mean	**0.00353**	**0.06061**	**0.01943**	**0.03948**	**0.00061**	**0.00125**	**0.00490**	**0.01542**	**0.00223**
%RSD	4.12833	0.81330	21.26077	0.77479	3.29522	0.08750	66.66767	4.18841	8.26643

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00377	0.00384	0.00200	0.04276	-0.02517	0.01691	0.01971	0.00130	0.00920
#2	0.00385	0.00426	0.00278	0.04271	-0.02517	0.01687	0.02122	0.00130	0.00944
Mean	**0.00381**	**0.00405**	**0.00239**	**0.04273**	**-0.02517**	**0.01689**	**0.02047**	**0.00130**	**0.00932**
%RSD	1.46204	7.35082	22.84243	0.08805	0.00000	0.20261	5.22045	0.00000	1.77216

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

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#1	-0.03871	0.00393	0.04924	0.00810	0.01070	0.03256	0.01918	0.01847	0.02227
#2	-0.03837	0.00334	0.04784	0.01065	0.01181	0.03678	0.02197	0.02236	0.02317
Mean	**-0.03854**	**0.00363**	**0.04854**	**0.00937**	**0.01126**	**0.03467**	**0.02057**	**0.02041**	**0.02272**
%RSD	0.63063	11.61947	2.04011	19.23301	7.03078	8.61294	9.59415	13.47090	2.81872

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03791	0.02071	-0.00008	-0.00398	0.00392	0.02067	0.08535	0.00343	0.00958
#2	0.04121	0.01903	-0.00003	-0.00585	0.00381	0.02226	0.09470	0.00401	0.01026
Mean	**0.03956**	**0.01987**	**-0.00005**	**-0.00492**	**0.00387**	**0.02147**	**0.09002**	**0.00372**	**0.00992**
%RSD	5.91227	5.94767	70.18422	26.88503	2.06326	5.24927	7.34348	10.99070	4.81858

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00917	0.00983	0.02100
#2	0.00953	0.01143	0.02290
Mean	**0.00935**	**0.01063**	**0.02195**
%RSD	2.65372	10.61391	6.11741

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:26
SampleId1 : M100016-7 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:16:52
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE18

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00509	0.07068	0.02109	0.03887	0.00082	0.00118	0.01271	0.01485	0.00207
#2	0.00385	0.05856	0.01934	0.03922	0.00071	0.00119	0.00790	0.01382	0.00211
Mean	**0.00447**	**0.06462**	**0.02022**	**0.03905**	**0.00076**	**0.00118**	**0.01030**	**0.01434**	**0.00209**
%RSD	19.61632	13.26534	6.11859	0.64094	10.49175	0.87431	33.03162	5.06847	1.33160

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00463	0.00495	0.00304	0.04031	-0.08061	0.01665	0.02511	0.00145	0.01001
#2	0.00427	0.00421	0.00341	0.04010	-0.09683	0.01672	0.02403	0.00138	0.00933
Mean	**0.00445**	**0.00458**	**0.00323**	**0.04021**	**-0.08872**	**0.01668**	**0.02457**	**0.00141**	**0.00967**
%RSD	5.80983	11.49222	8.00844	0.37434	12.92817	0.26544	3.10640	3.68695	4.93409

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04181	0.00482	0.05215	0.01365	0.00905	0.03397	0.02309	0.02421	0.01429
#2	-0.04328	0.00413	0.04744	0.01101	0.00907	0.03115	0.02102	0.02005	0.01889
Mean	**-0.04254**	**0.00447**	**0.04980**	**0.01233**	**0.00906**	**0.03256**	**0.02205**	**0.02213**	**0.01659**
%RSD	2.44843	10.81485	6.67696	15.15628	0.19563	6.11431	6.66324	13.30184	19.60521

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04098	0.02035	0.00000	0.00081	0.00425	0.02314	0.11586	0.00412	0.01431

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#2	0.04114	0.02035	-0.00004	-0.00145	0.00387	0.02541	0.10159	0.00388	0.01438
Mean	**0.04106**	**0.02035**	**-0.00002**	**-0.00032**	**0.00406**	**0.02427**	**0.10872**	**0.00400**	**0.01434**
%RSD	0.26638	0.00151	115.82404	501.14064	6.52188	6.60121	9.28067	4.28793	0.33316

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00945	0.01058	0.01759
#2	0.00934	0.00972	0.01927
Mean	**0.00940**	**0.01015**	**0.01843**
%RSD	0.87422	6.01414	6.45031

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:26
SampleId1 : M100016-8 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:18:37
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE19

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00297	0.07291	0.01886	0.03804	0.00054	0.00126	0.00799	0.01428	0.00221
#2	0.00446	0.07477	0.01938	0.03946	0.00074	0.00127	0.00642	0.01485	0.00243
Mean	**0.00371**	**0.07384**	**0.01912**	**0.03875**	**0.00064**	**0.00126**	**0.00720**	**0.01457**	**0.00232**
%RSD	28.36946	1.78692	1.92724	2.58327	22.03944	0.25450	15.37546	2.77167	6.56069

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00374	0.00413	0.00279	0.04627	-0.05931	0.01681	0.01906	0.00134	0.00913
#2	0.00437	0.00460	0.00306	0.04686	-0.04696	0.01677	0.02338	0.00145	0.00985
Mean	**0.00406**	**0.00437**	**0.00292**	**0.04656**	**-0.05313**	**0.01679**	**0.02122**	**0.00140**	**0.00949**
%RSD	10.94084	7.62406	6.65990	0.88887	16.43155	0.17986	14.38459	5.60346	5.41537

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04048	0.00413	0.04724	0.00871	0.01115	0.03256	0.02167	0.01609	0.02436
#2	-0.04004	0.00473	0.05195	0.01202	0.00927	0.03256	0.02214	0.02284	0.02175
Mean	**-0.04026**	**0.00443**	**0.04959**	**0.01037**	**0.01021**	**0.03256**	**0.02191**	**0.01947**	**0.02305**
%RSD	0.77619	9.53118	6.70390	22.59656	13.04284	0.00000	1.53895	24.50600	8.01549

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03954	0.01832	-0.00005	-0.00010	0.00397	0.02124	0.08190	0.00377	0.01019
#2	0.04034	0.02047	-0.00001	-0.00080	0.00414	0.02659	0.09224	0.00423	0.01032
Mean	**0.03994**	**0.01939**	**-0.00003**	**-0.00045**	**0.00405**	**0.02392**	**0.08707**	**0.00400**	**0.01026**
%RSD	1.41722	7.83531	93.19354	111.36892	2.95198	15.81242	8.39157	8.24408	0.93196

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00893	0.01034	0.02161
#2	0.00938	0.01019	0.02211

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Mean	**0.00915**	**0.01026**	**0.02186CH**
%RSD	3.42653	1.05287	1.63011

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:27
SampleId1 : M100016-9 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:21:39
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE20

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00127	0.05925	0.00877	0.01752	-0.00003	0.00061	0.00021	-0.00707	0.00097
#2	0.00102	0.05513	0.00925	0.01775	-0.00009	0.00061	-0.00048	-0.00719	0.00085
Mean	**0.00115**	**0.05719**	**0.00901**	**0.01763**	**-0.00006**	**0.00061**	**-0.00013**	**-0.00713**	**0.00091**
%RSD	15.36474	5.09788	3.79623	0.94619	69.27724	0.69293	369.18508	1.13246	9.49259

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00165	0.00195	0.00063	0.02073	-0.23727	0.01011	-0.00317	0.00060	0.00492
#2	0.00179	0.00171	0.00056	0.02057	-0.24260	0.01015	-0.00360	0.00064	0.00479
Mean	**0.00172**	**0.00183**	**0.00059**	**0.02065**	**-0.23994**	**0.01013**	**-0.00339**	**0.00062**	**0.00486**
%RSD	5.38632	9.19524	8.47226	0.54654	1.57005	0.27827	9.01610	4.19462	1.88957

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.08325	0.00144	0.03054	0.00280	0.00596	0.01285	0.01012	0.00549	0.01007
#2	-0.08364	0.00182	0.02664	0.00428	0.00566	0.01426	0.00911	0.00506	0.01568
Mean	**-0.08344**	**0.00163**	**0.02859**	**0.00354**	**0.00581**	**0.01356**	**0.00962**	**0.00527**	**0.01288**
%RSD	0.33284	16.18033	9.65020	29.49834	3.60875	7.34261	7.41857	5.78281	30.80580

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01791	0.00662	-0.00114	0.00056	0.00182	0.00847	0.03419	0.00145	0.00498
#2	0.01892	0.00793	-0.00111	-0.00048	0.00168	0.00912	0.03419	0.00167	0.00552
Mean	**0.01842**	**0.00728**	**-0.00113**	**0.00004**	**0.00175**	**0.00879**	**0.03419**	**0.00156**	**0.00525**
%RSD	3.90160	12.76330	2.25115	1863.17308	5.39201	5.22435	0.00022	10.13513	7.27590

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00376	0.00491	0.00855
#2	0.00370	0.00520	0.01214
Mean	**0.00373**	**0.00506**	**0.01034**
%RSD	1.20829	4.11149	24.59368

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:27
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 13:23:26
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations:**56** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20153	51.45570	0.52422	0.99967	1.01869	0.49947	0.51626	50.23145	0.50340
#2	0.20133	51.47467	0.52697	1.00191	1.02220	0.50096	0.52712	50.35649	0.50394
Mean	**0.20143**	**51.46518**	**0.52560**	**1.00079**	**1.02045**	**0.50021**	**0.52169**	**50.29397**	**0.50367**
%RSD	0.06857	0.02605	0.36968	0.15819	0.24276	0.21069	1.47182	0.17580	0.07575

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50753	1.00446	1.00328	20.76109	52.35213	0.53375	51.08471	0.99555	1.01310
#2	0.50841	1.00681	1.00518	20.82603	52.37293	0.53419	51.22127	0.99874	1.01764
Mean	**0.50797**	**1.00564**	**1.00423**	**20.79356**	**52.36253**	**0.53397**	**51.15299**	**0.99715**	**1.01537**
%RSD	0.12374	0.16481	0.13357	0.22084	0.02809	0.05767	0.18877	0.22657	0.31650

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	50.38251	1.03126	5.01730	0.98526	0.96867	5.09040	0.50381	1.04575	1.02827
#2	50.32419	1.03330	5.01506	0.98651	0.96978	5.07619	0.50572	1.04849	1.03051
Mean	**50.35335**	**1.03228**	**5.01618**	**0.98588**	**0.96922**	**5.08329**	**0.50477**	**1.04712**	**1.02939**
%RSD	0.08190	0.13953	0.03151	0.09004	0.08082	0.19779	0.26680	0.18531	0.15365

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.87800	1.02184	0.50920	0.12865	0.47954	0.52234	4.99959	0.49463	1.02208
#2	4.87990	1.02112	0.51133	0.12898	0.48141	0.52042	5.01042	0.49554	1.02574
Mean	**4.87895**	**1.02148**	**0.51027**	**0.12882**	**0.48047**	**0.52138**	**5.00500**	**0.49509**	**1.02391**
%RSD	0.02757	0.04967	0.29597	0.18257	0.27632	0.26094	0.15295	0.12937	0.25300

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.99660	0.97419	1.03409
#2	0.99918	0.97535	1.03650
Mean	**0.99789**	**0.97477**	**1.03530**
%RSD	0.18250	0.08392	0.16431

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:27
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/4/2010 13:25:18
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00035	0.05760	0.00162	-0.00054	-0.00026	0.00026	-0.00707	-0.00981	0.00002
#2	-0.00057	0.05545	-0.00288	-0.00101	-0.00034	0.00021	-0.00197	-0.01415	0.00022
Mean	**-0.00046**	**0.05652**	**-0.00063**	**-0.00077**	**-0.00030**	**0.00024**	**-0.00452**	**-0.01198**	**0.00012**
%RSD	33.26102	2.69326	507.47012	43.26706	20.12373	15.97243	79.85285	25.60516	113.75525

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	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00022	0.00035	-0.00132	0.00371	-0.20386	0.00395	0.00072	0.00046	-0.00063
#2	-0.00028	0.00001	-0.00097	0.00195	-0.22347	0.00391	-0.00511	0.00031	-0.00087
Mean	**-0.00025**	**0.00018**	**-0.00114**	**0.00283**	**-0.21366**	**0.00393**	**-0.00220**	**0.00038**	**-0.00075**
%RSD	14.74634	135.46618	21.80347	43.89708	6.49126	0.82069	187.44335	27.30801	22.02674

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.10009	-0.00063	-0.00067	-0.00146	0.00040	-0.00685	0.00076	-0.00021	0.00122
#2	-0.10505	-0.00032	0.00083	0.00035	0.00156	-0.01108	-0.00084	0.00189	0.00230
Mean	**-0.10257**	**-0.00048**	**0.00008**	**-0.00056**	**0.00098**	**-0.00897**	**-0.00004**	**0.00084**	**0.00176**
%RSD	3.41846	46.04129	1358.32917	229.00720	83.16815	33.30309	2708.38177	176.90524	43.39986

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00386	0.00018	-0.00197	0.00061	-0.00043	0.00122	-0.01500	-0.00051	0.00066
#2	-0.00224	-0.00138	-0.00204	-0.00157	-0.00047	-0.00322	-0.01254	-0.00021	0.00086
Mean	**-0.00305**	**-0.00060**	**-0.00200**	**-0.00048**	**-0.00045**	**-0.00100**	**-0.01377**	**-0.00036**	**0.00076**
%RSD	37.61014	182.74510	2.52936	318.78696	6.49928	312.73031	12.63953	58.02542	18.85848

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00053	-0.00022	0.00074
#2	-0.00021	0.00115	0.00216
Mean	**-0.00037**	**0.00047**	**0.00145**
%RSD	61.44550	207.04070	69.13040

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:27
SampleId1 : IP100303-3MB SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 13:27:09
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE21

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00032	0.03574	-0.00392	-0.00168	-0.00068	0.00003	-0.00550	-0.02283	-0.00018
#2	-0.00092	0.03449	-0.00147	-0.00246	-0.00080	0.00001	-0.01100	-0.02203	-0.00021
Mean	**-0.00062**	**0.03511**	**-0.00269**	**-0.00207**	**-0.00074**	**0.00002**	**-0.00825**	**-0.02243**	**-0.00020**
%RSD	69.31115	2.51390	64.49612	26.88039	10.86126	87.13934	47.08323	2.51971	9.29532

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00083	0.00003	-0.00210	-0.00273	-0.25132	0.00377	-0.02109	0.00005	-0.00115
#2	-0.00109	0.00005	-0.00174	-0.00284	-0.25882	0.00373	-0.02281	0.00005	-0.00162
Mean	**-0.00096**	**0.00004**	**-0.00192**	**-0.00278**	**-0.25507**	**0.00375**	**-0.02195**	**0.00005**	**-0.00139**
%RSD	19.29546	21.84703	13.02135	2.70184	2.08112	0.64451	5.56309	0.00000	23.83863

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	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.11658	-0.00031	0.00983	-0.00331	0.00251	-0.00404	-0.00257	-0.00415	0.00216
#2	-0.11717	0.00016	0.00933	-0.00257	0.00273	-0.01108	-0.00323	-0.00533	0.00502
Mean	**-0.11688**	**-0.00007**	**0.00958**	**-0.00294**	**0.00262**	**-0.00756**	**-0.00290**	**-0.00474**	**0.00359**
%RSD	0.35641	455.78981	3.69133	17.84786	5.67628	65.84208	16.04846	17.69137	56.31009

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00610	-0.00424	-0.00218	0.00015	-0.00075	-0.00359	-0.01450	-0.00001	0.00282
#2	-0.00576	-0.00317	-0.00218	-0.00182	-0.00104	-0.00207	-0.01401	-0.00035	0.00309
Mean	**-0.00593**	**-0.00370**	**-0.00218**	**-0.00083**	**-0.00089**	**-0.00283**	**-0.01426**	**-0.00018**	**0.00296**
%RSD	4.01151	20.51835	0.00000	166.50365	22.75251	37.91480	2.44052	133.50916	6.46521

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00088	0.00058	0.00006
#2	-0.00063	0.00096	0.00157
Mean	**-0.00075**	**0.00077**	**0.00081**
%RSD	23.41950	35.56525	131.12735

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:28
SampleId1 : M100017-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:28:55
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE22

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00300	0.07263	0.01781	0.03844	0.00059	0.00122	0.00318	0.01657	0.00203
#2	0.00368	0.07312	0.01629	0.03800	0.00062	0.00121	0.00553	0.01725	0.00223
Mean	**0.00334**	**0.07288**	**0.01705**	**0.03822**	**0.00061**	**0.00121**	**0.00436**	**0.01691**	**0.00213**
%RSD	14.25538	0.47661	6.32782	0.80030	3.29522	0.88695	38.27155	2.86550	6.70669

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00301	0.00382	0.00201	0.04058	-0.09005	0.01632	0.01604	0.00130	0.00858
#2	0.00340	0.00423	0.00207	0.04074	-0.10458	0.01634	0.01669	0.00138	0.00970
Mean	**0.00321**	**0.00402**	**0.00204**	**0.04066**	**-0.09732**	**0.01633**	**0.01637**	**0.00134**	**0.00914**
%RSD	8.65276	7.21204	2.28526	0.27763	10.55509	0.06164	2.79804	3.88976	8.63532

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03930	0.00383	0.04634	0.00652	0.01180	0.01989	0.01679	0.01421	0.02035
#2	-0.03901	0.00377	0.04684	0.00699	0.01329	0.02974	0.01733	0.01783	0.02039
Mean	**-0.03916**	**0.00380**	**0.04659**	**0.00675**	**0.01254**	**0.02482**	**0.01706**	**0.01602**	**0.02037**
%RSD	0.53207	1.15689	0.75911	4.86630	8.39545	28.07588	2.23854	15.96819	0.12070

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03377	0.01712	-0.00008	0.00082	0.00379	0.01666	0.08338	0.00369	0.01154
#2	0.03580	0.01832	-0.00006	-0.00053	0.00376	0.01915	0.08978	0.00378	0.01167
Mean	**0.03479**	**0.01772**	**-0.00007**	**0.00014**	**0.00378**	**0.01791**	**0.08658**	**0.00374**	**0.01161**
%RSD	4.12233	4.76403	14.80462	669.45176	0.57647	9.85130	5.22417	1.76466	0.82344

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00887	0.01004	0.01831
#2	0.00892	0.01119	0.01953
Mean	**0.00889**	**0.01061**	**0.01892**
%RSD	0.39692	7.64763	4.58858

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:28
SampleId1 : M100017-2 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 13:30:41
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE23

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00356	0.07822	0.01848	0.03844	0.00071	0.00119	0.00377	0.02787	0.00239
#2	0.00361	0.07945	0.02202	0.03781	0.00071	0.00118	0.00789	0.02730	0.00234
Mean	**0.00358**	**0.07883**	**0.02025**	**0.03812**	**0.00071**	**0.00119**	**0.00583**	**0.02759**	**0.00236**
%RSD	0.87506	1.10586	12.34463	1.16707	0.00000	0.55708	49.92561	1.46364	1.54403

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00377	0.00486	0.00298	0.04271	-0.07964	0.01641	0.02187	0.00145	0.00962
#2	0.00390	0.00504	0.00257	0.04249	-0.07456	0.01645	0.02165	0.00145	0.01035
Mean	**0.00384**	**0.00495**	**0.00277**	**0.04260**	**-0.07710**	**0.01643**	**0.02176**	**0.00145**	**0.00998**
%RSD	2.41006	2.60365	10.57755	0.35330	4.66280	0.17156	0.70139	0.00000	5.14785

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.02074	0.00463	0.04674	0.01210	0.01058	0.02974	0.01970	0.01099	0.01840
#2	-0.02030	0.00423	0.04784	0.00851	0.01012	0.03256	0.01923	0.01486	0.02046
Mean	**-0.02052**	**0.00443**	**0.04729**	**0.01031**	**0.01035**	**0.03115**	**0.01947**	**0.01293**	**0.01943**
%RSD	1.52301	6.35412	1.64532	24.62676	3.18922	6.39059	1.71153	21.17902	7.48219

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03910	0.01856	0.00006	0.00047	0.00382	0.01862	0.10208	0.00438	0.01390
#2	0.03831	0.01772	0.00007	-0.00024	0.00385	0.01641	0.08929	0.00369	0.01384
Mean	**0.03871**	**0.01814**	**0.00007**	**0.00012**	**0.00383**	**0.01752**	**0.09568**	**0.00404**	**0.01387**
%RSD	1.44505	3.25807	14.96920	430.38812	0.66220	8.91907	9.45457	12.08860	0.34452

	Zr	**Pb**	**Se**
	ppm	calc	calc

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#1	0.00930	0.01109	0.01593	**CH**
#2	0.00938	0.00958	0.01859	
Mean	**0.00934**	**0.01034**	**0.01726**	
%RSD	0.56083	10.30890	10.89732	

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:28
SampleId1 : M100017-3 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:32:30
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE24

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00420	0.07694	0.01953	0.03789	0.00071	0.00127	0.00789	0.01519	0.00237
#2	0.00357	0.07546	0.01986	0.03840	0.00071	0.00127	0.00593	0.01519	0.00231
Mean	**0.00388**	**0.07620**	**0.01969**	**0.03814**	**0.00071**	**0.00127**	**0.00691**	**0.01519**	**0.00234**
%RSD	11.58531	1.36496	1.20265	0.94776	0.00000	0.06431	20.11326	0.00000	1.72000

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00382	0.00479	0.00249	0.04154	-0.02905	0.01652	0.02187	0.00141	0.00949
#2	0.00359	0.00430	0.00214	0.04154	-0.04599	0.01657	0.01798	0.00141	0.00993
Mean	**0.00370**	**0.00454**	**0.00231**	**0.04154**	**-0.03752**	**0.01654**	**0.01993**	**0.00141**	**0.00971**
%RSD	4.49490	7.54832	10.65405	0.00000	31.93904	0.21905	13.78756	0.00000	3.21320

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03891	0.00456	0.04964	0.00931	0.00919	0.02693	0.01970	0.01255	0.02122
#2	-0.03970	0.00413	0.05235	0.00862	0.01059	0.02974	0.01989	0.02209	0.02279
Mean	**-0.03930**	**0.00434**	**0.05100**	**0.00897**	**0.00989**	**0.02834**	**0.01980**	**0.01732**	**0.02201**
%RSD	1.41352	6.88663	3.74542	5.37982	10.02622	7.02549	0.66821	38.93098	5.03816

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03768	0.01891	0.00001	0.00006	0.00382	0.01681	0.10159	0.00436	0.01032
#2	0.03749	0.01689	-0.00002	-0.00132	0.00384	0.01981	0.09421	0.00395	0.01059
Mean	**0.03759**	**0.01790**	**0.00000**	**-0.00063**	**0.00383**	**0.01831**	**0.09790**	**0.00416**	**0.01046**
%RSD	0.35822	8.01773	511.92900	154.94369	0.47363	11.55613	5.33122	6.97817	1.82779

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00966	0.00923	0.01833
#2	0.00940	0.00994	0.02256
Mean	**0.00953**	**0.00958**	**0.02045**
%RSD	1.92739	5.22607	14.59961

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:29
SampleId1 : M100017-4 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:34:17

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE25

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00332	0.07207	0.01912	0.03718	0.00062	0.00126	0.00357	0.01988	0.00218
#2	0.00414	0.07393	0.01901	0.03765	0.00074	0.00126	0.01064	0.02045	0.00249
Mean	**0.00373**	**0.07300**	**0.01906**	**0.03742**	**0.00068**	**0.00126**	**0.00711**	**0.02016**	**0.00234**
%RSD	15.38366	1.80544	0.41419	0.89186	11.80549	0.40027	70.35603	2.00247	9.39642

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00346	0.00431	0.00236	0.04090	-0.03389	0.01662	0.01798	0.00134	0.00949
#2	0.00403	0.00455	0.00306	0.04159	-0.01960	0.01670	0.02079	0.00141	0.01029
Mean	**0.00374**	**0.00443**	**0.00271**	**0.04124**	**-0.02675**	**0.01666**	**0.01939**	**0.00138**	**0.00989**
%RSD	10.87767	3.91608	18.28975	1.18599	37.76298	0.37458	10.23486	3.78564	5.75175

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03616	0.00412	0.05075	0.00641	0.01135	0.02411	0.01864	0.01448	0.01931
#2	-0.03518	0.00422	0.04774	0.01153	0.00956	0.02693	0.01864	0.01702	0.01899
Mean	**-0.03567**	**0.00417**	**0.04924**	**0.00897**	**0.01045**	**0.02552**	**0.01864**	**0.01575**	**0.01915**
%RSD	1.94693	1.68808	4.30950	40.34246	12.07237	7.80047	0.01628	11.41191	1.15807

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03730	0.01712	0.00019	0.00198	0.00395	0.01388	0.08584	0.00364	0.01404
#2	0.03769	0.01772	0.00025	0.00122	0.00384	0.02075	0.09618	0.00425	0.01424
Mean	**0.03749**	**0.01742**	**0.00022**	**0.00160**	**0.00390**	**0.01731**	**0.09101**	**0.00394**	**0.01414**
%RSD	0.74380	2.42328	18.57910	33.54830	1.95521	28.03802	8.02823	11.03917	1.01381

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00880	0.00970	0.01770
#2	0.00940	0.01022	0.01834
Mean	**0.00910**	**0.00996**	**0.01802**
%RSD	4.65834	3.65303	2.50139

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:29
SampleId1 : M100017-5 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:36:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE26

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00395	0.06911	0.01629	0.03840	0.00059	0.00113	0.00701	0.01668	0.00223
#2	0.00353	0.07001	0.01785	0.03671	0.00062	0.00114	0.00750	0.01622	0.00247

20000276

	Mean	%RSD
Ag	**0.00374**	7.90738
Al	**0.06956**	0.91499
As	**0.01707**	6.47509
B	**0.03755**	3.18413
Ba	**0.00061**	3.29522
Be	**0.00114**	0.50030
Bi	**0.00725**	4.73383
Ca	**0.01645**	1.96337
Cd	**0.00235**	7.35236

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00340	0.00468	0.00263	0.04068	-0.12637	0.01632	0.02122	0.00145	0.01019
#2	0.00283	0.00406	0.00207	0.04138	-0.16051	0.01639	0.01496	0.00141	0.00933
Mean	**0.00312**	**0.00437**	**0.00235**	**0.04103**	**-0.14344**	**0.01635**	**0.01809**	**0.00143**	**0.00976**
%RSD	13.05592	10.01942	16.75753	1.19214	16.82958	0.30777	24.46604	1.81975	6.20422

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04235	0.00453	0.05005	0.01032	0.01028	0.01989	0.01894	0.01822	0.01892
#2	-0.04289	0.00393	0.04524	0.00689	0.01223	0.02834	0.01959	0.01012	0.02376
Mean	**-0.04262**	**0.00423**	**0.04764**	**0.00861**	**0.01126**	**0.02411**	**0.01926**	**0.01417**	**0.02134**
%RSD	0.89621	9.97957	7.12682	28.19143	12.20276	24.76744	2.39675	40.41526	16.04491

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03598	0.02023	0.00001	0.00001	0.00367	0.01664	0.10503	0.00397	0.01073
#2	0.03742	0.01665	-0.00005	-0.00290	0.00363	0.01771	0.09175	0.00386	0.01086
Mean	**0.03670**	**0.01844**	**-0.00002**	**-0.00144**	**0.00365**	**0.01717**	**0.09839**	**0.00391**	**0.01080**
%RSD	2.77384	13.73606	208.48336	142.36388	0.89448	4.42839	9.54850	2.01862	0.88529

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00935	0.01030	0.01869
#2	0.00919	0.01045	0.01922
Mean	**0.00927**	**0.01037**	**0.01895**
%RSD	1.23837	1.04190	1.99152

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:29
SampleId1 : M100017-6 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:37:49
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE27

Final concentrations

	Mean	%RSD
Ag	**0.00299**	1.01586
Al	**0.06734**	4.10621
As	**0.01822**	0.57763
B	**0.03712**	0.52439
Ba	**0.00052**	3.83077
Be	**0.00120**	0.70786
Bi	**0.00529**	17.11090
Ca	**0.01337**	6.04056
Cd	**0.00225**	7.40758

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00319	0.00418	0.00200	0.04036	-0.06512	0.01637	0.01518	0.00130	0.00902
#2	0.00288	0.00400	0.00158	0.03983	-0.05495	0.01639	0.01583	0.00130	0.00923
Mean	**0.00304**	**0.00409**	**0.00179**	**0.04010**	**-0.06003**	**0.01638**	**0.01550**	**0.00130**	**0.00913**

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20000277

%RSD	7.30876	3.18437	16.52282	0.93832	11.97671	0.06145	2.95389	0.00000	1.60886

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04028	0.00434	0.04664	0.00683	0.01253	0.01989	0.01798	0.01265	0.02300
#2	-0.04073	0.00403	0.04524	0.00538	0.01276	0.02552	0.01834	0.00784	0.02070
Mean	**-0.04051**	**0.00419**	**0.04594**	**0.00610**	**0.01264**	**0.02271**	**0.01816**	**0.01024**	**0.02185**
%RSD	0.77149	5.25174	2.15559	16.77376	1.30208	17.53525	1.40276	33.15877	7.44168

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03452	0.01772	-0.00008	-0.00260	0.00352	0.01529	0.08486	0.00377	0.01059
#2	0.03107	0.01856	-0.00008	0.00156	0.00354	0.01850	0.07748	0.00401	0.01073
Mean	**0.03280**	**0.01814**	**-0.00008**	**-0.00052**	**0.00353**	**0.01689**	**0.08117**	**0.00389**	**0.01066**
%RSD	7.42625	3.25775	0.00000	563.56671	0.41053	13.43079	6.42959	4.40877	0.89652

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00914	0.01063	0.01955
#2	0.00861	0.01030	0.01642
Mean	**0.00888**	**0.01047**	**0.01798**
%RSD	4.24676	2.20732	12.32002

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:29
SampleId1 : M100017-7 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:39:36
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE28

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00375	0.07247	0.01975	0.03553	0.00054	0.00113	0.00632	0.01200	0.00193
#2	0.00367	0.07181	0.02120	0.03769	0.00068	0.00113	0.00897	0.01303	0.00222
Mean	**0.00371**	**0.07214**	**0.02048**	**0.03661**	**0.00061**	**0.00113**	**0.00765**	**0.01251**	**0.00208**
%RSD	1.49780	0.65330	5.01252	4.17773	16.47608	0.15632	24.53301	5.80866	9.89918

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00343	0.00413	0.00250	0.03925	-0.10531	0.01627	0.01475	0.00138	0.01032
#2	0.00385	0.00461	0.00228	0.03994	-0.09320	0.01636	0.02057	0.00138	0.01061
Mean	**0.00364**	**0.00437**	**0.00239**	**0.03959**	**-0.09925**	**0.01632**	**0.01766**	**0.00138**	**0.01046**
%RSD	8.12171	7.82287	6.53526	1.23539	8.62428	0.37013	23.33557	0.00000	1.92956

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04475	0.00429	0.04794	0.00730	0.01054	0.03115	0.01674	0.01653	0.01931
#2	-0.04333	0.00407	0.05095	0.01195	0.01035	0.02693	0.01983	0.01261	0.01896
Mean	**-0.04404**	**0.00418**	**0.04944**	**0.00963**	**0.01044**	**0.02904**	**0.01829**	**0.01457**	**0.01913**
%RSD	2.28632	3.78688	4.29207	34.21030	1.30227	10.28284	11.93975	19.06121	1.28792

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	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03316	0.01521	-0.00008	-0.00366	0.00347	0.01951	0.08929	0.00390	0.00958
#2	0.03511	0.01450	-0.00004	0.00222	0.00382	0.01707	0.09962	0.00421	0.00992
Mean	**0.03414**	**0.01486**	**-0.00006**	**-0.00072**	**0.00365**	**0.01829**	**0.09445**	**0.00405**	**0.00975**
%RSD	4.04047	3.41155	49.60697	577.09544	6.76306	9.46767	7.73540	5.53148	2.45104

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00908	0.00946	0.01838
#2	0.00907	0.01088	0.01684
Mean	**0.00907**	**0.01017**	**0.01761**
%RSD	0.05236	9.88924	6.18379

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:30
SampleId1 : M100017-8 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 13:41:22
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE29

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00361	0.07273	0.01949	0.03584	0.00071	0.00124	0.00534	0.01417	0.00234
#2	0.00386	0.06791	0.01722	0.03734	0.00068	0.00122	0.00809	0.01417	0.00215
Mean	**0.00373**	**0.07032**	**0.01835**	**0.03659**	**0.00069**	**0.00123**	**0.00671**	**0.01417**	**0.00225**
%RSD	4.77610	4.84843	8.74634	2.88798	2.89104	1.09449	28.94157	0.00000	6.10767

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00361	0.00417	0.00243	0.04058	-0.03946	0.01644	0.01885	0.00130	0.00941
#2	0.00359	0.00419	0.00229	0.04095	-0.06149	0.01646	0.01777	0.00138	0.01045
Mean	**0.00360**	**0.00418**	**0.00236**	**0.04076**	**-0.05047**	**0.01645**	**0.01831**	**0.00134**	**0.00993**
%RSD	0.51700	0.44637	4.19246	0.64611	30.86591	0.08567	4.16855	3.88976	7.39251

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04038	0.00459	0.05325	0.00923	0.01172	0.03115	0.01781	0.01594	0.01913
#2	-0.04171	0.00407	0.04304	0.00950	0.01068	0.02411	0.01871	0.01459	0.01997
Mean	**-0.04105**	**0.00433**	**0.04814**	**0.00936**	**0.01120**	**0.02763**	**0.01826**	**0.01526**	**0.01955**
%RSD	2.28401	8.53145	14.98716	2.07374	6.56639	18.01107	3.48620	6.25339	3.02474

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03411	0.01963	-0.00004	0.00252	0.00399	0.01630	0.08732	0.00421	0.01005
#2	0.03602	0.01688	-0.00005	0.00149	0.00405	0.01670	0.08486	0.00380	0.01005
Mean	**0.03506**	**0.01826**	**-0.00005**	**0.00201**	**0.00402**	**0.01650**	**0.08609**	**0.00401**	**0.01005**
%RSD	3.84283	10.63494	21.58278	36.22186	0.99278	1.69745	2.02103	7.23691	0.00000

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	0.00920	0.01089	0.01807
#2	0.00906	0.01029	0.01818
Mean	**0.00913**	**0.01059**	**0.01812**
%RSD	1.12259	4.02275	0.42258

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:30
SampleId1 : M100017-9 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 13:43:08
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE30

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00184	0.05001	0.01000	0.01740	0.00006	0.00048	0.00217	-0.00468	0.00101
#2	0.00209	0.05034	0.00851	0.01665	0.00006	0.00047	0.00482	-0.00490	0.00106
Mean	**0.00197**	**0.05018**	**0.00925**	**0.01702**	**0.00006**	**0.00048**	**0.00350**	**-0.00479**	**0.00103**
%RSD	9.26226	0.46516	11.37535	3.10354	0.00000	1.96082	53.53412	3.37203	3.81672

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00166	0.00281	-0.00002	0.02392	-0.21814	0.00992	0.00072	0.00071	0.00445
#2	0.00168	0.00311	0.00070	0.02387	-0.20797	0.00989	-0.00101	0.00079	0.00383
Mean	**0.00167**	**0.00296**	**0.00034**	**0.02390**	**-0.21306**	**0.00990**	**-0.00015**	**0.00075**	**0.00414**
%RSD	1.07607	7.03161	149.13676	0.15744	3.37540	0.16267	825.31734	6.94691	10.63266

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.08241	0.00234	0.02644	0.00374	0.00657	0.00863	0.00958	0.00517	0.01157
#2	-0.08232	0.00230	0.02764	0.00325	0.00586	0.01144	0.00975	0.00436	0.00843
Mean	**-0.08236**	**0.00232**	**0.02704**	**0.00350**	**0.00621**	**0.01004**	**0.00966**	**0.00477**	**0.01000**
%RSD	0.08430	1.13680	3.13957	9.98645	8.06927	19.83401	1.24428	12.12987	22.16804

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01362	0.00650	-0.00110	-0.00143	0.00141	0.00938	0.04403	0.00201	0.00721
#2	0.01269	0.00817	-0.00112	0.00033	0.00177	0.00973	0.03321	0.00223	0.00701
Mean	**0.01315**	**0.00734**	**-0.00111**	**-0.00055**	**0.00159**	**0.00955**	**0.03862**	**0.00212**	**0.00711**
%RSD	5.02766	16.10558	0.91502	227.02864	16.42508	2.62508	19.82095	7.45965	2.01556

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00408	0.00563	0.00944
#2	0.00408	0.00499	0.00708
Mean	**0.00408**	**0.00531**	**0.00826**
%RSD	0.06608	8.48967	20.23904

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:30

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SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 13:44:55
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19726	49.87851	0.50313	0.96027	0.98062	0.48917	0.50989	49.36090	0.48887
#2	0.19685	49.98833	0.51249	0.96126	0.98557	0.48968	0.50016	49.35306	0.49025
Mean	**0.19706**	**49.93342**	**0.50781**	**0.96076**	**0.98309**	**0.48942**	**0.50502**	**49.35698**	**0.48956**
%RSD	0.14877	0.15551	1.30311	0.07228	0.35640	0.07438	1.36296	0.01124	0.19830

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49577	0.98476	0.96741	20.25591	51.09699	0.51917	50.02284	0.97181	0.98225
#2	0.49538	0.98533	0.97459	20.27593	51.19757	0.52077	50.07551	0.97341	0.98505
Mean	**0.49557**	**0.98505**	**0.97100**	**20.26592**	**51.14728**	**0.51997**	**50.04917**	**0.97261**	**0.98365**
%RSD	0.05509	0.04126	0.52290	0.06984	0.13904	0.21833	0.07441	0.11612	0.20162

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.48622	0.99550	4.86533	0.96445	0.95920	4.87148	0.48751	1.00250	0.99580
#2	49.56867	0.99879	4.83263	0.96489	0.95520	4.89564	0.48853	1.00257	0.99445
Mean	**49.52744**	**0.99715**	**4.84898**	**0.96467**	**0.95720**	**4.88356**	**0.48802**	**1.00253**	**0.99512**
%RSD	0.11772	0.23342	0.47686	0.03233	0.29603	0.34985	0.14812	0.00513	0.09625

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.72180	0.98918	0.49146	0.12351	0.46897	0.49430	4.84480	0.48335	1.00640
#2	4.73747	0.99264	0.49412	0.12466	0.46958	0.50673	4.86850	0.48343	1.00525
Mean	**4.72964**	**0.99091**	**0.49279**	**0.12409**	**0.46927**	**0.50052**	**4.85665**	**0.48339**	**1.00583**
%RSD	0.23423	0.24668	0.38136	0.65715	0.09174	1.75676	0.34507	0.01146	0.08107

	Zr	Pb	Se
	ppm	calc	calc
#1	0.96834	0.96095	0.99803
#2	0.97013	0.95843	0.99715
Mean	**0.96923**	**0.95969**	**0.99759**
%RSD	0.13048	0.18612	0.06233

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:31
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/4/2010 13:46:47
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00093	0.04888	-0.00009	-0.00073	-0.00051	0.00014	-0.00168	-0.01552	-0.00006
#2	-0.00030	0.04802	-0.00080	-0.00030	-0.00043	0.00010	-0.00569	-0.01632	0.00020
Mean	**-0.00061**	**0.04845**	**-0.00044**	**-0.00052**	**-0.00047**	**0.00012**	**-0.00368**	**-0.01592**	**0.00007**
%RSD	72.84808	1.24771	113.28205	59.32368	12.82431	18.56161	77.12869	3.54972	272.84955

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00012	-0.00016	-0.00182	0.00142	-0.21233	0.00387	-0.00727	0.00031	-0.00081
#2	0.00025	-0.00005	-0.00162	0.00131	-0.20579	0.00390	-0.00662	0.00031	-0.00219
Mean	**0.00006**	**-0.00010**	**-0.00172**	**0.00137**	**-0.20906**	**0.00389**	**-0.00695**	**0.00031**	**-0.00150**
%RSD	412.42315	70.95146	8.27417	5.51187	2.21136	0.46655	6.59093	0.00000	64.73548

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.10618	0.00041	-0.00637	-0.00142	0.00157	0.00300	0.00082	-0.00527	0.00359
#2	-0.10676	-0.00015	-0.00247	-0.00038	0.00068	-0.00404	-0.00020	-0.00241	-0.00181
Mean	**-0.10647**	**0.00013**	**-0.00442**	**-0.00090**	**0.00112**	**-0.00052**	**0.00031**	**-0.00384**	**0.00089**
%RSD	0.39126	300.05308	62.36440	81.38944	55.92184	956.38372	232.41623	52.83870	430.13063

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00875	-0.00126	-0.00203	-0.00079	-0.00054	0.00133	-0.00959	-0.00053	0.00059
#2	-0.00586	-0.00066	-0.00203	-0.00224	-0.00050	0.00148	0.00517	-0.00014	0.00019
Mean	**-0.00731**	**-0.00096**	**-0.00203**	**-0.00152**	**-0.00052**	**0.00140**	**-0.00221**	**-0.00034**	**0.00039**
%RSD	27.93667	44.02991	0.00000	67.81482	4.87477	7.69587	473.15238	82.53352	73.80249

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00050	0.00057	0.00064
#2	-0.00020	0.00033	-0.00201
Mean	**-0.00035**	**0.00045**	**-0.00069**
%RSD	59.92159	39.00438	272.57394

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:31
SampleId1 : IP100301-4MB SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 13:48:39
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE31

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00092	0.03807	-0.00013	-0.00128	-0.00037	-0.00005	-0.00452	-0.00513	-0.00026
#2	0.00042	0.04294	0.00196	-0.00065	-0.00026	-0.00006	-0.00010	-0.00330	0.00009
Mean	**-0.00025**	**0.04051**	**0.00092**	**-0.00097**	**-0.00031**	**-0.00005**	**-0.00231**	**-0.00422**	**-0.00008**
%RSD	385.00085	8.50391	160.70493	45.96937	25.61659	4.52253	135.23591	30.62762	306.45898

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00075	0.00049	-0.00181	0.05484	-0.27553	0.00363	-0.02303	0.00057	-0.00100

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#2	-0.00004	0.00132	-0.00083	0.05526	-0.25689	0.00369	-0.01418	0.00064	-0.00105
Mean	**-0.00039**	**0.00090**	**-0.00132**	**0.05505**	**-0.26621**	**0.00366**	**-0.01860**	**0.00060**	**-0.00102**
%RSD	126.48414	64.99793	52.49667	0.54681	4.95299	1.10010	33.63836	8.64567	3.59010

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.10946	-0.00010	0.00913	-0.00249	0.00276	-0.01108	-0.00436	-0.00518	0.00171
#2	-0.10853	0.00092	0.01073	0.00255	0.00010	-0.00826	0.00265	-0.00457	0.00008
Mean	**-0.10900**	**0.00041**	**0.00993**	**0.00003**	**0.00143**	**-0.00967**	**-0.00085**	**-0.00487**	**0.00090**
%RSD	0.60512	175.14950	11.39584	11366.47699	131.85270	20.58610	579.85718	8.78824	129.22584

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00347	-0.00078	-0.00198	-0.00155	-0.00058	-0.00618	-0.02192	-0.00047	0.00160
#2	0.00527	0.00113	-0.00191	-0.00255	-0.00045	-0.00256	-0.00618	0.00011	0.00215
Mean	**0.00437**	**0.00018**	**-0.00195**	**-0.00205**	**-0.00052**	**-0.00437**	**-0.01405**	**-0.00018**	**0.00188**
%RSD	29.21148	769.23167	2.60388	34.46610	18.98969	58.56716	79.23215	232.41434	20.38613

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00084	0.00101	-0.00058
#2	-0.00020	0.00091	-0.00147
Mean	**-0.00052**	**0.00096**	**-0.00103**
%RSD	86.03783	7.29092	61.41243

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:31
SampleId1 : M100018-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:50:26
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE32

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00311	0.08035	0.02035	0.03675	0.00074	0.00119	0.00956	0.03015	0.00220
#2	0.00368	0.07872	0.01990	0.03702	0.00082	0.00116	0.00789	0.03027	0.00220
Mean	**0.00339**	**0.07953**	**0.02012**	**0.03688**	**0.00078**	**0.00117**	**0.00873**	**0.03021**	**0.00220**
%RSD	11.93786	1.44747	1.56942	0.52774	7.72553	1.56683	13.52087	0.26728	0.19475

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00312	0.00408	0.00342	0.09262	-0.11572	0.01601	0.02122	0.00178	0.00910
#2	0.00348	0.00451	0.00335	0.09135	-0.10918	0.01593	0.01755	0.00182	0.00939
Mean	**0.00330**	**0.00429**	**0.00338**	**0.09199**	**-0.11245**	**0.01597**	**0.01939**	**0.00180**	**0.00924**
%RSD	7.84383	7.03480	1.45621	0.98193	4.11070	0.37818	13.38405	1.44729	2.18422

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03655	0.00428	0.05735	0.00897	0.01233	0.02834	0.01596	0.01351	0.01886
#2	-0.03724	0.00422	0.05535	0.00987	0.01075	0.03256	0.01727	0.01648	0.02207

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Mean	**-0.03690**	**0.00425**	**0.05635**	**0.00942**	**0.01154**	**0.03045**	**0.01662**	**0.01499**	**0.02046**
%RSD	1.31750	1.03497	2.51090	6.78829	9.66245	9.80746	5.55657	13.97847	11.07534

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04441	0.01844	-0.00002	0.00058	0.00395	0.01718	0.08728	0.00368	0.01276
#2	0.04685	0.01712	-0.00002	0.00196	0.00416	0.01725	0.08581	0.00376	0.01336
Mean	**0.04563**	**0.01778**	**-0.00002**	**0.00127**	**0.00406**	**0.01721**	**0.08655**	**0.00372**	**0.01306**
%RSD	3.78570	5.22373	0.00000	76.38491	3.57589	0.29212	1.20537	1.41339	3.29323

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00921	0.01121	0.01708
#2	0.00901	0.01046	0.02020
Mean	**0.00911**	**0.01083**	**0.01864**
%RSD	1.58470	4.90071	11.85289

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:31
SampleId1 : M100018-2 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:52:12
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE33

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00378	0.08427	0.01897	0.03769	0.00074	0.00112	0.01005	0.03438	0.00230
#2	0.00357	0.08489	0.01942	0.03769	0.00076	0.00113	0.00613	0.03427	0.00223
Mean	**0.00368**	**0.08458**	**0.01919**	**0.03769**	**0.00075**	**0.00112**	**0.00809**	**0.03432**	**0.00226**
%RSD	4.11708	0.51995	1.64551	0.00000	2.67251	0.51646	34.32893	0.23527	2.37294

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00372	0.00507	0.00320	0.08379	-0.09829	0.01580	0.01928	0.00186	0.00928
#2	0.00369	0.00478	0.00271	0.08400	-0.10337	0.01584	0.02209	0.00186	0.00980
Mean	**0.00370**	**0.00492**	**0.00296**	**0.08390**	**-0.10083**	**0.01582**	**0.02068**	**0.00186**	**0.00954**
%RSD	0.50600	4.13794	11.85555	0.17943	3.56567	0.20362	9.59394	0.00000	3.84708

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03351	0.00436	0.05735	0.01028	0.01144	0.02552	0.01815	0.01292	0.02074
#2	-0.03307	0.00415	0.05395	0.01115	0.01090	0.02693	0.01804	0.01551	0.01659
Mean	**-0.03329**	**0.00425**	**0.05565**	**0.01071**	**0.01117**	**0.02622**	**0.01810**	**0.01422**	**0.01867**
%RSD	0.93881	3.51891	4.32223	5.72407	3.38378	3.79556	0.43561	12.87000	15.70437

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	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04413	0.01593	-0.00003	-0.00163	0.00383	0.01902	0.09172	0.00392	0.01451
#2	0.04447	0.01724	-0.00004	0.00038	0.00401	0.02007	0.09123	0.00364	0.01438
Mean	**0.04430**	**0.01659**	**-0.00003**	**-0.00063**	**0.00392**	**0.01954**	**0.09147**	**0.00378**	**0.01445**

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%RSD	0.54512	5.59775	31.06451	227.52854	3.33205	3.78808	0.38049	5.22754	0.66164

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00918	0.01105	0.01814
#2	0.00922	0.01098	0.01623
Mean	**0.00920**	**0.01102**	**0.01718**
%RSD	0.34910	0.43495	7.83321

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:32
SampleId1 : M100018-3 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:53:58
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE34

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00335	0.13409	0.01949	0.03753	0.00074	0.00114	0.00563	0.03038	0.00215
#2	0.00399	0.13086	0.01707	0.03856	0.00074	0.00115	0.01133	0.03141	0.00218
Mean	**0.00367**	**0.13248**	**0.01828**	**0.03804**	**0.00074**	**0.00114**	**0.00848**	**0.03090**	**0.00217**
%RSD	12.25617	1.72351	9.35783	1.90041	0.00000	0.73683	47.48418	2.35217	0.83883

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00356	0.00468	0.00249	0.10460	-0.10482	0.01587	0.02252	0.00186	0.00954
#2	0.00382	0.00487	0.00284	0.10550	-0.10531	0.01584	0.01993	0.00189	0.00962
Mean	**0.00369**	**0.00478**	**0.00267**	**0.10505**	**-0.10507**	**0.01586**	**0.02122**	**0.00187**	**0.00958**
%RSD	5.00677	2.89657	9.19975	0.60906	0.32589	0.12697	8.63075	1.39038	0.57472

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03508	0.00736	0.05495	0.01083	0.01081	0.03256	0.02012	0.01546	0.02099
#2	-0.03518	0.00670	0.05245	0.01148	0.00952	0.02271	0.02131	0.02134	0.01897
Mean	**-0.03513**	**0.00703**	**0.05370**	**0.01116**	**0.01016**	**0.02763**	**0.02071**	**0.01840**	**0.01998**
%RSD	0.19769	6.63764	3.29356	4.10390	8.98621	25.21549	4.05316	22.61240	7.15253

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04345	0.01868	-0.00004	-0.00146	0.00381	0.01715	0.09367	0.00391	0.01255
#2	0.04723	0.01975	-0.00001	-0.00038	0.00391	0.01434	0.10302	0.00421	0.01276
Mean	**0.04534**	**0.01921**	**-0.00003**	**-0.00092**	**0.00386**	**0.01574**	**0.09835**	**0.00406**	**0.01265**
%RSD	5.89676	3.95405	79.61782	82.42513	1.88068	12.62476	6.72162	5.20264	1.13292

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00936	0.01082	0.01915
#2	0.00932	0.01017	0.01976
Mean	**0.00934**	**0.01049**	**0.01945**
%RSD	0.30526	4.35151	2.22294

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:32

SampleId1 : M100018-4 SampleId2 : [SAMPLE]

Analysis commenced : 3/4/2010 13:55:45

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE35

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00268	0.08814	0.02083	0.03679	0.00102	0.00116	0.00377	0.02627	0.00198
#2	0.00300	0.09052	0.02049	0.03710	0.00102	0.00116	0.00446	0.02707	0.00223
Mean	**0.00284**	**0.08933**	**0.02066**	**0.03694**	**0.00102**	**0.00116**	**0.00411**	**0.02667**	**0.00210**
%RSD	7.87195	1.88549	1.14632	0.60217	0.00000	0.01192	11.88000	2.11928	8.34959

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00333	0.00442	0.00236	0.09034	-0.10313	0.01585	0.01647	0.00167	0.00848
#2	0.00351	0.00447	0.00328	0.09103	-0.13920	0.01588	0.01906	0.00175	0.00988
Mean	**0.00342**	**0.00444**	**0.00282**	**0.09068**	**-0.12117**	**0.01587**	**0.01777**	**0.00171**	**0.00918**
%RSD	3.79267	0.74790	22.98966	0.53952	21.05333	0.12688	10.30836	3.05069	10.79836

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03832	0.00438	0.05435	0.00782	0.01157	0.02130	0.01679	0.01453	0.02106
#2	-0.03930	0.00400	0.05555	0.00721	0.01323	0.02693	0.01864	0.01572	0.01872
Mean	**-0.03881**	**0.00419**	**0.05495**	**0.00751**	**0.01240**	**0.02411**	**0.01771**	**0.01513**	**0.01989**
%RSD	1.78926	6.51216	1.54493	5.71535	9.45863	16.51163	7.40127	5.56643	8.29934

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04055	0.01426	-0.00004	0.00372	0.00414	0.01371	0.08236	0.00381	0.01262
#2	0.04224	0.01569	0.00000	0.00183	0.00408	0.01718	0.08827	0.00363	0.01228
Mean	**0.04140**	**0.01497**	**-0.00002**	**0.00278**	**0.00411**	**0.01544**	**0.08532**	**0.00372**	**0.01245**
%RSD	2.88866	6.76549	115.82404	48.12978	1.14694	15.88658	4.89346	3.54293	1.91894

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00902	0.01032	0.01888
#2	0.00924	0.01123	0.01772
Mean	**0.00913**	**0.01077**	**0.01830**
%RSD	1.66239	5.93540	4.48313

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:32

SampleId1 : M100018-5 SampleId2 : [SAMPLE]

Analysis commenced : 3/4/2010 13:57:41

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE36

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00392	0.08104	0.02090	0.03568	0.00071	0.00112	0.00937	0.02433	0.00269
#2	0.00404	0.08313	0.02001	0.03675	0.00059	0.00111	0.00867	0.02456	0.00189
Mean	**0.00398**	**0.08209**	**0.02046**	**0.03622**	**0.00065**	**0.00111**	**0.00902**	**0.02444**	**0.00229**
%RSD	2.09199	1.79309	3.08743	2.07316	12.31969	0.44899	5.41933	0.66067	24.55859

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00374	0.00479	0.00256	0.08549	-0.11475	0.01582	0.02187	0.00175	0.00889
#2	0.00359	0.00444	0.00257	0.08597	-0.12419	0.01586	0.02338	0.00175	0.00926
Mean	**0.00367**	**0.00462**	**0.00256**	**0.08573**	**-0.11947**	**0.01584**	**0.02263**	**0.00175**	**0.00907**
%RSD	3.03013	5.24585	0.34778	0.39507	5.58877	0.17791	4.72239	0.00000	2.83161

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04210	0.00503	0.05475	0.01313	0.00978	0.02974	0.01851	0.01589	0.01820
#2	-0.04200	0.00412	0.05475	0.00853	0.01046	0.02693	0.01982	0.01647	0.01977
Mean	**-0.04205**	**0.00457**	**0.05475**	**0.01083**	**0.01012**	**0.02834**	**0.01917**	**0.01618**	**0.01898**
%RSD	0.16514	14.04187	0.00000	30.01666	4.73600	7.02549	4.84865	2.53361	5.84168

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04114	0.01772	-0.00004	-0.00109	0.00375	0.01509	0.10107	0.00426	0.01005
#2	0.04116	0.01844	-0.00005	0.00038	0.00373	0.01609	0.08483	0.00413	0.01053
Mean	**0.04115**	**0.01808**	**-0.00004**	**-0.00035**	**0.00374**	**0.01559**	**0.09295**	**0.00419**	**0.01029**
%RSD	0.04468	2.80179	11.68287	295.36942	0.38747	4.54278	12.35359	2.19942	3.25116

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00959	0.01090	0.01743
#2	0.00979	0.00982	0.01867
Mean	**0.00969**	**0.01036**	**0.01805**
%RSD	1.48100	7.36691	4.85394

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:33
SampleId1 : M100018-6 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 13:59:30
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE37

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00285	0.08302	0.01867	0.03620	0.00071	0.00109	0.00436	0.03267	0.00247
#2	0.00364	0.08445	0.01848	0.03592	0.00068	0.00107	0.00495	0.03244	0.00207
Mean	**0.00325**	**0.08374**	**0.01858**	**0.03606**	**0.00069**	**0.00108**	**0.00465**	**0.03255**	**0.00227**
%RSD	17.19802	1.21018	0.70830	0.53983	2.89104	1.17826	8.91711	0.49612	12.46260

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00382	0.00452	0.00299	0.08959	-0.14187	0.01569	0.01712	0.00219	0.00962
#2	0.00367	0.00461	0.00271	0.08943	-0.14574	0.01567	0.01734	0.00230	0.00946
Mean	**0.00374**	**0.00456**	**0.00285**	**0.08951**	**-0.14380**	**0.01568**	**0.01723**	**0.00224**	**0.00954**
%RSD	2.96731	1.40548	6.92462	0.12613	1.90492	0.11555	0.88594	3.48575	1.15412

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03945	0.00479	0.05725	0.00979	0.01137	0.02834	0.02000	0.01605	0.01785
#2	-0.04004	0.00390	0.05535	0.00830	0.00970	0.03256	0.01899	0.01928	0.01869
Mean	**-0.03974**	**0.00434**	**0.05630**	**0.00904**	**0.01053**	**0.03045**	**0.01950**	**0.01766**	**0.01827**
%RSD	1.04835	14.58344	2.38747	11.66391	11.22816	9.80746	3.67261	12.93092	3.23684

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04074	0.01677	-0.00005	-0.00019	0.00392	0.01472	0.09221	0.00359	0.01201
#2	0.04082	0.01796	-0.00003	0.00053	0.00397	0.01739	0.08679	0.00364	0.01174
Mean	**0.04078**	**0.01736**	**-0.00004**	**0.00017**	**0.00395**	**0.01606**	**0.08950**	**0.00362**	**0.01188**
%RSD	0.13050	4.86200	35.04862	297.26216	0.82706	11.74954	4.27627	1.09327	1.60940

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00935	0.01084	0.01725
#2	0.00910	0.00923	0.01888
Mean	**0.00922**	**0.01004**	**0.01807**
%RSD	1.96304	11.35891	6.39307

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:33
SampleId1 : M100018-7 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 14:01:19
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE38

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00097	0.06074	0.01156	0.03313	0.00020	0.00111	-0.01187	0.01816	0.00141
#2	-0.00002	0.06142	0.01309	0.03407	0.00023	0.00111	-0.00519	0.01873	0.00162
Mean	**-0.00049**	**0.06108**	**0.01233**	**0.03360**	**0.00021**	**0.00111**	**-0.00853**	**0.01845**	**0.00152**
%RSD	136.80707	0.78912	8.75477	1.98624	9.48040	0.39547	55.38466	2.18838	9.70214

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00053	0.00186	-0.00084	0.06671	-0.15664	0.01583	-0.00943	0.00112	0.00658
#2	0.00079	0.00184	-0.00014	0.06703	-0.16705	0.01577	-0.00598	0.00116	0.00780
Mean	**0.00066**	**0.00185**	**-0.00049**	**0.06687**	**-0.16184**	**0.01580**	**-0.00770**	**0.00114**	**0.00719**
%RSD	28.23250	0.74807	100.39860	0.33767	4.54898	0.24209	31.70400	2.29153	11.99319

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

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#1	-0.04200	0.00082	0.05165	-0.00926	0.02104	0.02130	0.00663	-0.00823	0.03112
#2	-0.04294	0.00199	0.05215	-0.00911	0.01931	0.01426	0.00712	0.00311	0.03147
Mean	**-0.04247**	**0.00141**	**0.05190**	**-0.00919**	**0.02017**	**0.01778**	**0.00687**	**-0.00256**	**0.03130**
%RSD	1.55336	58.76674	0.68156	1.20796	6.06638	27.99293	5.00026	313.06661	0.78684

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02920	0.01020	-0.00028	0.00389	0.00405	0.01030	0.00808	0.00088	0.01046
#2	0.03115	0.01187	-0.00027	0.00391	0.00392	0.01049	0.02137	0.00114	0.01093
Mean	**0.03018**	**0.01103**	**-0.00028**	**0.00390**	**0.00399**	**0.01040**	**0.01472**	**0.00101**	**0.01069**
%RSD	4.57006	10.71147	3.66827	0.45287	2.18420	1.27924	63.79643	18.27246	3.12789

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00715	0.01095	0.01802
#2	0.00725	0.00985	0.02202
Mean	**0.00720**	**0.01040**	**0.02002**
%RSD	0.97755	7.49577	14.14886

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:33
SampleId1 : M100018-8 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 14:03:06
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE39

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00346	0.09130	0.02150	0.03840	0.00071	0.00125	0.00485	0.02684	0.00218
#2	0.00424	0.09230	0.02031	0.03722	0.00082	0.00125	0.00730	0.02719	0.00230
Mean	**0.00385**	**0.09180**	**0.02090**	**0.03781**	**0.00076**	**0.00125**	**0.00608**	**0.02701**	**0.00224**
%RSD	14.35964	0.76936	4.02862	2.20647	10.49175	0.55487	28.53971	0.89675	4.00046

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00361	0.00445	0.00327	0.09773	-0.07577	0.01608	0.01820	0.00186	0.00905
#2	0.00398	0.00486	0.00292	0.09853	-0.07165	0.01611	0.02338	0.00186	0.00959
Mean	**0.00380**	**0.00466**	**0.00309**	**0.09813**	**-0.07371**	**0.01609**	**0.02079**	**0.00186**	**0.00932**
%RSD	6.82480	6.26458	8.12848	0.57528	3.94820	0.15012	17.61995	0.00000	4.13505

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03645	0.00466	0.05665	0.01284	0.01200	0.02552	0.01893	0.01643	0.02151
#2	-0.03591	0.00413	0.05665	0.01371	0.01077	0.02834	0.01750	0.02559	0.02039
Mean	**-0.03618**	**0.00439**	**0.05665**	**0.01327**	**0.01139**	**0.02693**	**0.01822**	**0.02101**	**0.02095**
%RSD	1.05555	8.41064	0.00000	4.62041	7.62258	7.39273	5.53571	30.84862	3.76235

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04494	0.01868	-0.00002	0.00070	0.00397	0.01837	0.09368	0.00387	0.01195

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#2	0.04704	0.01987	0.00000	-0.00010	0.00398	0.02202	0.09564	0.00430	0.01147
Mean	**0.04599**	**0.01927**	**-0.00001**	**0.00030**	**0.00397**	**0.02020**	**0.09466**	**0.00408**	**0.01171**
%RSD	3.22891	4.38025	91.09241	188.67081	0.18272	12.76941	1.46986	7.42835	2.85708

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00927	0.01228	0.01982
#2	0.00978	0.01175	0.02213
Mean	**0.00953**	**0.01202**	**0.02097**
%RSD	3.76477	3.11871	7.78486

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:34
SampleId1 : M100018-9 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 14:04:53
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE40

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00195	0.07085	0.00777	0.01653	0.00014	0.00053	0.00208	0.00515	0.00119
#2	0.00092	0.06898	0.00873	0.01704	0.00006	0.00051	0.00041	0.00435	0.00090
Mean	**0.00143**	**0.06992**	**0.00825**	**0.01679**	**0.00010**	**0.00052**	**0.00124**	**0.00475**	**0.00104**
%RSD	50.79491	1.89580	8.29472	2.15332	61.33435	2.26670	95.15342	11.90976	20.18996

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00126	0.00230	0.00020	0.05058	-0.20991	0.00963	-0.00123	0.00097	0.00453
#2	0.00090	0.00176	0.00035	0.05048	-0.23073	0.00963	-0.00533	0.00093	0.00391
Mean	**0.00108**	**0.00203**	**0.00027**	**0.05053**	**-0.22032**	**0.00963**	**-0.00328**	**0.00095**	**0.00422**
%RSD	23.97719	18.57289	39.04205	0.14894	6.68370	0.06274	88.47323	2.73464	10.43650

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.07942	0.00224	0.03634	0.00474	0.00646	0.00722	0.00988	0.00749	0.00948
#2	-0.07966	0.00153	0.03384	0.00106	0.00781	0.00581	0.00756	0.00392	0.01105
Mean	**-0.07954**	**0.00189**	**0.03509**	**0.00290**	**0.00714**	**0.00652**	**0.00872**	**0.00571**	**0.01027**
%RSD	0.21824	26.58560	5.03980	89.62536	13.35505	15.27135	18.79763	44.19546	10.79902

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01878	0.00698	-0.00112	-0.00018	0.00183	0.01108	0.04106	0.00162	0.00715
#2	0.01933	0.00841	-0.00115	-0.00045	0.00162	0.00916	0.03073	0.00181	0.00681
Mean	**0.01906**	**0.00769**	**-0.00113**	**-0.00031**	**0.00172**	**0.01012**	**0.03589**	**0.00172**	**0.00698**
%RSD	2.06109	13.16809	2.23690	61.83902	8.64219	13.41648	20.35594	7.68339	3.42434

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	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00430	0.00589	0.00882
#2	0.00429	0.00556	0.00868

Mean	**0.00429**	**0.00573**	**0.00875CH**
%RSD	0.07083	4.03354	1.14683

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:34
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 14:06:40
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19796	50.09858	0.50814	0.96679	0.98819	0.48406	0.51013	48.94107	0.49234
#2	0.19878	50.16953	0.50885	0.96691	0.99041	0.48482	0.51694	49.01226	0.49185
Mean	**0.19837**	**50.13405**	**0.50850**	**0.96685**	**0.98930**	**0.48444**	**0.51353**	**48.97666**	**0.49210**
%RSD	0.29206	0.10008	0.09812	0.00862	0.15877	0.11191	0.93852	0.10278	0.07172

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49244	0.97727	0.98236	20.10714	51.48631	0.52117	49.53886	0.96368	0.97869
#2	0.49323	0.97922	0.98240	20.14170	51.52908	0.52160	49.64116	0.96576	0.98069
Mean	**0.49283**	**0.97824**	**0.98238**	**20.12442**	**51.50769**	**0.52138**	**49.59001**	**0.96472**	**0.97969**
%RSD	0.11257	0.14125	0.00290	0.12143	0.05871	0.05836	0.14587	0.15245	0.14433

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.60586	0.99800	4.83039	0.95372	0.93927	4.84732	0.48974	0.99725	0.98127
#2	49.63885	0.99930	4.83029	0.95919	0.94198	4.88143	0.48761	1.00002	0.98628
Mean	**49.62235**	**0.99865**	**4.83034**	**0.95645**	**0.94062**	**4.86438**	**0.48868**	**0.99863**	**0.98377**
%RSD	0.04702	0.09235	0.00149	0.40443	0.20338	0.49584	0.30824	0.19597	0.36054

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.70254	0.98573	0.49638	0.12198	0.46629	0.50209	4.85923	0.48141	0.98185
#2	4.71173	0.98763	0.49684	0.11879	0.46728	0.50521	4.89823	0.48231	0.98354
Mean	**4.70714**	**0.98668**	**0.49661**	**0.12039**	**0.46679**	**0.50365**	**4.87873**	**0.48186**	**0.98270**
%RSD	0.13800	0.13663	0.06515	1.87381	0.14881	0.43868	0.56535	0.13207	0.12202

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.96965	0.94408	0.98659
#2	0.97135	0.94771	0.99086
Mean	**0.97050**	**0.94590**	**0.98872**
%RSD	0.12397	0.27108	0.30519

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:34
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/4/2010 14:08:33
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations:**56** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00011	0.06277	0.00107	-0.00050	-0.00034	0.00015	0.00235	-0.01609	0.00005
#2	-0.00071	0.05787	-0.00243	-0.00207	-0.00045	0.00012	-0.00482	-0.01804	0.00018
Mean	**-0.00041**	**0.06032**	**-0.00068**	**-0.00128**	**-0.00040**	**0.00014**	**-0.00123**	**-0.01707**	**0.00011**
%RSD	101.93372	5.74114	362.02705	86.73123	20.14349	15.30387	411.35382	8.04388	83.86530

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00014	0.00019	-0.00147	0.00137	-0.20967	0.00391	-0.00382	0.00034	-0.00048
#2	-0.00091	0.00013	-0.00210	0.00089	-0.22734	0.00385	-0.00943	0.00023	-0.00024
Mean	**-0.00038**	**0.00016**	**-0.00178**	**0.00113**	**-0.21851**	**0.00388**	**-0.00662**	**0.00029**	**-0.00036**
%RSD	193.58784	23.49349	24.74900	30.07882	5.72052	1.09021	59.91371	26.99738	45.81034

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.10618	0.00064	-0.00797	0.00224	-0.00223	-0.01248	0.00106	-0.00505	-0.00063
#2	-0.10843	0.00004	-0.00227	-0.00206	0.00207	-0.01389	0.00005	0.00038	0.00150
Mean	**-0.10730**	**0.00034**	**-0.00512**	**0.00009**	**-0.00008**	**-0.01319**	**0.00056**	**-0.00234**	**0.00043**
%RSD	1.48816	125.22214	78.69099	3439.72439	3751.61229	7.54665	128.18522	164.48365	345.54713

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00653	0.00029	-0.00203	-0.00058	-0.00030	0.00050	0.00025	0.00018	0.00059
#2	-0.00982	-0.00173	-0.00208	-0.00057	-0.00037	-0.00341	-0.01647	-0.00055	0.00086
Mean	**-0.00817**	**-0.00072**	**-0.00205**	**-0.00057**	**-0.00033**	**-0.00145**	**-0.00811**	**-0.00019**	**0.00073**
%RSD	28.50310	199.30509	1.73032	1.55127	15.22104	190.30272	145.85335	275.99088	26.31430

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00024	-0.00074	-0.00210
#2	-0.00068	0.00069	0.00113
Mean	**-0.00046**	**-0.00002**	**-0.00049**
%RSD	66.98812	4124.97892	467.98578

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:34
SampleId1 : CRI **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/4/2010 14:10:26
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD3

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02053	0.47251	0.01246	0.41706	0.42756	0.01042	0.05167	5.36779	0.01078
#2	0.02027	0.47114	0.00996	0.41655	0.42753	0.01042	0.04931	5.36928	0.01078
Mean	**0.02040**	**0.47183**	**0.01121**	**0.41680**	**0.42754**	**0.01042**	**0.05049**	**5.36854**	**0.01078**
%RSD	0.87874	0.20618	15.73187	0.08669	0.00470	0.00528	3.29796	0.01964	0.00752

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	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10352	0.02106	0.05163	0.21832	4.02730	0.02023	5.32698	0.03106	0.02021
#2	0.10449	0.02108	0.05149	0.21843	4.01694	0.02027	5.33367	0.03109	0.01964
Mean	**0.10400**	**0.02107**	**0.05156**	**0.21838**	**4.02212**	**0.02025**	**5.33033**	**0.03108**	**0.01992**
%RSD	0.65789	0.07095	0.20212	0.03449	0.18203	0.10933	0.08881	0.08390	2.02661

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.32390	0.08568	0.21506	0.00654	0.00612	0.20714	0.12624	0.00703	0.00937
#2	4.31210	0.08574	0.21135	0.00550	0.00585	0.20573	0.12481	0.00881	0.01135
Mean	**4.31800**	**0.08571**	**0.21321**	**0.00602**	**0.00598**	**0.20644**	**0.12553**	**0.00792**	**0.01036**
%RSD	0.19334	0.05132	1.22827	12.25512	3.25156	0.48234	0.80533	15.93841	13.55476

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10086	0.10652	0.01954	0.08870	0.02005	0.02007	0.20333	0.10502	0.04020
#2	0.10091	0.10652	0.01951	0.09121	0.02003	0.01982	0.21071	0.10497	0.04067
Mean	**0.10088**	**0.10652**	**0.01953**	**0.08996**	**0.02004**	**0.01994**	**0.20702**	**0.10499**	**0.04043**
%RSD	0.03808	0.00002	0.10392	1.97696	0.07239	0.88065	2.52128	0.03765	0.82744

	Zr	Pb	Se
	ppm	calc	calc
#1	0.05236	0.00626	0.00859
#2	0.05199	0.00573	0.01051
Mean	**0.05217**	**0.00600**	**0.00955**
%RSD	0.50290	6.26151	14.21323

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:35
SampleId1 : ICSA SampleId2 : [FLEXQC]
Analysis commenced : 3/4/2010 14:12:18
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD4

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00014	261.22921	0.00040	-0.00238	-0.00020	0.00052	0.00755	258.07210	0.00009
#2	-0.00047	263.85859	0.00073	-0.00215	-0.00026	0.00053	0.00411	259.20046	0.00007
Mean	**-0.00017**	**262.54390**	**0.00056**	**-0.00227**	**-0.00023**	**0.00052**	**0.00583**	**258.63628**	**0.00008**
%RSD	260.59896	0.70817	42.03351	7.36425	17.58669	0.31900	41.65718	0.30849	18.96026

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00150	-0.00071	-0.00553	104.95221	-0.33317	0.00547	264.63195	-0.00076	-0.00004
#2	0.00140	-0.00032	-0.00639	105.56394	-0.35182	0.00546	266.32249	-0.00069	-0.00094
Mean	**0.00145**	**-0.00051**	**-0.00596**	**105.25808**	**-0.34250**	**0.00547**	**265.47722**	**-0.00072**	**-0.00049**
%RSD	5.07739	53.08760	10.13640	0.41096	3.85018	0.14741	0.45028	7.19975	131.00134

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	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.09994	0.00184	0.01243	0.00407	0.00034	0.00581	0.00553	0.00929	0.00037
#2	-0.10024	0.00024	0.00613	0.00284	0.00125	0.01004	0.00796	0.00773	-0.00054
Mean	**-0.10009**	**0.00104**	**0.00928**	**0.00346**	**0.00080**	**0.00793**	**0.00674**	**0.00851**	**-0.00009**
%RSD	0.20811	109.10476	48.01455	25.25050	80.66342	37.67705	25.42988	12.98134	761.31477

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01342	0.00006	0.01121	-0.00419	-0.00069	0.00091	0.03262	-0.00179	0.00079
#2	-0.01302	0.00316	0.01134	-0.00455	-0.00096	-0.00305	0.03860	-0.00199	0.00086
Mean	**-0.01322**	**0.00161**	**0.01128**	**-0.00437**	**-0.00083**	**-0.00107**	**0.03561**	**-0.00189**	**0.00083**
%RSD	2.10823	136.46366	0.80955	5.72866	23.71104	261.89727	11.87679	7.43808	5.77295

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00192	0.00159	0.00334
#2	0.00180	0.00178	0.00221
Mean	**0.00186**	**0.00168**	**0.00278**
%RSD	4.37639	8.21507	28.84402

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:35
SampleId1 : ICSAB **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/4/2010 14:14:11
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD5

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20733	264.05992	0.11594	1.01032	0.52172	0.47253	0.53993	258.28550	1.02160
#2	0.20655	263.92840	0.11274	1.00965	0.52237	0.47170	0.54722	257.62363	1.02005
Mean	**0.20694**	**263.99416**	**0.11434**	**1.00998**	**0.52205**	**0.47211**	**0.54357**	**257.95456**	**1.02083**
%RSD	0.26785	0.03523	1.97861	0.04675	0.08854	0.12478	0.94942	0.18143	0.10739

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47098	0.47130	0.52444	105.31367	-0.33995	1.10411	266.43384	0.46594	1.00500
#2	0.46902	0.47051	0.52436	105.11995	-0.34746	1.10417	265.95137	0.46516	1.00287
Mean	**0.47000**	**0.47090**	**0.52440**	**105.21681**	**-0.34371**	**1.10414**	**266.19261**	**0.46555**	**1.00393**
%RSD	0.29436	0.11884	0.01007	0.13020	1.54461	0.00375	0.12816	0.11801	0.14999

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.10770	0.95349	1.02666	0.05225	0.05672	1.02314	0.61068	0.05506	0.05699
#2	-0.10784	0.94986	1.02375	0.05251	0.05442	1.02032	0.61303	0.06154	0.05289
Mean	**-0.10777**	**0.95168**	**1.02521**	**0.05238**	**0.05557**	**1.02173**	**0.61186**	**0.05830**	**0.05494**
%RSD	0.09663	0.26951	0.20072	0.35285	2.92588	0.19523	0.27157	7.85146	5.28407

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.95150	1.00532	1.02639	-0.04104	0.94589	0.10329	10.32000	0.48296	0.86941
#2	0.95128	1.00424	1.02887	-0.04336	0.94515	0.10621	10.32510	0.48441	0.86799
Mean	**0.95139**	**1.00478**	**1.02763**	**-0.04220**	**0.94552**	**0.10475**	**10.32255**	**0.48368**	**0.86870**
%RSD	0.01628	0.07545	0.17063	3.88658	0.05533	1.97352	0.03490	0.21218	0.11590

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.50545	0.05523	0.05635
#2	0.50504	0.05379	0.05577
Mean	**0.50525**	**0.05451**	**0.05606**
%RSD	0.05773	1.87667	0.73510

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:35
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 14:16:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19846	49.93998	0.50840	0.97740	0.98529	0.49038	0.51189	49.81418	0.49710
#2	0.20032	50.30056	0.51512	0.98325	0.99189	0.49199	0.51508	49.97391	0.49977
Mean	**0.19939**	**50.12027**	**0.51176**	**0.98033**	**0.98859**	**0.49118**	**0.51349**	**49.89404**	**0.49843**
%RSD	0.65905	0.50872	0.92871	0.42217	0.47257	0.23180	0.43927	0.22637	0.37785

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49836	0.98935	0.98076	20.31881	51.11803	0.51625	50.38914	0.97304	0.99484
#2	0.50069	0.99360	0.98657	20.40314	51.47868	0.52014	50.62041	0.97735	0.99627
Mean	**0.49953**	**0.99148**	**0.98366**	**20.36097**	**51.29836**	**0.51819**	**50.50478**	**0.97519**	**0.99556**
%RSD	0.32967	0.30276	0.41799	0.29287	0.49713	0.53119	0.32380	0.31243	0.10145

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.31841	1.01566	4.84908	0.96993	0.95416	4.88143	0.49295	1.00077	0.99327
#2	49.64455	1.01971	4.90037	0.97409	0.95563	4.93971	0.49669	1.01342	0.99172
Mean	**49.48148**	**1.01769**	**4.87473**	**0.97201**	**0.95489**	**4.91057**	**0.49482**	**1.00710**	**0.99249**
%RSD	0.46607	0.28134	0.74399	0.30266	0.10866	0.83916	0.53576	0.88835	0.11072

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.71121	1.00122	0.49602	0.12181	0.46778	0.50931	4.83389	0.48442	1.00607
#2	4.74720	1.00551	0.49926	0.11998	0.47009	0.50709	4.88916	0.48695	1.00769
Mean	**4.72920**	**1.00337**	**0.49764**	**0.12090**	**0.46893**	**0.50820**	**4.86152**	**0.48569**	**1.00688**
%RSD	0.53814	0.30229	0.46127	1.06761	0.34871	0.30878	0.80398	0.36815	0.11434

	Zr	**Pb**	**Se**
	ppm	calc	calc

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#1	0.97462	0.95941	0.99577	**CH**
#2	0.98046	0.96177	0.99894	
Mean	**0.97754**	**0.96059**	**0.99736**	
%RSD	0.42223	0.17403	0.22522	

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:36
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/4/2010 14:17:56
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00107	0.07382	-0.00202	0.00002	-0.00051	0.00025	-0.00521	-0.00696	-0.00020
#2	0.00021	0.07278	0.00058	-0.00018	-0.00031	0.00022	0.00196	-0.01141	0.00019
Mean	**-0.00043**	**0.07330**	**-0.00072**	**-0.00008**	**-0.00041**	**0.00024**	**-0.00162**	**-0.00919**	**-0.00001**
%RSD	210.66528	1.00338	255.67037	167.44826	34.03901	8.64164	311.86457	34.28299	4667.89914

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00025	-0.00008	-0.00167	0.00493	-0.14211	0.00406	0.00223	0.00031	-0.00035
#2	-0.00009	0.00043	-0.00154	0.00307	-0.14042	0.00404	0.00244	0.00034	0.00004
Mean	**-0.00017**	**0.00017**	**-0.00161**	**0.00400**	**-0.14126**	**0.00405**	**0.00233**	**0.00033**	**-0.00015**
%RSD	64.29547	206.18444	5.94904	32.92938	0.84840	0.24879	6.53846	7.98314	180.01784

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.10352	-0.00035	-0.00157	0.00006	0.00071	-0.00967	-0.00227	-0.00458	0.00143
#2	-0.10416	-0.00012	-0.00397	0.00073	0.00250	-0.00967	0.00047	-0.00565	0.00080
Mean	**-0.10384**	**-0.00024**	**-0.00277**	**0.00039**	**0.00161**	**-0.00967**	**-0.00090**	**-0.00511**	**0.00111**
%RSD	0.43459	67.36037	61.22302	118.84942	78.51828	0.00000	214.99016	14.82084	39.80491

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00847	-0.00257	-0.00204	-0.00184	-0.00042	-0.00257	-0.01303	-0.00034	0.00025
#2	-0.00665	0.00006	-0.00200	-0.00025	-0.00037	0.00133	-0.00467	0.00007	0.00073
Mean	**-0.00756**	**-0.00126**	**-0.00202**	**-0.00104**	**-0.00040**	**-0.00062**	**-0.00885**	**-0.00014**	**0.00049**
%RSD	17.00859	147.72373	1.25347	107.43109	8.20752	443.86123	66.84019	208.24995	68.28519

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00034	0.00050	-0.00057
#2	-0.00037	0.00191	-0.00135
Mean	**-0.00036**	**0.00120**	**-0.00096**
%RSD	5.78435	82.92094	57.17878

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:36
SampleId1 : CCV SampleId2 : [CV]
Analysis commenced : 3/4/2010 15:22:52

Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19978	50.70764	0.51382	0.97716	0.99340	0.50066	0.51105	50.37124	0.49381
#2	0.19893	50.82427	0.51442	0.97760	0.99394	0.50043	0.51293	50.33638	0.49263
Mean	**0.19936**	**50.76595**	**0.51412**	**0.97738**	**0.99367**	**0.50054**	**0.51199**	**50.35381**	**0.49322**
%RSD	0.30400	0.16245	0.08172	0.03126	0.03850	0.03224	0.25934	0.04895	0.16855

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50702	1.00740	0.98267	20.73011	51.34252	0.52525	51.36520	0.99592	1.00391
#2	0.50679	1.00758	0.98344	20.72110	51.42436	0.52641	51.34981	0.99599	1.00500
Mean	**0.50690**	**1.00749**	**0.98305**	**20.72561**	**51.38344**	**0.52583**	**51.35750**	**0.99596**	**1.00445**
%RSD	0.03253	0.01270	0.05515	0.03074	0.11262	0.15649	0.02119	0.00528	0.07678

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.99111	1.01303	4.97869	0.99081	0.97277	5.00510	0.48953	1.01907	1.01445
#2	50.09016	1.00713	4.97199	0.98729	0.97907	4.99373	0.48688	1.02091	1.02378
Mean	**50.04064**	**1.01008**	**4.97534**	**0.98905**	**0.97592**	**4.99941**	**0.48820**	**1.01999**	**1.01912**
%RSD	0.13996	0.41303	0.09530	0.25175	0.45626	0.16086	0.38402	0.12715	0.64700

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.83936	1.00896	0.49929	0.12743	0.47934	0.50883	4.91463	0.49299	1.05016
#2	4.84234	1.00455	0.49907	0.12702	0.47881	0.50671	4.92699	0.49219	1.04989
Mean	**4.84085**	**1.00675**	**0.49918**	**0.12723**	**0.47908**	**0.50777**	**4.92081**	**0.49259**	**1.05003**
%RSD	0.04346	0.30979	0.03086	0.22653	0.07778	0.29488	0.17758	0.11512	0.01828

	Zr	Pb	Se
	ppm	calc	calc
#1	0.98434	0.97878	1.01599
#2	0.98312	0.98181	1.02282
Mean	**0.98373**	**0.98029**	**1.01941**
%RSD	0.08755	0.21839	0.47379

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:36
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/4/2010 15:24:45
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00051	0.08194	-0.00016	0.00123	0.00054	0.00046	0.00000	0.03175	0.00072
#2	-0.00012	0.07107	-0.00139	0.00116	0.00031	0.00035	0.00020	0.01965	0.00046

Mean	**-0.00031**	**0.07651**	**-0.00078**	**0.00120**	**0.00042**	**0.00041**	**0.00010**	**0.02570**	**0.00059**
%RSD	87.63188	10.04065	111.86363	4.65376	37.81672	20.65117	141.52667	33.30397	30.58820

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00051	0.00122	-0.00012	0.01913	-0.20579	0.00415	0.04454	0.00112	0.00012
#2	0.00025	0.00094	-0.00041	0.01525	-0.23170	0.00404	0.03158	0.00093	-0.00009
Mean	**0.00038**	**0.00108**	**-0.00027**	**0.01719**	**-0.21875**	**0.00409**	**0.03806**	**0.00103**	**0.00002**
%RSD	49.03723	18.35462	76.89347	15.97389	8.37559	1.92032	24.06294	12.69154	930.36196

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.07515	0.00084	0.00043	0.00113	0.00181	-0.00685	0.00046	-0.00640	0.00188
#2	-0.08492	0.00040	0.00123	-0.00113	0.00060	-0.01248	-0.00031	0.00137	-0.00035
Mean	**-0.08003**	**0.00062**	**0.00083**	**0.00000**	**0.00120**	**-0.00967**	**0.00007**	**-0.00252**	**0.00077**
%RSD	8.63253	49.89187	68.31257270	100.30974	70.86663	41.17222	735.47122	218.16196	205.29714

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00096	0.00053	-0.00155	-0.00026	0.00004	0.00455	-0.00566	0.00029	0.00147
#2	-0.00117	-0.00114	-0.00165	-0.00171	-0.00018	-0.00394	0.00270	0.00065	0.00127
Mean	**-0.00107**	**-0.00030**	**-0.00160**	**-0.00098**	**-0.00007**	**0.00031**	**-0.00148**	**0.00047**	**0.00137**
%RSD	14.36936	390.65979	4.42817	104.70905	211.55348	1963.59692	400.10942	53.25597	10.47638

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00029	0.00158	-0.00088
#2	0.00029	0.00002	0.00022
Mean	**0.00029**	**0.00080**	**-0.00033**
%RSD	0.27801	137.26272	238.36613

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:36
SampleId1 : 1002177-1 100X SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 15:26:37
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE1

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00057	0.02619	0.13908	0.02389	0.04251	0.00007	-0.00159	8.58251	-0.00109
#2	0.00011	0.02406	0.14142	0.02436	0.04287	0.00003	-0.00355	8.61679	-0.00084
Mean	**-0.00023**	**0.02513**	**0.14025**	**0.02412**	**0.04269**	**0.00005**	**-0.00257**	**8.59965**	**-0.00097**
%RSD	205.33981	5.97245	1.18153	1.38333	0.61066	55.15432	53.90966	0.28185	18.15373

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00049	0.00019	-0.00142	-0.00284	0.45280	0.00818	4.06500	0.07690	-0.00097
#2	0.00039	0.00071	-0.00058	-0.00316	0.44482	0.00816	4.08961	0.07727	0.00046
Mean	**0.00044**	**0.00045**	**-0.00100**	**-0.00300**	**0.44881**	**0.00817**	**4.07731**	**0.07708**	**-0.00026**

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%RSD	16.85966	82.88434	59.95437	7.53006	1.25787	0.09862	0.42691	0.33837	393.15607

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	200.63849	0.00169	0.00103	0.00545	0.00309	1.34060	-0.00215	-0.01195	-0.00153
#2	199.77786	0.00108	-0.00617	0.00737	0.00332	1.34060	-0.00007	-0.00526	0.00160
Mean	**200.20818**	**0.00139**	**-0.00257**	**0.00641**	**0.00321**	**1.34060**	**-0.00111**	**-0.00861**	**0.00003**
%RSD	0.30396	31.04545	197.95321	21.19124	4.91571	0.00000	132.90838	54.96017	6434.31482

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.11786	0.00101	2.03208	-0.00462	-0.00060	0.00182	-0.06370	-0.00553	0.00492
#2	0.11956	0.00018	2.04179	-0.00107	-0.00054	0.00370	-0.05977	-0.00482	0.00471
Mean	**0.11871**	**0.00059**	**2.03693**	**-0.00284**	**-0.00057**	**0.00276**	**-0.06174**	**-0.00518**	**0.00482**
%RSD	1.00914	99.57725	0.33727	88.15036	7.64177	48.20824	4.50840	9.68091	2.97738

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00019	0.00388	-0.00500
#2	-0.00016	0.00467	-0.00068
Mean	**-0.00017**	**0.00427**	**-0.00284**
%RSD	10.90862	13.04384	107.42549

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:37
SampleId1 : 1002177-2 100X SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 15:28:23
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00174	0.02171	0.24246	0.18452	0.02750	0.00006	-0.00328	43.93915	-0.00197
#2	-0.00123	0.01962	0.23852	0.18035	0.02716	0.00007	-0.00014	43.26339	-0.00179
Mean	**-0.00148**	**0.02066**	**0.24049**	**0.18244**	**0.02733**	**0.00007**	**-0.00171**	**43.60127**	**-0.00188**
%RSD	24.13765	7.13302	1.15881	1.61541	0.88031	5.91080	130.00693	1.09593	6.83740

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00063	0.00019	-0.00172	-0.00486	3.16261	0.01774	30.38772	0.19244	0.00191
#2	0.00010	-0.00007	-0.00129	-0.00401	3.09680	0.01758	29.93005	0.18960	0.00092
Mean	**0.00036**	**0.00006**	**-0.00151**	**-0.00443**	**3.12970**	**0.01766**	**30.15888**	**0.19102**	**0.00142**
%RSD	102.07309	330.37552	20.20166	13.57485	1.48694	0.62683	1.07306	1.05232	49.20534

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	415.28024	0.00228	-0.00477	0.00851	0.00675	5.92146	-0.00148	-0.01416	0.00160
#2	410.45941	0.00218	-0.00397	0.00761	0.00684	5.82320	-0.00136	-0.01244	0.00342
Mean	**413.14983**	**0.00223**	**-0.00437**	**0.00806**	**0.00680**	**5.87233**	**-0.00142**	**-0.01330**	**0.00251**
%RSD	0.92093	3.15840	12.93899	7.94040	0.93689	1.18318	5.64058	9.14061	51.06406

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	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.31508	-0.00090	5.56173	-0.00905	-0.00088	0.00053	-0.13455	-0.00932	0.00647
#2	0.30960	0.00173	5.44522	-0.00437	-0.00036	0.00017	-0.14144	-0.00988	0.00627
Mean	**0.31234**	**0.00041**	**5.50347**	**-0.00671**	**-0.00062**	**0.00035**	**-0.13799**	**-0.00960**	**0.00637**
%RSD	1.24161	447.99364	1.49691	49.31958	59.24913	73.35816	3.52963	4.12153	2.25080

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00004	0.00734	-0.00365
#2	-0.00039	0.00710	-0.00187
Mean	**-0.00022**	**0.00722**	**-0.00276**
%RSD	113.50604	2.36314	45.68795

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:37
SampleId1 : 1002177-3 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 15:30:09
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE3

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00010	0.02745	0.00382	0.08866	0.04253	0.00006	-0.00756	29.85362	-0.00008
#2	-0.00036	0.02922	0.00445	0.08763	0.04242	0.00005	0.00039	29.79755	-0.00001
Mean	**-0.00023**	**0.02833**	**0.00414**	**0.08814**	**0.04248**	**0.00005**	**-0.00359**	**29.82559**	**-0.00005**
%RSD	77.66158	4.42783	10.81580	0.82020	0.18884	13.18513	156.76157	0.13293	100.61673

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00025	0.00013	-0.00111	-0.00449	1.04916	0.00734	19.41693	0.17480	-0.00037
#2	0.00070	0.00012	-0.00076	-0.00396	1.05182	0.00737	19.36439	0.17450	0.00012
Mean	**0.00048**	**0.00013**	**-0.00093**	**-0.00422**	**1.05049**	**0.00736**	**19.39066**	**0.17465**	**-0.00013**
%RSD	65.92847	9.05616	26.49722	8.91201	0.17899	0.24643	0.19159	0.11957	274.63419

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	130.42658	0.00238	0.00093	-0.00043	0.00119	5.20986	-0.00399	-0.00075	0.00045
#2	130.03089	0.00182	0.00123	0.00137	0.00123	5.17430	-0.00197	-0.00614	0.00101
Mean	**130.22873**	**0.00210**	**0.00108**	**0.00047**	**0.00121**	**5.19208**	**-0.00298**	**-0.00344**	**0.00073**
%RSD	0.21485	18.87239	19.67678	269.09925	2.14796	0.48421	48.08532	110.58371	53.96903

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.57926	-0.00090	1.86735	-0.01140	-0.00069	-0.00410	-0.01598	0.00044	0.00269
#2	0.57755	0.00018	1.86452	-0.00716	-0.00038	-0.00139	-0.00909	0.00059	0.00282
Mean	**0.57841**	**-0.00036**	**1.86594**	**-0.00928**	**-0.00053**	**-0.00274**	**-0.01253**	**0.00051**	**0.00275**
%RSD	0.20825	210.01965	0.10725	32.29371	40.77967	69.89222	38.85633	20.62123	3.47060

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	-0.00004	0.00065	0.00005
#2	-0.00014	0.00127	-0.00137
Mean	**-0.00009**	**0.00096**	**-0.00066**
%RSD	74.60587	45.60261	152.38781

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:37
SampleId1 : 1002177-4 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:31:56
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE4

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00110	0.02294	0.00188	1.27290	0.00025	0.00007	-0.00354	0.45025	-0.00011
#2	-0.00054	0.02579	0.00054	1.28437	0.00028	0.00008	-0.00118	0.45013	-0.00040
Mean	**-0.00082**	**0.02436**	**0.00121**	**1.27863**	**0.00027**	**0.00007**	**-0.00236**	**0.45019**	**-0.00026**
%RSD	48.68049	8.27943	77.98911	0.63409	7.47580	6.64050	70.75560	0.01794	78.01307

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00004	-0.00038	0.00024	-0.00608	0.30569	0.00475	0.27486	0.00263	-0.00154
#2	0.00019	-0.00001	0.00030	-0.00555	0.29238	0.00472	0.28091	0.00270	-0.00058
Mean	**0.00008**	**-0.00019**	**0.00027**	**-0.00582**	**0.29904**	**0.00473**	**0.27789**	**0.00267**	**-0.00106**
%RSD	217.47221	135.77548	16.01856	6.46682	3.14709	0.34044	1.53802	1.95450	63.98064

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	44.39383	-0.00055	0.00053	0.00109	-0.00048	0.11562	-0.00144	-0.00318	-0.00146
#2	44.51039	-0.00057	0.00013	-0.00027	-0.00056	0.10717	-0.00025	-0.00279	0.00035
Mean	**44.45211**	**-0.00056**	**0.00033**	**0.00041**	**-0.00052**	**0.11140**	**-0.00084**	**-0.00299**	**-0.00056**
%RSD	0.18542	3.15003	86.21028	235.28132	10.74451	5.36218	100.06601	9.15293	229.16551

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.05897	0.00077	0.02618	-0.00312	-0.00036	0.00240	-0.01893	-0.00014	0.00188
#2	0.07190	0.00089	0.02650	-0.00320	-0.00032	0.00064	-0.00761	-0.00040	0.00248
Mean	**0.06543**	**0.00083**	**0.02634**	**-0.00316**	**-0.00034**	**0.00152**	**-0.01327**	**-0.00027**	**0.00218**
%RSD	13.97464	10.14195	0.86686	1.85457	9.56437	81.84996	60.29199	67.93870	19.73412

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00096	0.00004	-0.00204
#2	-0.00076	-0.00047	-0.00070
Mean	**-0.00086**	**-0.00021**	**-0.00137**
%RSD	16.28501	166.80399	69.14808

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:38

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SampleId1 : 1003011-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:33:42
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE5

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00165	0.01856	-0.00080	0.16046	0.20589	0.00008	-0.00443	96.30791	-0.00023
#2	-0.00094	0.01986	0.00215	0.15983	0.20529	0.00009	-0.00501	96.11736	-0.00045
Mean	**-0.00130**	**0.01921**	**0.00068**	**0.16014**	**0.20559**	**0.00009**	**-0.00472**	**96.21263**	**-0.00034**
%RSD	38.44549	4.78085	307.94466	0.27779	0.20498	4.26335	8.73941	0.14004	45.42583

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00007	0.00111	-0.00130	0.00009	3.46027	0.01967	56.82697	0.00090	0.00321
#2	-0.00004	0.00148	-0.00053	0.00014	3.44243	0.01960	56.72418	0.00090	0.00269
Mean	**-0.00005**	**0.00130**	**-0.00092**	**0.00011**	**3.45135**	**0.01964**	**56.77557**	**0.00090**	**0.00295**
%RSD	33.67553	20.15348	59.42598	32.77181	0.36534	0.25623	0.12802	0.00000	12.44819

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	41.35854	0.04828	0.01103	-0.00220	0.00121	15.07411	-0.00017	0.01460	0.01428
#2	41.23404	0.04938	0.01393	-0.00131	0.00057	15.02918	-0.00226	0.01385	0.01324
Mean	**41.29629**	**0.04883**	**0.01248**	**-0.00176**	**0.00089**	**15.05164**	**-0.00121**	**0.01422**	**0.01376**
%RSD	0.21318	1.58565	16.43401	35.70786	51.30547	0.21108	121.97132	3.70268	5.37144

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	14.72117	0.01152	4.17116	-0.01899	-0.00092	0.00008	-0.03812	0.00130	0.00411
#2	14.66702	0.00973	4.16772	-0.01854	-0.00095	-0.00475	-0.02582	0.00115	0.00411
Mean	**14.69410**	**0.01062**	**4.16944**	**-0.01877**	**-0.00094**	**-0.00233**	**-0.03197**	**0.00122**	**0.00411**
%RSD	0.26060	11.92058	0.05830	1.69278	2.31790	146.36005	27.20364	8.63630	0.00000

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00289	0.00008	0.01439
#2	-0.00272	-0.00006	0.01344
Mean	**-0.00280**	**0.00001**	**0.01392**
%RSD	4.09894	1172.68122	4.80342

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:38
SampleId1 : 1003011-2 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:35:28
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE6

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Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	-0.00052	0.02072	-0.00061	0.12365	0.04994	0.00000	-0.00286	43.61330	-0.00035
#2	0.00003	0.02219	-0.00080	0.12314	0.04974	-0.00001	0.00088	43.43555	0.00006
Mean	**-0.00025**	**0.02146**	**-0.00070**	**0.12340**	**0.04984**	**0.00000**	**-0.00099**	**43.52442**	**-0.00015**
%RSD	157.87783	4.84266	18.74642	0.29293	0.28167	76.30129	268.10629	0.28877	197.62863

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00013	0.00667	-0.00124	-0.00108	6.91003	0.04505	10.55834	0.00086	0.00220
#2	0.00092	0.00723	-0.00034	-0.00044	6.86949	0.04484	10.53738	0.00093	0.00349
Mean	**0.00053**	**0.00695**	**-0.00079**	**-0.00076**	**6.88976**	**0.04495**	**10.54786**	**0.00090**	**0.00284**
%RSD	105.53562	5.69862	80.53918	59.16241	0.41613	0.32636	0.14049	5.80609	32.25618

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	50.40623	0.00030	-0.00137	-0.00190	0.00118	63.95499	0.00054	0.00350	0.00474
#2	50.23448	0.00036	-0.00597	0.00120	-0.00075	63.95026	-0.00011	0.00050	0.00338
Mean	**50.32035**	**0.00033**	**-0.00367**	**-0.00035**	**0.00021**	**63.95262**	**0.00022**	**0.00200**	**0.00406**
%RSD	0.24133	13.28911	88.58265	628.34395	643.21599	0.00523	212.61132	105.88236	23.68208

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.39545	0.00053	3.96155	-0.00627	-0.00050	0.00413	-0.02976	-0.00040	0.00032
#2	1.39113	-0.00006	3.93135	-0.00764	-0.00032	0.00353	0.00075	0.00074	0.00012
Mean	**1.39329**	**0.00024**	**3.94645**	**-0.00695**	**-0.00041**	**0.00383**	**-0.01450**	**0.00017**	**0.00022**
%RSD	0.21891	179.56283	0.54099	13.95632	30.03770	11.00606	148.70857	480.00575	65.29864

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00104	0.00015	0.00432
#2	-0.00051	-0.00010	0.00242
Mean	**-0.00078**	**0.00003**	**0.00337**
%RSD	47.71910	710.88974	39.91268

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:38
SampleId1 : 1003011-2L 5X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:37:14
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE7

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00032	0.02822	0.00103	0.02459	0.00936	0.00003	-0.00373	8.80338	-0.00035
#2	-0.00047	0.02917	0.00092	0.02574	0.00955	0.00004	0.00029	8.85756	0.00004
Mean	**-0.00040**	**0.02870**	**0.00097**	**0.02516**	**0.00946**	**0.00004**	**-0.00172**	**8.83047**	**-0.00015**
%RSD	27.41397	2.33986	8.11515	3.20459	1.48440	15.05110	165.54266	0.43391	175.97923

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00021	0.00181	-0.00125	-0.00273	0.83882	0.01068	2.12758	0.00034	0.00092

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#2	0.00016	0.00177	-0.00062	-0.00209	0.83568	0.01071	2.14485	0.00031	-0.00004
Mean	**-0.00003**	**0.00179**	**-0.00094**	**-0.00241**	**0.83725**	**0.01070**	**2.13621**	**0.00033**	**0.00044**
%RSD	928.64154	1.72395	47.47627	18.71371	0.26549	0.18823	0.57172	7.98314	152.92792

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	9.02467	-0.00001	-0.00257	0.00205	-0.00139	11.71480	-0.00085	-0.00231	-0.00133
#2	9.09057	0.00082	-0.00317	0.00167	-0.00101	11.82283	0.00188	0.00039	0.00083
Mean	**9.05762**	**0.00041**	**-0.00287**	**0.00186**	**-0.00120**	**11.76881**	**0.00052**	**-0.00096**	**-0.00025**
%RSD	0.51451	145.30455	14.77280	14.57104	22.61213	0.64908	373.44980	199.62757	623.35127

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.26616	-0.00185	0.79327	-0.00178	-0.00054	0.00104	-0.01106	-0.00014	0.00032
#2	0.26871	-0.00138	0.80035	-0.00362	-0.00054	-0.00008	0.00026	0.00021	0.00066
Mean	**0.26743**	**-0.00162**	**0.79681**	**-0.00270**	**-0.00054**	**0.00048**	**-0.00540**	**0.00004**	**0.00049**
%RSD	0.67546	20.90625	0.62787	48.15344	0.00000	163.94096	148.13735	682.25032	48.77514

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00063	-0.00024	-0.00165
#2	-0.00037	-0.00012	0.00069
Mean	**-0.00050**	**-0.00018**	**-0.00048**
%RSD	35.95669	50.15726	343.15550

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:39
SampleId1 : 1003011-2MS SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 15:39:01
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE8

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00063	2.52632	2.46344	1.28091	2.36061	0.05455	-0.00211	86.98687	0.06085
#2	-0.00006	2.58029	2.52379	1.32147	2.42632	0.05559	-0.00914	87.47828	0.06292
Mean	**-0.00034**	**2.55331**	**2.49362**	**1.30119**	**2.39346**	**0.05507**	**-0.00562**	**87.23257**	**0.06188**
%RSD	117.79823	1.49479	1.71144	2.20425	1.94105	1.33405	88.35606	0.39834	2.37254

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.56468	0.23040	0.28938	1.17451	58.37816	0.65180	56.10939	0.55814	1.16287
#2	0.57692	0.23549	0.29653	1.19703	58.96175	0.65892	56.74022	0.56928	1.19061
Mean	**0.57080**	**0.23295**	**0.29296**	**1.18577**	**58.66996**	**0.65536**	**56.42481**	**0.56371**	**1.17674**
%RSD	1.21592	1.54414	1.72505	1.34300	0.70336	0.76833	0.79055	1.39801	1.66681

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	93.33021	0.55780	-0.00177	0.55281	0.57647	61.89165	0.56736	2.62544	2.72574
#2	93.71991	0.57513	-0.00167	0.56792	0.54714	61.96556	0.58702	2.69477	2.60955

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Mean	**93.52506**	**0.56647**	**-0.00172**	**0.56036**	**0.56180**	**61.92861**	**0.57719**	**2.66010**	**2.66765**
%RSD	0.29464	2.16309	4.10650	1.90760	3.69105	0.08439	2.40853	1.84305	3.07959

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	3.68111	0.59719	4.35117	-0.01305	0.55773	2.35914	-0.02515	0.57213	0.54768
#2	3.73234	0.60589	4.37054	-0.01429	0.56872	2.43539	-0.02565	0.58525	0.56061
Mean	**3.70672**	**0.60154**	**4.36086**	**-0.01367**	**0.56323**	**2.39726**	**-0.02540**	**0.57869**	**0.55415**
%RSD	0.97726	1.02215	0.31417	6.41147	1.37964	2.24897	1.41244	1.60301	1.65052

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00171	0.56859	2.69234
#2	-0.00128	0.55406	2.63793
Mean	**-0.00149**	**0.56132**	**2.66513**
%RSD	20.45248	1.82989	1.44345

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:39
SampleId1 : 1003011-2MSD **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:40:47
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE9

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00005	2.47383	2.45512	1.27714	2.31438	0.05461	-0.00037	89.34607	0.06079
#2	0.00092	2.52134	2.47798	1.29328	2.34606	0.05513	-0.00063	90.04505	0.06210
Mean	**0.00048**	**2.49758**	**2.46655**	**1.28521**	**2.33022**	**0.05487**	**-0.00050**	**89.69556**	**0.06144**
%RSD	127.99652	1.34496	0.65525	0.88793	0.96139	0.67477	37.07412	0.55104	1.49910

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.56411	0.23051	0.28322	1.16712	59.52451	0.66562	58.46547	0.55573	1.15752
#2	0.57088	0.23274	0.28872	1.18114	60.11349	0.67332	59.05695	0.56143	1.17316
Mean	**0.56749**	**0.23163**	**0.28597**	**1.17413**	**59.81900**	**0.66947**	**58.76121**	**0.55858**	**1.16534**
%RSD	0.84352	0.68063	1.35998	0.84403	0.69622	0.81356	0.71176	0.72180	0.94872

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	93.65345	0.56079	-0.00587	0.55782	0.56501	60.75579	0.56661	2.60937	2.63890
#2	94.67815	0.56934	0.00163	0.56471	0.55512	61.19544	0.57858	2.64377	2.63213
Mean	**94.16580**	**0.56506**	**-0.00212**	**0.56127**	**0.56006**	**60.97561**	**0.57260**	**2.62657**	**2.63552**
%RSD	0.76946	1.07024	249.93170	0.86809	1.24892	0.50983	1.47867	0.92611	0.18168

20000305

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	3.62738	0.59958	4.27862	-0.01772	0.55178	2.36625	-0.02071	0.56982	0.55371
#2	3.67011	0.60184	4.30709	-0.01590	0.55729	2.39144	0.00388	0.57624	0.56000
Mean	**3.64874**	**0.60071**	**4.29286**	**-0.01681**	**0.55454**	**2.37884**	**-0.00842**	**0.57303**	**0.55686**

20000305

%RSD	0.82801	0.26604	0.46890	7.64454	0.70229	0.74861	206.59970	0.79229	0.79976

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00111	0.56262	2.62907
#2	-0.00091	0.55831	2.63600
Mean	**-0.00101**	**0.56046**	**2.63254**
%RSD	14.14312	0.54295	0.18638

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:39
SampleId1 : 1003011-3 5X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:42:33
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE10

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00038	0.02764	0.00360	0.06805	0.01265	0.00001	-0.00147	97.60871	0.00010
#2	-0.00014	0.02458	-0.00057	0.06746	0.01250	-0.00001	-0.00442	97.23627	-0.00008
Mean	**0.00012**	**0.02611**	**0.00151**	**0.06775**	**0.01257**	**0.00000**	**-0.00295**	**97.42249**	**0.00001**
%RSD	304.56602	8.27794	194.87162	0.61560	0.79729	11616.06575	70.78124	0.27032	1185.98771

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00016	0.00026	-0.00062	-0.00321	1.62645	0.01322	48.93267	0.00049	0.00033
#2	0.00016	-0.00007	-0.00139	-0.00332	1.61824	0.01316	48.71075	0.00042	-0.00024
Mean	**0.00016**	**0.00010**	**-0.00101**	**-0.00326**	**1.62235**	**0.01319**	**48.82171**	**0.00046**	**0.00004**
%RSD	0.02204	235.58285	53.75188	2.30543	0.35796	0.35112	0.32142	11.44418	967.41780

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	36.24683	0.00018	0.00283	0.00188	0.00003	17.27899	0.00202	0.00590	0.00568
#2	36.10122	-0.00080	0.00143	-0.00040	0.00142	17.20040	-0.00001	0.00955	0.00596
Mean	**36.17403**	**-0.00031**	**0.00213**	**0.00074**	**0.00073**	**17.23970**	**0.00101**	**0.00772**	**0.00582**
%RSD	0.28463	221.54532	46.51847	218.67834	134.91339	0.32235	142.17009	33.43792	3.39129

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.18331	0.00615	1.17792	-0.01705	-0.00065	0.00296	0.00223	0.00061	0.00282
#2	2.17479	0.00591	1.17217	-0.01788	-0.00077	-0.00023	-0.01647	0.00051	0.00363
Mean	**2.17905**	**0.00603**	**1.17504**	**-0.01746**	**-0.00071**	**0.00136**	**-0.00712**	**0.00056**	**0.00323**
%RSD	0.27655	2.80032	0.34618	3.35280	11.73935	165.39393	185.60437	11.80302	17.77083

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00005	0.00065	0.00575
#2	0.00002	0.00081	0.00715
Mean	**-0.00001**	**0.00073**	**0.00645**
%RSD	301.69358	15.93758	15.36617

20000306

20000306

ted: 3/4/2010 17:29:56 User: ROY FRENCH

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:39

SampleId1 : CCV SampleId2 : [CV]

Analysis commenced : 3/4/2010 15:44:21

Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19633	50.18674	0.49834	0.95823	0.98435	0.48718	0.50253	48.76067	0.48233
#2	0.19525	49.68453	0.49734	0.95324	0.97353	0.48363	0.49597	48.43227	0.47817
Mean	**0.19579**	**49.93563**	**0.49784**	**0.95574**	**0.97894**	**0.48541**	**0.49925**	**48.59647**	**0.48025**
%RSD	0.39025	0.71115	0.14242	0.36910	0.78164	0.51609	0.92876	0.47785	0.61212

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49253	0.98092	0.97706	20.19367	50.91387	0.51910	49.87199	0.96921	0.97568
#2	0.48908	0.97439	0.96452	20.03265	50.54251	0.51464	49.49486	0.96190	0.96757
Mean	**0.49080**	**0.97766**	**0.97079**	**20.11316**	**50.72819**	**0.51687**	**49.68342**	**0.96555**	**0.97163**
%RSD	0.49755	0.47249	0.91323	0.56609	0.51765	0.61035	0.53673	0.53584	0.58966

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.26803	0.98109	4.87477	0.95307	0.94583	4.96245	0.47810	1.00139	0.98577
#2	48.91390	0.97272	4.81933	0.94864	0.94326	4.88285	0.47449	0.99396	0.98888
Mean	**49.09096**	**0.97691**	**4.84705**	**0.95086**	**0.94454**	**4.92265**	**0.47630**	**0.99767**	**0.98732**
%RSD	0.51009	0.60600	0.80891	0.32985	0.19304	1.14339	0.53531	0.52656	0.22261

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.74579	0.98179	0.49268	0.12390	0.47053	0.49967	4.86757	0.48099	1.00403
#2	4.70797	0.97750	0.48755	0.12043	0.46612	0.49080	4.83556	0.47793	0.99752
Mean	**4.72688**	**0.97964**	**0.49012**	**0.12216**	**0.46832**	**0.49523**	**4.85156**	**0.47946**	**1.00077**
%RSD	0.56572	0.30944	0.74064	2.00976	0.66590	1.26623	0.46644	0.45198	0.46013

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.96707	0.94824	0.99097
#2	0.95815	0.94505	0.99057
Mean	**0.96261**	**0.94665**	**0.99077**
%RSD	0.65579	0.23880	0.02860

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:40

SampleId1 : CCB SampleId2 : [CB]

Analysis commenced : 3/4/2010 15:46:14

Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

20000307

20000307

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00075	0.03777	-0.00143	0.00214	-0.00034	0.00017	-0.00393	-0.01164	0.00017
#2	-0.00074	0.03850	-0.00147	0.00245	-0.00037	0.00018	-0.00619	-0.01233	-0.00010
Mean	**-0.00075**	**0.03813**	**-0.00145**	**0.00230**	**-0.00036**	**0.00017**	**-0.00506**	**-0.01198**	**0.00004**
%RSD	0.56562	1.35165	1.81964	9.68828	5.63818	5.83991	31.55226	4.04292	542.21210

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00020	-0.00014	-0.00161	0.00195	-0.15591	0.00413	-0.00080	0.00034	-0.00058
#2	0.00001	-0.00013	-0.00125	0.00174	-0.14865	0.00416	-0.00749	0.00034	-0.00045
Mean	**-0.00009**	**-0.00014**	**-0.00143**	**0.00184**	**-0.15228**	**0.00414**	**-0.00414**	**0.00034**	**-0.00052**
%RSD	156.97788	8.70618	17.87095	8.16108	3.37299	0.38890	114.25506	0.00000	17.77367

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.09061	0.00062	-0.00197	-0.00168	0.00082	-0.00826	-0.00149	-0.00236	0.00268
#2	-0.09125	-0.00010	-0.00127	-0.00185	0.00118	-0.00404	-0.00227	0.00049	0.00362
Mean	**-0.09093**	**0.00026**	**-0.00162**	**-0.00177**	**0.00100**	**-0.00615**	**-0.00188**	**-0.00094**	**0.00315**
%RSD	0.49632	194.32707	30.51784	6.76601	25.43695	48.54602	29.04027	214.90196	21.10038

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00624	-0.00185	-0.00191	-0.00258	-0.00043	-0.00116	-0.01008	-0.00040	0.00019
#2	-0.00568	-0.00162	-0.00192	-0.00214	-0.00040	-0.00243	-0.01795	-0.00031	0.00012
Mean	**-0.00596**	**-0.00173**	**-0.00192**	**-0.00236**	**-0.00041**	**-0.00180**	**-0.01401**	**-0.00035**	**0.00015**
%RSD	6.57693	9.73163	0.26478	13.29586	4.38988	49.86556	39.71843	18.61371	31.44591

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00038	-0.00001	0.00100
#2	-0.00050	0.00017	0.00258
Mean	**-0.00044**	**0.00008**	**0.00179**
%RSD	19.56476	166.12180	62.27871

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:40
SampleId1 : 1003011-4 2X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:48:07
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE11

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00053	0.04299	-0.00087	0.18401	0.04398	0.00017	-0.00569	142.07474	-0.00026
#2	-0.00043	0.03686	-0.00303	0.18409	0.04401	0.00015	-0.00236	141.71320	0.00010
Mean	**-0.00048**	**0.03992**	**-0.00195**	**0.18405**	**0.04399**	**0.00016**	**-0.00403**	**141.89397**	**-0.00008**
%RSD	15.04925	10.85644	78.32786	0.03021	0.04558	8.36878	58.66546	0.18017	321.53758

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

20000308

	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00018	0.00270	0.00052	0.01520	1.80422	0.02229	65.14079	0.00473	0.00142
#2	0.00039	0.00279	0.00087	0.01456	1.80204	0.02225	65.03099	0.00481	0.00103
Mean	**0.00028**	**0.00275**	**0.00070**	**0.01488**	**1.80313**	**0.02227**	**65.08589**	**0.00477**	**0.00122**
%RSD	52.30909	2.15815	35.31080	3.03427	0.08523	0.09940	0.11930	1.09328	22.51549

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	72.92441	0.17492	0.00663	-0.00220	0.00188	43.55946	-0.00216	0.01273	0.01049
#2	72.94303	0.17564	0.00313	-0.00073	0.00021	43.50760	-0.00222	0.01155	0.00958
Mean	**72.93372**	**0.17528**	**0.00488**	**-0.00147**	**0.00105**	**43.53353**	**-0.00219**	**0.01214**	**0.01004**
%RSD	0.01805	0.29107	50.73488	70.77902	112.70767	0.08424	2.05248	6.87493	6.38403

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	7.85044	0.00877	7.82453	-0.01640	-0.00100	-0.00048	-0.01550	0.00022	0.00830
#2	7.84328	0.00818	7.80416	-0.01924	-0.00104	-0.00170	-0.00812	0.00007	0.00789
Mean	**7.84686**	**0.00847**	**7.81434**	**-0.01782**	**-0.00102**	**-0.00109**	**-0.01181**	**0.00014**	**0.00809**
%RSD	0.06449	4.98096	0.18430	11.29070	2.49310	79.32831	44.19263	74.01095	3.54301

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00128	0.00052	0.01123
#2	-0.00119	-0.00010	0.01024
Mean	**-0.00124**	**0.00021**	**0.01074**
%RSD	4.67346	210.22975	6.56885

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:40
SampleId1 : 1003011-5 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:49:53
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE12

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00534	-0.00015	0.07654	0.25167	0.09282	0.00003	-0.02084	39.47963	-0.00128
#2	-0.00492	0.01151	0.07706	0.25895	0.09600	0.00003	-0.01858	40.00986	-0.00115
Mean	**-0.00513**	**0.00568**	**0.07680**	**0.25531**	**0.09441**	**0.00003**	**-0.01971**	**39.74475**	**-0.00122**
%RSD	5.80493	145.16073	0.47963	2.01443	2.37950	13.11669	8.10901	0.94334	7.74314

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00316	-0.00355	-0.00316	-0.00534	6.43031	0.09798	37.30162	0.00267	0.00061
#2	-0.00237	-0.00260	-0.00260	-0.00481	6.61033	0.10054	37.87735	0.00289	0.00020
Mean	**-0.00276**	**-0.00308**	**-0.00288**	**-0.00507**	**6.52032**	**0.09926**	**37.58948**	**0.00278**	**0.00041**
%RSD	20.22947	21.77552	13.74273	7.41642	1.95227	1.82389	1.08304	5.63008	72.48648

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

20000309

#1	98.85621	-0.00285	0.01643	-0.02087	0.01196	20.71625	-0.00977	-0.00088	0.02463
#2	100.94038	-0.00218	0.02053	-0.01408	0.01033	21.02542	-0.00753	-0.00168	0.02341
Mean	**99.89829**	**-0.00251**	**0.01848**	**-0.01747**	**0.01114**	**20.87084**	**-0.00865**	**-0.00128**	**0.02402**
%RSD	1.47523	18.91270	15.69006	27.44523	10.33460	1.04748	18.36284	44.23854	3.58951

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	11.31921	0.01391	1.02439	-0.01089	-0.00021	-0.00891	-0.10897	-0.00363	0.00519
#2	11.50226	0.00949	1.05550	-0.01154	-0.00049	-0.00750	-0.09962	-0.00281	0.00390
Mean	**11.41074**	**0.01170**	**1.03995**	**-0.01122**	**-0.00035**	**-0.00821**	**-0.10429**	**-0.00322**	**0.00454**
%RSD	1.13431	26.70317	2.11548	4.07796	56.12105	12.17881	6.33752	18.03270	19.97831

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00466	0.00103	0.01614
#2	-0.00447	0.00220	0.01506
Mean	**-0.00456**	**0.00161**	**0.01560**
%RSD	2.92304	51.36842	4.89726

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:41
SampleId1 : 1003011-6 5X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:51:43
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE13

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00047	0.03129	-0.00076	0.04898	0.02631	0.00001	-0.00060	52.51050	-0.00028
#2	0.00059	0.03272	-0.00098	0.04874	0.02657	0.00001	0.00196	52.86201	-0.00002
Mean	**0.00006**	**0.03201**	**-0.00087**	**0.04886**	**0.02644**	**0.00001**	**0.00068**	**52.68625**	**-0.00015**
%RSD	1268.60111	3.15597	18.16217	0.34148	0.68253	20.02364	265.98631	0.47176	120.53086

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00094	0.00043	-0.00331	42.60231	1.04336	0.01394	13.67394	1.60949	-0.00133
#2	0.00034	0.00023	-0.00361	42.91560	1.04820	0.01399	13.78069	1.62200	-0.00128
Mean	**0.00064**	**0.00033**	**-0.00346**	**42.75895**	**1.04578**	**0.01397**	**13.72732**	**1.61575**	**-0.00131**
%RSD	66.75231	42.15044	6.06290	0.51809	0.32691	0.27390	0.54991	0.54725	2.80643

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	69.41117	0.03101	-0.01217	0.00124	0.00056	16.95306	0.00034	0.00574	0.00453
#2	69.91907	0.03136	-0.00857	0.00175	-0.00002	17.07381	-0.00067	-0.00266	0.00231
Mean	**69.66512**	**0.03118**	**-0.01037**	**0.00150**	**0.00027**	**17.01343**	**-0.00017**	**0.00154**	**0.00342**
%RSD	0.51552	0.79001	24.54266	23.87182	150.56489	0.50184	426.64942	386.64157	45.84903

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.39208	0.00149	3.58452	-0.00269	-0.00064	-0.00582	-0.00415	-0.00166	0.00066

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#2	0.39849	0.00101	3.61733	-0.00257	-0.00063	-0.00444	0.01286	-0.00178	0.00046
Mean	**0.39528**	**0.00125**	**3.60093**	**-0.00263**	**-0.00063**	**-0.00513**	**0.00435**	**-0.00172**	**0.00056**
%RSD	1.14738	27.01023	0.64431	3.19150	0.57238	18.91547	276.29653	5.17525	25.71722

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00019	0.00078	0.00493
#2	0.00017	0.00057	0.00065
Mean	**0.00018**	**0.00068**	**0.00279**
%RSD	9.27746	22.30607	108.26713

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:41
SampleId1 : 1003011-7 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 15:53:30
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE14

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00112	0.16978	0.00460	0.13124	0.16043	0.00003	-0.00521	33.84445	-0.00074
#2	-0.00116	0.16923	0.00564	0.13081	0.16099	0.00004	-0.00266	33.82836	-0.00040
Mean	**-0.00114**	**0.16951**	**0.00512**	**0.13103**	**0.16071**	**0.00003**	**-0.00393**	**33.83640**	**-0.00057**
%RSD	2.39547	0.22845	14.38444	0.23343	0.24969	15.56440	45.86971	0.03362	41.75212

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00050	0.02584	-0.00124	0.00067	5.25196	0.05319	0.50843	0.00093	0.00534
#2	0.00029	0.02609	-0.00124	-0.00028	5.26735	0.05311	0.50843	0.00093	0.00466
Mean	**0.00039**	**0.02597**	**-0.00124**	**0.00019**	**5.25965**	**0.05315**	**0.50843**	**0.00093**	**0.00500**
%RSD	37.44984	0.67854	0.13061	347.97831	0.20685	0.10202	0.00000	0.00000	9.54519

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	62.04869	-0.00102	-0.00407	-0.00141	0.00075	15.23213	-0.00290	0.00631	0.00160
#2	62.19420	-0.00070	-0.00537	-0.00387	0.00123	15.16109	0.00024	-0.00011	0.00446
Mean	**62.12144**	**-0.00086**	**-0.00472**	**-0.00264**	**0.00099**	**15.19661**	**-0.00133**	**0.00310**	**0.00303**
%RSD	0.16563	26.68513	19.46736	65.86734	33.94037	0.33056	167.06640	146.36900	66.65299

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	7.76488	0.00006	1.72121	-0.00327	-0.00028	0.00406	-0.02435	0.00473	-0.00008
#2	7.78603	-0.00090	1.72060	-0.00300	-0.00049	0.00114	-0.02139	0.00462	0.00032
Mean	**7.77546**	**-0.00042**	**1.72091**	**-0.00314**	**-0.00039**	**0.00260**	**-0.02287**	**0.00467**	**0.00012**
%RSD	0.19235	160.18309	0.02490	6.13928	38.37975	79.56399	9.12946	1.69648	242.62437

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00265	0.00003	0.00317
#2	-0.00240	-0.00047	0.00294

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Mean	**-0.00253**	**-0.00022**	**0.00305CH**
%RSD	6.91012	162.49028	5.33250

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:41
SampleId1 : 1002177-2 500X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:55:18
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE15

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00078	0.03302	0.03155	0.02625	0.00351	0.00004	-0.00551	6.55521	-0.00060
#2	0.00043	0.03364	0.02958	0.02680	0.00354	0.00004	-0.00236	6.52731	-0.00041
Mean	**-0.00017**	**0.03333**	**0.03056**	**0.02652**	**0.00353**	**0.00004**	**-0.00393**	**6.54126**	**-0.00051**
%RSD	487.20224	1.30172	4.56366	1.46790	0.56815	4.62473	56.54653	0.30163	26.02558

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00027	0.00001	-0.00181	-0.00486	0.15226	0.00562	4.45498	0.02748	-0.00050
#2	0.00028	0.00057	-0.00118	-0.00411	0.16339	0.00563	4.43814	0.02748	0.00004
Mean	**0.00000**	**0.00029**	**-0.00149**	**-0.00449**	**0.15782**	**0.00562**	**4.44656**	**0.02748**	**-0.00023**
%RSD	11998.45124	135.50534	29.75801	11.73716	4.98809	0.07165	0.26785	0.00000	166.99604

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	53.38708	0.00047	-0.00097	0.00090	0.00335	0.88776	0.00065	0.00038	0.00087
#2	53.09392	0.00177	-0.00427	0.00476	0.00050	0.87648	-0.00031	-0.00080	0.00049
Mean	**53.24050**	**0.00112**	**-0.00262**	**0.00283**	**0.00192**	**0.88212**	**0.00017**	**-0.00021**	**0.00068**
%RSD	0.38935	81.61509	88.99779	96.34678	104.93593	0.90426	397.44320	393.02270	39.96963

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.05572	0.00006	0.81273	-0.00599	-0.00076	0.00309	-0.02139	-0.00135	0.00154
#2	0.05760	-0.00162	0.80581	-0.00506	-0.00051	0.00028	-0.01057	-0.00098	0.00086
Mean	**0.05666**	**-0.00078**	**0.80927**	**-0.00552**	**-0.00063**	**0.00169**	**-0.01598**	**-0.00117**	**0.00120**
%RSD	2.35018	151.66880	0.60496	11.92241	28.04660	117.67788	47.89950	22.61754	39.84013

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00037	0.00254	0.00071
#2	-0.00016	0.00192	0.00006
Mean	**-0.00026**	**0.00223**	**0.00038**
%RSD	57.80997	19.72332	119.97888

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:41
SampleId1 : 1100302-1MB **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:57:04
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE16

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Final concentrations:**57** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00022	0.02793	-0.00143	0.00049	0.00057	0.00004	-0.00059	-0.00319	0.00033
#2	-0.00003	0.03094	0.00200	-0.00014	0.00059	0.00004	-0.00462	-0.00319	-0.00012
Mean	**-0.00013**	**0.02944**	**0.00028**	**0.00017**	**0.00058**	**0.00004**	**-0.00260**	**-0.00319**	**0.00010**
%RSD	107.36092	7.23756	851.48760	257.79883	3.45628	6.72160	109.35912	0.00000	315.58221

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00019	0.00014	-0.00112	-0.00263	-0.12613	0.00398	-0.01137	0.00027	-0.00115
#2	-0.00001	-0.00012	-0.00125	-0.00241	-0.13025	0.00397	-0.01677	0.00023	-0.00136
Mean	**0.00009**	**0.00001**	**-0.00118**	**-0.00252**	**-0.12819**	**0.00397**	**-0.01407**	**0.00025**	**-0.00126**
%RSD	164.37681	1636.19576	7.66969	5.97438	2.27051	0.20282	27.11904	10.31143	11.68965

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.07421	0.00054	0.00483	0.00178	-0.00062	-0.00263	0.00004	0.00056	0.00028
#2	-0.07623	0.00037	0.00693	0.00155	0.00012	0.00018	-0.00085	0.00006	-0.00077
Mean	**-0.07522**	**0.00046**	**0.00588**	**0.00167**	**-0.00025**	**-0.00122**	**-0.00040**	**0.00031**	**-0.00025**
%RSD	1.89236	25.11256	25.26227	9.43333	209.69880	162.61204	157.04066	114.85233	301.56502

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00504	0.00041	-0.00156	0.00004	-0.00037	-0.00058	0.00124	0.00044	0.00661
#2	-0.00461	-0.00269	-0.00157	0.00096	-0.00032	0.00017	-0.01598	-0.00020	0.00694
Mean	**-0.00482**	**-0.00114**	**-0.00157**	**0.00050**	**-0.00034**	**-0.00021**	**-0.00737**	**0.00012**	**0.00677**
%RSD	6.32936	192.89783	0.64707	129.02251	10.54782	255.46529	165.23477	371.63112	3.52681

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00047	0.00018	0.00037
#2	-0.00072	0.00060	-0.00049
Mean	**-0.00059**	**0.00039**	**-0.00006**
%RSD	29.44279	75.53624	999.13889

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:42
SampleId1 : F100302-1RVS **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 15:58:54
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE17

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00194	0.13561	0.00568	0.00438	0.00448	0.00101	0.00680	0.50371	0.00186
#2	0.00223	0.13600	0.00739	0.00497	0.00451	0.00103	0.00710	0.50508	0.00202
Mean	**0.00208**	**0.13580**	**0.00654**	**0.00468**	**0.00449**	**0.00102**	**0.00695**	**0.50440**	**0.00194**
%RSD	9.59428	0.20072	18.51879	8.92144	0.44625	1.09532	3.00688	0.19219	5.89675

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ted: 3/4/2010 17:29:57 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00207	0.00514	0.00395	0.10290	0.55078	0.00700	0.50174	0.00506	0.00946
#2	0.00223	0.00543	0.00402	0.10295	0.54981	0.00699	0.50606	0.00517	0.00944
Mean	**0.00215**	**0.00529**	**0.00398**	**0.10292**	**0.55029**	**0.00699**	**0.50390**	**0.00512**	**0.00945**
%RSD	5.14482	3.84057	1.22428	0.03657	0.12433	0.11521	0.60585	1.52773	0.19420

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.70069	0.00526	0.10888	0.00433	0.00648	0.09169	0.01031	0.00253	0.00552
#2	0.70552	0.00556	0.11668	0.00545	0.00284	0.09591	0.01161	0.00432	0.00364
Mean	**0.70310**	**0.00541**	**0.11278**	**0.00489**	**0.00466**	**0.09380**	**0.01096**	**0.00342**	**0.00458**
%RSD	0.48512	3.90032	4.89356	16.14137	55.18566	3.18402	8.41672	36.77938	29.05919

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02753	0.01020	0.00306	-0.00354	0.00431	0.00889	0.04644	0.00495	0.00701
#2	0.02949	0.01080	0.00312	-0.00359	0.00451	0.01044	0.04890	0.00499	0.00762
Mean	**0.02851**	**0.01050**	**0.00309**	**-0.00356**	**0.00441**	**0.00966**	**0.04767**	**0.00497**	**0.00732**
%RSD	4.86458	4.01963	1.31423	0.98204	3.12453	11.36940	3.64956	0.53067	5.87910

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00379	0.00577	0.00452
#2	0.00405	0.00371	0.00386
Mean	**0.00392**	**0.00474**	**0.00419**
%RSD	4.62893	30.67403	11.15762

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:42
SampleId1 : F100302-1LCS SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:00:41
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE18

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10289	2.17284	2.09366	0.99036	2.03462	0.04812	-0.00330	41.10171	0.05215
#2	0.10232	2.14054	2.07711	0.98545	2.01685	0.04790	0.00101	40.89042	0.05228
Mean	**0.10261**	**2.15669**	**2.08538**	**0.98791**	**2.02573**	**0.04801**	**-0.00115**	**40.99606**	**0.05222**
%RSD	0.39331	1.05876	0.56134	0.35145	0.62012	0.31251	265.58261	0.36443	0.17827

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49686	0.19902	0.25682	1.03520	41.96894	0.52006	41.98582	0.48884	1.02297
#2	0.49397	0.19763	0.25434	1.02831	41.52300	0.51414	41.72438	0.48592	1.01533
Mean	**0.49541**	**0.19833**	**0.25558**	**1.03176**	**41.74597**	**0.51710**	**41.85510**	**0.48738**	**1.01915**
%RSD	0.41260	0.49589	0.68527	0.47260	0.75535	0.81002	0.44167	0.42413	0.52975

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	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	39.32746	0.49863	0.01553	0.48610	0.48157	0.00441	0.50190	2.10486	2.08416
#2	38.87489	0.49695	0.00323	0.48226	0.47792	-0.00263	0.49984	2.08490	2.06734
Mean	**39.10118**	**0.49779**	**0.00938**	**0.48418**	**0.47975**	**0.00089**	**0.50087**	**2.09488**	**2.07575**
%RSD	0.81843	0.23841	92.74268	0.56117	0.53740	560.90891	0.29070	0.67365	0.57310

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.00536	0.52151	0.50879	-0.01590	0.49110	2.08131	-0.00783	0.50497	0.48254
#2	1.98315	0.51937	0.50464	-0.01443	0.48772	2.07290	-0.00783	0.50212	0.48064
Mean	**1.99426**	**0.52044**	**0.50672**	**-0.01516**	**0.48941**	**2.07710**	**-0.00783**	**0.50355**	**0.48159**
%RSD	0.78754	0.29124	0.57881	6.88458	0.48930	0.28621	0.04241	0.39999	0.27834

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00051	0.48308	2.09105
#2	-0.00033	0.47937	2.07318
Mean	**-0.00042**	**0.48122**	**2.08212**
%RSD	29.82184	0.54537	0.60679

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:42
SampleId1 : 1002225-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:02:28
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE19

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00022	1.20690	0.00218	0.45047	0.32855	-0.00046	-0.00264	182.38579	0.00102
#2	0.00038	1.20488	0.00129	0.44788	0.32809	-0.00046	-0.00313	182.20923	0.00078
Mean	**0.00008**	**1.20589**	**0.00174**	**0.44917**	**0.32832**	**-0.00046**	**-0.00288**	**182.29751**	**0.00090**
%RSD	521.28865	0.11891	36.38600	0.40839	0.09785	0.33922	11.85978	0.06848	18.80206

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00328	0.00278	0.01773	0.98314	28.15989	2.10631	132.58472	0.26471	0.00970
#2	0.00288	0.00321	0.01737	0.97994	28.05245	2.09814	132.44966	0.26427	0.01019
Mean	**0.00308**	**0.00299**	**0.01755**	**0.98154**	**28.10617**	**2.10222**	**132.51719**	**0.26449**	**0.00994**
%RSD	9.17426	10.27472	1.44831	0.23101	0.27029	0.27479	0.07207	0.11851	3.50686

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	523.79469	0.00207	0.13619	0.00243	0.00002	92.21812	0.00023	0.00232	0.00081
#2	523.09654	0.00115	0.13669	0.00157	0.00036	92.10612	-0.00060	-0.00161	0.00210
Mean	**523.44561**	**0.00161**	**0.13644**	**0.00200**	**0.00019**	**92.16212**	**-0.00019**	**0.00036**	**0.00145**
%RSD	0.09431	40.52976	0.25930	30.28052	128.96500	0.08593	312.62553	778.79186	62.65093

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

20000315

	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.26418	0.00217	1.88175	-0.02091	0.03134	0.00431	-0.01025	0.00303	0.04378
#2	4.23367	0.00193	1.87934	-0.01759	0.03457	0.00363	-0.00336	0.00300	0.04418
Mean	**4.24893**	**0.00205**	**1.88055**	**-0.01925**	**0.03296**	**0.00397**	**-0.00681**	**0.00302**	**0.04398**
%RSD	0.50766	8.37858	0.09093	12.21746	6.93291	12.14140	71.55130	0.88918	0.65202

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00113	0.00082	0.00131
#2	0.00064	0.00077	0.00086
Mean	**0.00089**	**0.00079**	**0.00109**
%RSD	38.52101	4.76812	29.18087

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:43
SampleId1 : 1002226-1 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:04:14
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE20

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00001	0.27436	-0.00120	0.25694	0.04636	0.00015	-0.00577	52.19734	0.00013
#2	-0.00252	0.26352	-0.00478	0.25179	0.04560	0.00010	-0.01413	50.75989	-0.00049
Mean	**-0.00126**	**0.26894**	**-0.00299**	**0.25437**	**0.04598**	**0.00013**	**-0.00995**	**51.47861**	**-0.00018**
%RSD	142.11787	2.84902	84.47325	1.43173	1.17757	29.73586	59.42218	1.97447	248.60987

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00072	0.00094	0.03141	0.27617	23.32040	0.15352	12.78362	0.06421	0.00259
#2	-0.00146	-0.00111	0.02926	0.26642	23.18516	0.15261	12.44156	0.06259	0.00017
Mean	**-0.00037**	**-0.00009**	**0.03033**	**0.27129**	**23.25278**	**0.15307**	**12.61259**	**0.06340**	**0.00138**
%RSD	414.76947	1657.34098	5.00988	2.54078	0.41127	0.41984	1.91772	1.81000	123.82485

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	448.83283	0.00208	4.77648	0.00145	0.00172	45.61178	0.00037	0.00119	0.00335
#2	449.84817	0.00026	4.67202	-0.01110	0.00894	44.77349	-0.00558	-0.00981	0.01234
Mean	**449.34050**	**0.00117**	**4.72425**	**-0.00482**	**0.00533**	**45.19263**	**-0.00261**	**-0.00431**	**0.00785**
%RSD	0.15978	109.70495	1.56353	184.07439	95.86222	1.31164	161.22015	180.43208	81.01374

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	13.31236	-0.00009	0.34024	0.00254	0.01890	0.00276	-0.01617	0.00101	0.05885
#2	13.09893	-0.00474	0.33666	-0.00611	0.01817	-0.00579	-0.07619	-0.00136	0.05615
Mean	**13.20564**	**-0.00241**	**0.33845**	**-0.00179**	**0.01854**	**-0.00152**	**-0.04618**	**-0.00017**	**0.05750**
%RSD	1.14282	136.39471	0.74958	342.68413	2.79818	399.35405	91.90208	978.39883	3.32499

	Zr	**Pb**	**Se**
	ppm	calc	calc

20000316 20000316

#1	-0.00091	0.00163	0.00263	**CH**
#2	-0.00168	0.00227	0.00497	
Mean	**-0.00129**	**0.00195**	**0.00380**	
%RSD	42.21160	23.18238	43.45926	

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:43
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 16:06:04
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19226	48.71226	0.49366	0.93851	0.95886	0.47960	0.48900	48.14041	0.47571
#2	0.19338	48.97176	0.49128	0.93926	0.96122	0.47954	0.49040	48.15277	0.47722
Mean	**0.19282**	**48.84201**	**0.49247**	**0.93888**	**0.96004**	**0.47957**	**0.48970**	**48.14659**	**0.47647**
%RSD	0.41065	0.37570	0.34128	0.05621	0.17407	0.00872	0.20189	0.01814	0.22380

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.48424	0.96365	0.95359	19.80153	49.62449	0.50514	49.07462	0.94942	0.95610
#2	0.48429	0.96463	0.95745	19.81473	49.84934	0.50740	49.14961	0.94982	0.95750
Mean	**0.48427**	**0.96414**	**0.95552**	**19.80813**	**49.73692**	**0.50627**	**49.11212**	**0.94962**	**0.95680**
%RSD	0.00795	0.07144	0.28583	0.04714	0.31967	0.31504	0.10797	0.03042	0.10364

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	46.09707	0.96921	4.72328	0.93953	0.93064	4.80753	0.46334	0.97489	0.96709
#2	46.54272	0.96616	4.74805	0.93545	0.92808	4.80469	0.46931	0.97759	0.96824
Mean	**46.31990**	**0.96768**	**4.73566**	**0.93749**	**0.92936**	**4.80611**	**0.46632**	**0.97624**	**0.96767**
%RSD	0.68031	0.22238	0.36987	0.30798	0.19457	0.04182	0.90538	0.19580	0.08404

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.63458	0.96058	0.48118	0.12219	0.45936	0.48706	4.73988	0.47258	0.98775
#2	4.65241	0.96403	0.48231	0.12070	0.45988	0.49449	4.76507	0.47350	0.98775
Mean	**4.64349**	**0.96230**	**0.48174**	**0.12144**	**0.45962**	**0.49078**	**4.75247**	**0.47304**	**0.98775**
%RSD	0.27154	0.25403	0.16516	0.86678	0.08108	1.07072	0.37472	0.13670	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.94825	0.93360	0.96969
#2	0.94834	0.93053	0.97135
Mean	**0.94829**	**0.93207**	**0.97052**
%RSD	0.00684	0.23255	0.12148

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:43
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/4/2010 16:07:56

Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00002	0.05401	-0.00068	0.00088	-0.00020	0.00017	-0.00147	-0.00776	0.00031
#2	-0.00030	0.05682	0.00252	0.00206	-0.00011	0.00021	0.00039	-0.00125	0.00027
Mean	**-0.00014**	**0.05541**	**0.00092**	**0.00147**	**-0.00016**	**0.00019**	**-0.00054**	**-0.00450**	**0.00029**
%RSD	166.71195	3.58662	246.79775	56.73708	38.28142	17.30398	244.12535	102.19464	9.69609

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00038	0.00044	-0.00070	0.00376	-0.16850	0.00480	0.00460	0.00049	-0.00014
#2	-0.00004	0.00100	-0.00098	0.00599	-0.17795	0.00476	0.01237	0.00060	-0.00071
Mean	**0.00017**	**0.00072**	**-0.00084**	**0.00488**	**-0.17322**	**0.00478**	**0.00849**	**0.00055**	**-0.00043**
%RSD	177.03887	55.49740	23.83877	32.40188	3.85482	0.54777	64.74913	14.27779	94.90223

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.06614	-0.00002	0.00023	0.00108	0.00074	-0.00263	0.00237	0.00196	0.00425
#2	0.09503	0.00025	-0.00177	0.00068	0.00152	-0.00826	-0.00073	0.00007	0.00101
Mean	**0.08058**	**0.00011**	**-0.00077**	**0.00088**	**0.00113**	**-0.00545**	**0.00082**	**0.00102**	**0.00263**
%RSD	25.34532	170.86010	183.20855	32.62900	48.71322	73.09161	268.38848	131.29796	87.09654

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00599	-0.00162	-0.00190	-0.00150	-0.00027	0.00202	0.00419	-0.00003	0.00079
#2	-0.00524	-0.00018	-0.00183	-0.00016	-0.00015	0.00014	0.00271	0.00018	0.00052
Mean	**-0.00562**	**-0.00090**	**-0.00186**	**-0.00083**	**-0.00021**	**0.00108**	**0.00345**	**0.00008**	**0.00066**
%RSD	9.38458	112.64145	2.44712	114.46012	37.90694	122.68969	30.28524	192.66568	29.01358

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00005	0.00085	0.00349
#2	0.00006	0.00124	0.00070
Mean	**0.00001**	**0.00104**	**0.00209**
%RSD	806.81951	25.91069	94.24791

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:43
SampleId1 : 1002226-6 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:09:48
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE21

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00010	0.16332	0.00051	0.25914	0.02847	0.00010	-0.00116	47.07369	0.00014
#2	-0.00084	0.16336	-0.00001	0.26087	0.02864	0.00009	-0.00647	47.25278	-0.00017

20000318

Mean	**-0.00037**	**0.16334**	**0.00025**	**0.26001**	**0.02855**	**0.00009**	**-0.00381**	**47.16324**	**-0.00002**
%RSD	180.99422	0.01896	149.08447	0.47045	0.42136	5.08691	98.42327	0.26850	1312.66122

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00015	0.00078	0.03374	0.13265	18.78131	0.02387	6.02864	0.01767	0.00175
#2	-0.00042	0.00025	0.03397	0.13324	18.89514	0.02397	6.06298	0.01771	0.00150
Mean	**-0.00014**	**0.00052**	**0.03385**	**0.13295**	**18.83822**	**0.02392**	**6.04581**	**0.01769**	**0.00162**
%RSD	298.60691	71.91991	0.47895	0.31145	0.42728	0.28601	0.40162	0.14737	11.29419

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	155.35544	0.00227	5.06760	0.00229	0.00192	45.00741	0.00006	0.00287	0.00131
#2	155.73097	0.00116	5.10215	-0.00176	0.00479	45.49698	-0.00190	-0.00200	0.00758
Mean	**155.54321**	**0.00171**	**5.08488**	**0.00027**	**0.00336**	**45.25220**	**-0.00092**	**0.00043**	**0.00444**
%RSD	0.17072	45.73420	0.48051	1079.66272	60.37663	0.76499	151.03095	797.10073	99.78565

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	14.16108	0.00314	0.31030	-0.00455	0.01415	0.00558	-0.00820	0.00074	0.04540
#2	14.27870	-0.00163	0.31318	-0.00409	0.01324	0.00052	-0.02985	-0.00047	0.04560
Mean	**14.21989**	**0.00076**	**0.31174**	**-0.00432**	**0.01370**	**0.00305**	**-0.01902**	**0.00014**	**0.04550**
%RSD	0.58490	446.57615	0.65420	7.68023	4.71393	117.46117	80.46728	623.02390	0.31511

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00016	0.00205	0.00183
#2	-0.00018	0.00261	0.00439
Mean	**-0.00001**	**0.00233**	**0.00311**
%RSD	2061.06364	17.05847	58.27450

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:44
SampleId1 : 1002226-11 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:11:35
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE22

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00050	1.66670	0.00040	0.27137	0.20668	-0.00005	-0.00446	89.57146	0.00018
#2	-0.00065	1.67393	0.00121	0.27393	0.20730	-0.00006	-0.00358	89.63165	0.00019
Mean	**-0.00057**	**1.67031**	**0.00081**	**0.27265**	**0.20699**	**-0.00005**	**-0.00402**	**89.60156**	**0.00018**
%RSD	18.28455	0.30612	71.88628	0.66275	0.21329	9.37724	15.54664	0.04750	4.84262

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00459	0.00157	0.01193	1.95480	28.10781	1.51337	78.79162	0.54740	0.00539
#2	0.00443	0.00198	0.01193	1.95292	28.18569	1.51595	78.80640	0.54825	0.00645
Mean	**0.00451**	**0.00177**	**0.01193**	**1.95386**	**28.14675**	**1.51466**	**78.79901**	**0.54783**	**0.00592**

20000318

20000319

%RSD	2.42878	16.32089	0.04078	0.06800	0.19564	0.12024	0.01326	0.10991	12.70952

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	844.80876	0.00402	0.26391	0.00080	0.00122	37.53605	0.00050	-0.00335	0.00138
#2	839.56899	0.00388	0.26431	0.00184	0.00147	37.64778	0.00116	-0.00092	0.00064
Mean	**842.18888**	**0.00395**	**0.26411**	**0.00132**	**0.00135**	**37.59192**	**0.00083**	**-0.00214**	**0.00101**
%RSD	0.43993	2.44900	0.10721	55.50286	12.96278	0.21017	56.08353	80.50594	51.28980

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.96284	0.00106	0.61625	-0.02170	0.06412	0.00339	-0.02272	0.00382	0.26679
#2	4.97071	-0.00073	0.61746	-0.02144	0.06353	0.00372	-0.01387	0.00305	0.26692
Mean	**4.96677**	**0.00016**	**0.61685**	**-0.02157**	**0.06383**	**0.00356**	**-0.01830**	**0.00344**	**0.26686**
%RSD	0.11208	788.99547	0.13861	0.85007	0.65333	6.56113	34.23293	15.73791	0.03585

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00184	0.00108	-0.00020
#2	0.00169	0.00159	0.00012
Mean	**0.00176**	**0.00134**	**-0.00004**
%RSD	5.95766	26.93716	590.74625

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:44
SampleId1 : 1002228-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:13:22
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE23

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00046	0.50941	0.00036	0.25730	0.05683	0.00008	-0.00035	53.05526	0.00003
#2	0.00063	0.51020	-0.00210	0.26032	0.05728	0.00009	0.00260	53.23841	0.00032
Mean	**0.00008**	**0.50981**	**-0.00087**	**0.25881**	**0.05705**	**0.00009**	**0.00112**	**53.14684**	**0.00018**
%RSD	949.31812	0.10944	199.78314	0.82710	0.56239	12.40233	185.84003	0.24368	115.62960

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00064	0.00086	0.03424	0.47010	25.37639	0.19815	14.67238	0.07291	0.00183
#2	0.00080	0.00166	0.03493	0.46765	25.52782	0.19929	14.74715	0.07339	0.00204
Mean	**0.00072**	**0.00126**	**0.03458**	**0.46887**	**25.45210**	**0.19872**	**14.70976**	**0.07315**	**0.00194**
%RSD	15.50437	45.14620	1.42081	0.36987	0.42069	0.40458	0.35946	0.46349	7.58210

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	652.89965	0.00304	4.66765	0.00227	0.00157	45.85523	-0.00095	0.00297	0.00439
#2	659.67348	0.00265	4.70846	0.00476	0.00079	46.23822	0.00035	0.00708	0.00122
Mean	**656.28657**	**0.00284**	**4.68805**	**0.00352**	**0.00118**	**46.04672**	**-0.00030**	**0.00503**	**0.00281**
%RSD	0.72984	9.58871	0.61547	50.07851	46.59746	0.58813	308.97693	57.83577	79.93724

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	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	13.32769	0.00420	0.36041	-0.00678	0.02520	-0.00221	-0.01089	0.00094	0.06608
#2	13.42658	0.00373	0.36280	-0.01005	0.02540	0.00278	0.00633	0.00170	0.06581
Mean	**13.37713**	**0.00397**	**0.36160**	**-0.00842**	**0.02530**	**0.00028**	**-0.00228**	**0.00132**	**0.06595**
%RSD	0.52274	8.51857	0.46705	27.44264	0.55906	1242.46756	534.54104	40.88365	0.28991

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00031	0.00180	0.00392
#2	0.00083	0.00211	0.00317
Mean	**0.00026**	**0.00196**	**0.00354**
%RSD	312.99263	11.25450	14.88131

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:44
SampleId1 : 1002228-6 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:15:09
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE24

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00045	9.51684	0.00319	0.11984	0.12905	0.00063	-0.00138	43.82883	0.00061
#2	-0.00032	9.56313	0.00267	0.11956	0.12907	0.00061	-0.00156	43.66028	0.00044
Mean	**-0.00039**	**9.53999**	**0.00293**	**0.11970**	**0.12906**	**0.00062**	**-0.00147**	**43.74456**	**0.00053**
%RSD	24.64048	0.34304	12.58826	0.16260	0.01554	2.11834	8.89926	0.27245	22.63902

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00309	0.01106	0.03891	6.82138	17.19855	0.39292	21.87585	0.20839	0.00209
#2	0.00371	0.01180	0.03911	6.84009	17.22724	0.39173	21.80774	0.20828	0.00207
Mean	**0.00340**	**0.01143**	**0.03901**	**6.83073**	**17.21290**	**0.39232**	**21.84179**	**0.20834**	**0.00208**
%RSD	12.92315	4.59671	0.36019	0.19370	0.11784	0.21449	0.22052	0.03760	0.88269

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	993.22133	0.00752	0.69949	0.01529	0.01463	17.33431	0.00049	-0.00052	0.00148
#2	985.45566	0.00835	0.69929	0.01695	0.01424	17.31975	0.00179	0.00273	-0.00120
Mean	**989.33850**	**0.00793**	**0.69939**	**0.01612**	**0.01443**	**17.32703**	**0.00114**	**0.00111**	**0.00014**
%RSD	0.55503	7.43028	0.02027	7.29513	1.91285	0.05940	80.35943	207.06800	1313.30426

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	23.25420	-0.00025	0.24847	-0.00786	0.36357	-0.00010	-0.01620	0.02634	0.20145
#2	23.43892	0.00106	0.24684	-0.00899	0.36680	0.00186	0.00150	0.02623	0.20043
Mean	**23.34656**	**0.00041**	**0.24766**	**-0.00842**	**0.36519**	**0.00088**	**-0.00735**	**0.02628**	**0.20094**
%RSD	0.55946	227.59944	0.46774	9.51645	0.62448	158.30525	170.32884	0.29123	0.35699

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	0.00738	0.01485	0.00082
#2	0.00624	0.01514	0.00011
Mean	**0.00681**	**0.01499**	**0.00047**
%RSD	11.79617	1.38286	107.14734

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:45
SampleId1 : 1002228-11 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:16:56
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE25

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00002	1.02879	0.00334	0.25262	0.06426	0.00014	0.00127	53.90732	0.00037
#2	0.00035	1.03270	0.00241	0.25537	0.06468	0.00013	-0.00148	54.00802	0.00011
Mean	**0.00019**	**1.03075**	**0.00287**	**0.25399**	**0.06447**	**0.00014**	**-0.00011**	**53.95767**	**0.00024**
%RSD	123.40422	0.26833	22.91615	0.76617	0.46661	3.34961	1831.36320	0.13197	76.48709

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00099	0.00167	0.03387	0.85700	25.98056	0.21869	15.71110	0.08236	0.00168
#2	0.00119	0.00176	0.03430	0.85224	26.05905	0.21913	15.74525	0.08243	0.00266
Mean	**0.00109**	**0.00171**	**0.03409**	**0.85462**	**26.01980**	**0.21891**	**15.72817**	**0.08239**	**0.00217**
%RSD	13.18264	3.78632	0.89346	0.39332	0.21331	0.14254	0.15353	0.06331	32.13815

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	759.50449	0.00286	4.49860	0.00490	0.00166	45.47249	0.00124	0.00400	0.00316
#2	752.27573	0.00234	4.51229	0.00598	0.00230	45.60413	0.00042	0.00508	0.00177
Mean	**755.89011**	**0.00260**	**4.50545**	**0.00544**	**0.00198**	**45.53831**	**0.00083**	**0.00454**	**0.00246**
%RSD	0.67622	14.20265	0.21494	14.03407	23.03025	0.20440	70.35364	16.69851	40.03086

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	14.05204	0.00203	0.36531	-0.00920	0.04947	0.00163	0.00312	0.00258	0.07568
#2	14.06973	-0.00001	0.36677	-0.00891	0.05249	0.00123	-0.00426	0.00264	0.07582
Mean	**14.06089**	**0.00101**	**0.36604**	**-0.00905**	**0.05098**	**0.00143**	**-0.00057**	**0.00261**	**0.07575**
%RSD	0.08895	142.18540	0.28246	2.29371	4.18231	19.83551	910.64357	1.49158	0.12620

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00028	0.00274	0.00344
#2	0.00036	0.00352	0.00287
Mean	**0.00032**	**0.00313**	**0.00315**
%RSD	17.57737	17.82436	12.83983

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:45

SampleId1 : 1002246-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:18:44
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE26

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00049	0.88357	-0.00042	0.42575	0.09047	0.00016	0.00511	56.21969	0.00029
#2	0.00082	0.88858	0.00278	0.43003	0.09160	0.00015	0.00501	56.46103	0.00047
Mean	**0.00065**	**0.88607**	**0.00118**	**0.42789**	**0.09103**	**0.00015**	**0.00506**	**56.34036**	**0.00038**
%RSD	35.09390	0.40012	192.19643	0.70804	0.88132	2.33231	1.35583	0.30290	33.03830

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00091	0.00308	0.15582	1.53845	26.37720	0.04780	19.31359	0.04437	0.00692
#2	0.00049	0.00283	0.15689	1.54038	26.71757	0.04843	19.42190	0.04437	0.00643
Mean	**0.00070**	**0.00296**	**0.15636**	**1.53941**	**26.54738**	**0.04811**	**19.36774**	**0.04437**	**0.00667**
%RSD	42.05838	5.96245	0.48111	0.08860	0.90660	0.92704	0.39546	0.00000	5.22545

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	93.35763	0.00561	8.30096	0.00514	0.00194	30.14128	0.00139	0.00075	0.00086
#2	94.85150	0.00454	8.30989	0.00086	0.00431	30.42299	0.00062	-0.00049	0.00326
Mean	**94.10456**	**0.00508**	**8.30542**	**0.00300**	**0.00312**	**30.28214**	**0.00100**	**0.00013**	**0.00206**
%RSD	1.12250	14.90081	0.07602	101.02368	53.64145	0.65782	54.59714	690.33469	82.46997

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	6.73139	0.00651	0.43769	-0.00951	0.09391	0.00222	-0.01949	0.00193	0.15911
#2	6.77538	0.00472	0.44232	-0.00963	0.09335	0.00215	-0.02195	0.00128	0.15911
Mean	**6.75339**	**0.00562**	**0.44000**	**-0.00957**	**0.09363**	**0.00219**	**-0.02072**	**0.00160**	**0.15911**
%RSD	0.46066	22.53333	0.74471	0.89829	0.42207	2.35860	8.39998	28.76336	0.00000

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00317	0.00300	0.00082
#2	0.00265	0.00316	0.00201
Mean	**0.00291**	**0.00308**	**0.00142**
%RSD	12.68840	3.54290	59.37093

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:45
SampleId1 : 1002258-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:20:31
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE27

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

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#1	-0.00045	0.04358	-0.00080	0.06081	0.05470	0.00012	-0.00560	3.42326	0.00024
#2	-0.00088	0.04406	-0.00307	0.06081	0.05476	0.00011	-0.00344	3.41742	-0.00004
Mean	**-0.00067**	**0.04382**	**-0.00193**	**0.06081**	**0.05473**	**0.00012**	**-0.00452**	**3.42034**	**0.00010**
%RSD	44.98321	0.78277	83.17354	0.00000	0.07329	6.51615	33.74919	0.12075	205.41127

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00017	0.00034	-0.00047	0.01578	0.59238	0.00813	0.07173	0.00245	-0.00032
#2	-0.00036	-0.00033	-0.00067	0.01488	0.57206	0.00808	0.06871	0.00245	-0.00071
Mean	**-0.00027**	**0.00001**	**-0.00057**	**0.01533**	**0.58222**	**0.00811**	**0.07022**	**0.00245**	**-0.00052**
%RSD	48.78448	8873.14888	25.80579	4.17176	2.46771	0.44720	3.04306	0.00000	53.32101

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	132.75712	0.00059	0.00873	0.00021	0.00208	26.77623	0.00058	0.00081	0.00279
#2	132.59902	0.00015	0.00363	-0.00094	0.00223	26.89918	-0.00096	-0.00706	0.00157
Mean	**132.67807**	**0.00037**	**0.00618**	**-0.00036**	**0.00215**	**26.83770**	**-0.00019**	**-0.00313**	**0.00218**
%RSD	0.08426	83.59722	58.37204	222.62717	4.78292	0.32395	583.98995	178.11341	39.56765

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	6.24926	-0.00114	0.10575	-0.00206	-0.00038	-0.00019	-0.01747	-0.00029	0.00431
#2	6.23839	-0.00185	0.10588	-0.00184	-0.00020	-0.00063	-0.02288	-0.00040	0.00411
Mean	**6.24383**	**-0.00150**	**0.10582**	**-0.00195**	**-0.00029**	**-0.00041**	**-0.02017**	**-0.00034**	**0.00421**
%RSD	0.12311	33.86617	0.08649	7.90825	46.27479	75.43798	18.96756	23.16233	3.40784

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00160	0.00146	0.00213
#2	-0.00181	0.00117	-0.00131
Mean	**-0.00170**	**0.00132**	**0.00041**
%RSD	8.62565	15.29430	589.22601

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:46
SampleId1 : 1002258-1D SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:22:18
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE28

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00029	0.05045	0.00040	0.06168	0.05481	0.00005	0.00088	3.33073	0.00005
#2	-0.00046	0.04874	0.00058	0.06054	0.05532	0.00005	0.00137	3.35192	-0.00017
Mean	**-0.00008**	**0.04960**	**0.00049**	**0.06111**	**0.05507**	**0.00005**	**0.00113**	**3.34132**	**-0.00006**
%RSD	633.42242	2.43666	26.90623	1.31961	0.65550	3.04032	30.64030	0.44834	260.75601

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00004	0.00026	0.00009	0.01419	0.51812	0.00788	0.06958	0.00248	-0.00006

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#2	0.00001	0.00020	-0.00054	0.01445	0.51812	0.00789	0.06547	0.00245	0.00015
Mean	**-0.00002**	**0.00023**	**-0.00022**	**0.01432**	**0.51812**	**0.00788**	**0.06753**	**0.00246**	**0.00004**
%RSD	228.74201	18.83416	200.97447	1.31360	0.00000	0.10222	4.29490	1.05764	351.78846

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	132.28244	0.00049	0.00043	0.00236	-0.00012	26.31577	-0.00120	0.00497	0.00045
#2	132.54623	0.00029	0.01113	0.00217	0.00035	26.44010	0.00083	0.00049	-0.00160
Mean	**132.41434**	**0.00039**	**0.00578**	**0.00226**	**0.00011**	**26.37794**	**-0.00018**	**0.00273**	**-0.00057**
%RSD	0.14087	36.37294	130.94395	5.94295	297.86956	0.33329	776.50363	116.00744	253.48603

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	6.13117	0.00018	0.10456	-0.00321	-0.00049	0.00339	-0.00960	0.00001	0.00512
#2	6.16157	0.00244	0.10543	-0.00185	-0.00053	0.00422	-0.01402	-0.00003	0.00438
Mean	**6.14637**	**0.00131**	**0.10500**	**-0.00253**	**-0.00051**	**0.00380**	**-0.01181**	**-0.00001**	**0.00475**
%RSD	0.34966	122.46608	0.58111	37.97008	5.65470	15.39919	26.51595	396.47760	11.07245

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00155	0.00070	0.00196
#2	-0.00169	0.00095	-0.00090
Mean	**-0.00162**	**0.00083**	**0.00053**
%RSD	5.92392	21.29630	384.36446

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:46
SampleId1 : 1002258-1L 5X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:24:07
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE29

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00025	0.04179	-0.00076	0.01052	0.01035	-0.00004	0.00088	0.65315	0.00019
#2	-0.00018	0.04473	-0.00087	0.01091	0.01038	-0.00005	-0.00363	0.65441	0.00004
Mean	**-0.00021**	**0.04326**	**-0.00081**	**0.01071**	**0.01036**	**-0.00004**	**-0.00138**	**0.65378**	**0.00011**
%RSD	20.00479	4.81303	9.70422	2.59593	0.19349	8.86904	231.34982	0.13594	90.51961

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00045	-0.00004	-0.00153	-0.00135	-0.13025	0.00482	-0.00403	0.00057	-0.00061
#2	0.00010	-0.00015	-0.00112	-0.00114	-0.12322	0.00482	0.00158	0.00057	-0.00043
Mean	**-0.00017**	**-0.00010**	**-0.00133**	**-0.00124**	**-0.12673**	**0.00482**	**-0.00123**	**0.00057**	**-0.00052**
%RSD	227.13653	79.47490	22.06226	12.11712	3.91761	0.08360	323.36738	0.00000	24.88314

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	25.56084	-0.00055	0.00063	-0.00076	-0.00004	5.11031	-0.00262	-0.00490	-0.00112
#2	25.62646	0.00004	-0.00107	0.00060	-0.00128	5.10604	0.00106	-0.00257	-0.00073

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Mean	**25.59365**	**-0.00025**	**-0.00022**	**-0.00008**	**-0.00066**	**5.10818**	**-0.00078**	**-0.00374**	**-0.00092**
%RSD	0.18131	162.94962	541.68761	1198.60452	133.64832	0.05905	334.30377	44.11290	29.30673

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.21217	-0.00209	0.01950	-0.00120	-0.00049	0.00057	-0.01352	-0.00016	0.00106
#2	1.20917	0.00089	0.01953	0.00108	-0.00025	0.00252	0.00124	0.00016	0.00106
Mean	**1.21067**	**-0.00060**	**0.01951**	**-0.00006**	**-0.00037**	**0.00154**	**-0.00614**	**0.00000**	**0.00106**
%RSD	0.17554	351.35695	0.10400	2615.84974	47.11544	89.62180	169.97838	67067.37158	0.00000

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00099	-0.00028	-0.00238
#2	-0.00091	-0.00065	-0.00134
Mean	**-0.00095**	**-0.00046**	**-0.00186**
%RSD	5.96917	57.00034	39.20661

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:46
SampleId1 : 1002258-1MS SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:25:54
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE30

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10076	2.15460	2.07427	1.04001	2.04263	0.04756	-0.00293	43.66738	0.05240
#2	0.10140	2.17627	2.07563	1.04838	2.06346	0.04776	-0.00410	43.85712	0.05222
Mean	**0.10108**	**2.16543**	**2.07495**	**1.04420**	**2.05304**	**0.04766**	**-0.00352**	**43.76225**	**0.05231**
%RSD	0.44685	0.70762	0.04649	0.56654	0.71738	0.30015	23.40848	0.30657	0.23453

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49031	0.19581	0.25547	1.13327	50.62668	0.58333	40.99707	0.48192	1.01136
#2	0.49245	0.19562	0.25809	1.13851	51.02185	0.58835	41.19351	0.48422	1.01660
Mean	**0.49138**	**0.19572**	**0.25678**	**1.13589**	**50.82427**	**0.58584**	**41.09529**	**0.48307**	**1.01398**
%RSD	0.30778	0.06895	0.71988	0.32628	0.54979	0.60551	0.33801	0.33582	0.36583

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	175.95380	0.49145	0.00403	0.47786	0.47384	26.67552	0.49433	2.06755	2.04104
#2	176.88778	0.49640	0.00913	0.47994	0.47135	26.85029	0.49810	2.07471	2.03548
Mean	**176.42079**	**0.49393**	**0.00658**	**0.47890**	**0.47260**	**26.76290**	**0.49621**	**2.07113**	**2.03826**
%RSD	0.37435	0.70837	54.82259	0.30824	0.37268	0.46178	0.53705	0.24430	0.19291

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	8.22097	0.51878	0.60411	-0.01381	0.47816	2.06238	-0.00740	0.49630	0.47618
#2	8.27644	0.52522	0.60845	-0.01647	0.48098	2.08112	-0.00200	0.49894	0.47800
Mean	**8.24871**	**0.52200**	**0.60628**	**-0.01514**	**0.47957**	**2.07175**	**-0.00470**	**0.49762**	**0.47709**

20000326

%RSD	0.47550	0.87225	0.50535	12.43397	0.41564	0.63964	81.36344	0.37563	0.27093

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00152	0.47518	2.04987
#2	-0.00183	0.47421	2.04854
Mean	**-0.00168**	**0.47470**	**2.04921**
%RSD	13.12104	0.14393	0.04576

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:46
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 16:27:42
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19261	48.44603	0.48400	0.92877	0.95499	0.47199	0.49125	47.51155	0.47143
#2	0.19504	49.24772	0.49273	0.94236	0.96738	0.47492	0.49328	47.79436	0.47635
Mean	**0.19383**	**48.84687**	**0.48837**	**0.93556**	**0.96118**	**0.47346**	**0.49227**	**47.65296**	**0.47389**
%RSD	0.88895	1.16053	1.26369	1.02730	0.91122	0.43716	0.29081	0.41965	0.73393

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47876	0.95213	0.95098	19.53834	49.70708	0.50441	48.40561	0.93534	0.94381
#2	0.48117	0.95804	0.96465	19.67919	50.31309	0.51122	48.76536	0.94318	0.95501
Mean	**0.47997**	**0.95509**	**0.95781**	**19.60876**	**50.01009**	**0.50781**	**48.58548**	**0.93926**	**0.94941**
%RSD	0.35525	0.43747	1.00911	0.50792	0.85686	0.94794	0.52358	0.58987	0.83361

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	47.44801	0.95908	4.67496	0.92858	0.91850	4.76348	0.46501	0.95975	0.96382
#2	48.06987	0.96567	4.74267	0.93007	0.91710	4.80327	0.47001	0.97673	0.95674
Mean	**47.75894**	**0.96237**	**4.70881**	**0.92932**	**0.91780**	**4.78337**	**0.46751**	**0.96824**	**0.96028**
%RSD	0.92072	0.48374	1.01676	0.11389	0.10776	0.58818	0.75597	1.24012	0.52126

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.58149	0.95355	0.47872	0.11839	0.45412	0.48812	4.73561	0.46870	0.96503
#2	4.64058	0.95819	0.48409	0.12117	0.45840	0.48770	4.76615	0.47153	0.96957
Mean	**4.61103**	**0.95587**	**0.48140**	**0.11978**	**0.45626**	**0.48791**	**4.75088**	**0.47011**	**0.96730**
%RSD	0.90617	0.34362	0.78800	1.64153	0.66293	0.06121	0.45443	0.42681	0.33220

20000327

	Zr	Pb	Se
	ppm	calc	calc
#1	0.94216	0.92185	0.96246
#2	0.95005	0.92142	0.96340
Mean	**0.94611**	**0.92164**	**0.96293**
%RSD	0.58980	0.03334	0.06852

ted: 3/4/2010 17:29:57 User: ROY FRENCH
Method : Paragon File : 100304A Printed : 3/4/2010 17:29:47
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/4/2010 16:29:35
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00029	0.06616	-0.00027	0.00092	-0.00006	0.00023	-0.00265	-0.00502	0.00037
#2	0.00011	0.06882	-0.00076	0.00116	-0.00006	0.00022	-0.00472	-0.00456	0.00045
Mean	**-0.00009**	**0.06749**	**-0.00052**	**0.00104**	**-0.00006**	**0.00022**	**-0.00368**	**-0.00479**	**0.00041**
%RSD	300.04178	2.78665	66.32413	16.07755	0.00000	0.37260	39.58645	6.74405	13.08150

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00022	0.00088	-0.00119	0.00466	-0.21451	0.00419	0.00611	0.00053	-0.00069
#2	0.00030	0.00075	-0.00111	0.00498	-0.22202	0.00419	0.01065	0.00060	0.00030
Mean	**0.00026**	**0.00081**	**-0.00115**	**0.00482**	**-0.21826**	**0.00419**	**0.00838**	**0.00057**	**-0.00019**
%RSD	21.38631	11.67555	4.69276	4.67990	2.43196	0.04810	38.25688	9.20863	363.50331

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.02933	0.00018	0.00263	0.00179	0.00041	-0.00404	-0.00061	0.00174	-0.00178
#2	-0.03007	0.00049	-0.00327	0.00200	-0.00020	-0.00685	0.00011	-0.00306	0.00132
Mean	**-0.02970**	**0.00033**	**-0.00032**	**0.00189**	**0.00010**	**-0.00545**	**-0.00025**	**-0.00066**	**-0.00023**
%RSD	1.75354	66.44557	1296.02663	7.70894	426.13205	36.54577	203.09454	512.65453	968.10949

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00334	-0.00162	-0.00188	-0.00360	-0.00032	0.00104	-0.00319	0.00055	0.00032
#2	-0.00325	-0.00114	-0.00188	-0.00117	-0.00026	0.00100	-0.01008	0.00031	0.00019
Mean	**-0.00330**	**-0.00138**	**-0.00188**	**-0.00239**	**-0.00029**	**0.00102**	**-0.00664**	**0.00043**	**0.00025**
%RSD	1.76227	24.52441	0.26983	71.95790	13.75737	2.75839	73.39576	39.87847	37.72601

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00041	0.00087	-0.00061
#2	0.00001	0.00053	-0.00014
Mean	**0.00021**	**0.00070**	**-0.00037**
%RSD	137.40762	34.42670	89.13547

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:47
SampleId1 : 1002258-1MSD SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:31:28
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE31

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10240	2.20963	2.12459	1.06197	2.09968	0.04912	-0.00425	44.67036	0.05289
#2	0.10149	2.20384	2.10767	1.06079	2.08998	0.04888	-0.00083	44.44142	0.05288
Mean	**0.10195**	**2.20674**	**2.11613**	**1.06138**	**2.09483**	**0.04900**	**-0.00254**	**44.55589**	**0.05288**
%RSD	0.63468	0.18558	0.56542	0.07850	0.32745	0.34704	95.35120	0.36333	0.01571

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50503	0.20110	0.26114	1.06691	52.12726	0.60578	42.52560	0.50087	1.03354
#2	0.50295	0.20061	0.26115	1.06119	51.88620	0.60296	42.33997	0.49876	1.02263
Mean	**0.50399**	**0.20086**	**0.26115**	**1.06405**	**52.00673**	**0.60437**	**42.43278**	**0.49982**	**1.02808**
%RSD	0.29075	0.17330	0.00352	0.38017	0.32776	0.32942	0.30934	0.29843	0.75021

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	182.14807	0.49357	0.00413	0.49045	0.48928	27.95502	0.50380	2.12251	2.09556
#2	181.30283	0.49081	0.00443	0.48890	0.48995	27.83332	0.50211	2.10649	2.11225
Mean	**181.72545**	**0.49219**	**0.00428**	**0.48968**	**0.48962**	**27.89417**	**0.50295**	**2.11450**	**2.10391**
%RSD	0.32889	0.39652	4.95861	0.22306	0.09635	0.30851	0.23656	0.53574	0.56069

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	8.60767	0.52962	0.61739	-0.01533	0.49983	2.09118	-0.01523	0.51080	0.49825
#2	8.59649	0.52878	0.61397	-0.01573	0.49767	2.08728	-0.03196	0.50820	0.49581
Mean	**8.60208**	**0.52920**	**0.61568**	**-0.01553**	**0.49875**	**2.08923**	**-0.02359**	**0.50950**	**0.49703**
%RSD	0.09189	0.11125	0.39318	1.83413	0.30678	0.13174	50.12261	0.36170	0.34677

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00150	0.48967	2.10454
#2	-0.00140	0.48960	2.11033
Mean	**-0.00145**	**0.48964**	**2.10743**
%RSD	4.90183	0.01002	0.19435

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:47
SampleId1 : 1002258-3 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:33:15
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE32

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00014	0.01334	0.00159	0.05476	0.01971	-0.00005	-0.00275	1.94943	0.00007
#2	0.00082	0.01386	0.00066	0.05543	0.01971	-0.00007	0.00049	1.95263	0.00029
Mean	**0.00048**	**0.01360**	**0.00112**	**0.05509**	**0.01971**	**-0.00006**	**-0.00113**	**1.95103**	**0.00018**
%RSD	100.53540	2.69220	58.65136	0.85806	0.00000	14.45523	203.41871	0.11608	87.42090

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00030	0.00026	0.00016	0.05404	0.53215	0.00807	0.07929	0.00411	0.00012
#2	0.00051	0.00053	0.00080	0.05468	0.52513	0.00802	0.07778	0.00411	-0.00024
Mean	**0.00040**	**0.00040**	**0.00048**	**0.05436**	**0.52864**	**0.00805**	**0.07853**	**0.00411**	**-0.00006**
%RSD	36.56285	47.34205	94.94628	0.83065	0.93836	0.47564	1.36052	0.00000	413.86323

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	139.57818	0.00107	0.00623	0.00177	0.00144	37.98008	0.00083	0.00358	0.00266
#2	139.91571	0.00139	0.00413	0.00297	0.00059	38.14782	-0.00007	0.00088	0.00036
Mean	**139.74695**	**0.00123**	**0.00518**	**0.00237**	**0.00101**	**38.06395**	**0.00038**	**0.00223**	**0.00151**
%RSD	0.17079	18.55084	28.67732	35.65817	59.76322	0.31160	167.96935	85.73543	107.99295

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	6.31851	-0.00042	0.04958	-0.00277	-0.00017	0.00181	0.00071	-0.00002	0.00742
#2	6.34938	-0.00030	0.04990	-0.00354	0.00000	0.00401	-0.00323	0.00056	0.00721
Mean	**6.33395**	**-0.00036**	**0.04974**	**-0.00315**	**-0.00008**	**0.00291**	**-0.00126**	**0.00027**	**0.00732**
%RSD	0.34461	23.27121	0.44915	17.15282	141.09399	53.40119	221.27384	150.58480	1.95970

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00122	0.00155	0.00296
#2	-0.00114	0.00138	0.00053
Mean	**-0.00118**	**0.00147**	**0.00175**
%RSD	4.76604	8.34415	98.54069

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:48
SampleId1 : IP100304-3MB **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:35:02
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE33

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00057	0.00262	-0.00050	-0.00010	-0.00043	-0.00010	-0.00354	-0.02226	-0.00017
#2	-0.00071	0.00335	0.00073	0.00072	-0.00057	-0.00009	-0.00325	-0.02432	-0.00027
Mean	**-0.00064**	**0.00299**	**0.00012**	**0.00031**	**-0.00050**	**-0.00009**	**-0.00339**	**-0.02329**	**-0.00022**
%RSD	15.00717	17.48649	743.09738	188.23720	20.15537	0.36538	6.06792	6.24097	31.82967

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00009	0.00049	-0.00083	-0.00342	-0.15131	0.00421	-0.01720	0.00009	-0.00024
#2	-0.00051	-0.00015	-0.00118	-0.00385	-0.16899	0.00416	-0.01979	0.00005	-0.00084
Mean	**-0.00030**	**0.00017**	**-0.00100**	**-0.00364**	**-0.16015**	**0.00419**	**-0.01850**	**0.00007**	**-0.00054**
%RSD	97.41392	268.71043	24.56955	8.27716	7.80439	0.81825	9.90282	38.06738	77.84547

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

20000330

#1	-0.01755	-0.00017	0.00503	-0.00051	-0.00064	0.00581	-0.00108	-0.00209	0.00171
#2	-0.03641	-0.00033	0.00093	-0.00151	0.00175	-0.00122	0.00017	-0.00436	0.00209
Mean	**-0.02698**	**-0.00025**	**0.00298**	**-0.00101**	**0.00056**	**0.00229**	**-0.00046**	**-0.00323**	**0.00190**
%RSD	49.42636	45.07119	97.34931	69.72358	302.66632	216.86147	193.77106	49.73839	14.28307

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00067	-0.00018	-0.00206	-0.00204	-0.00034	0.00071	-0.00860	0.00010	0.00066
#2	-0.00155	-0.00221	-0.00213	-0.00295	-0.00056	-0.00001	-0.01647	-0.00036	0.00052
Mean	**-0.00044**	**-0.00120**	**-0.00210**	**-0.00250**	**-0.00045**	**0.00035**	**-0.01254**	**-0.00013**	**0.00059**
%RSD	356.95212	119.83363	2.41696	25.94301	34.73409	147.07809	44.40653	251.04761	16.16496

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00025	-0.00060	0.00044
#2	-0.00058	0.00066	-0.00006
Mean	**-0.00042**	**0.00003**	**0.00019**
%RSD	56.30655	2588.89032	185.64499

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:48
SampleId1 : IP100304-3RVS SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:36:50
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE34

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00145	0.10219	0.00207	0.00532	0.00428	0.00088	0.00572	0.46818	0.00182
#2	0.00223	0.10201	0.00263	0.00462	0.00437	0.00088	0.00739	0.47047	0.00210
Mean	**0.00184**	**0.10210**	**0.00235**	**0.00497**	**0.00432**	**0.00088**	**0.00656**	**0.46933**	**0.00196**
%RSD	30.09026	0.12507	16.79841	10.07044	1.39142	0.36737	18.01679	0.34424	10.38379

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00200	0.00504	0.00381	0.10024	0.46683	0.00726	0.47972	0.00492	0.00965
#2	0.00179	0.00522	0.00416	0.10013	0.46199	0.00724	0.48447	0.00488	0.00915
Mean	**0.00189**	**0.00513**	**0.00398**	**0.10018**	**0.46441**	**0.00725**	**0.48210**	**0.00490**	**0.00940**
%RSD	7.84062	2.38309	6.21876	0.07514	0.73671	0.11114	0.69657	0.53224	3.71024

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.69297	0.00456	0.10407	0.00289	0.00440	0.09872	0.00674	0.00312	0.00604
#2	0.69567	0.00457	0.10527	0.00454	0.00504	0.09450	0.00882	0.00658	0.00517
Mean	**0.69432**	**0.00456**	**0.10467**	**0.00371**	**0.00472**	**0.09661**	**0.00778**	**0.00485**	**0.00561**
%RSD	0.27570	0.19288	0.81113	31.46728	9.64502	3.09124	18.85389	50.36298	10.98844

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02950	0.00960	0.00272	-0.00485	0.00427	0.01195	0.04152	0.00465	0.00546

20000331

#2	0.02922	0.00865	0.00279	-0.00405	0.00448	0.00892	0.04644	0.00490	0.00546
Mean	**0.02936**	**0.00912**	**0.00275**	**-0.00445**	**0.00438**	**0.01044**	**0.04398**	**0.00477**	**0.00546**
%RSD	0.67600	7.40393	1.65757	12.72838	3.48177	20.52559	7.91152	3.58993	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00413	0.00389	0.00507
#2	0.00426	0.00487	0.00564
Mean	**0.00420**	**0.00438**	**0.00535**
%RSD	2.07089	15.79822	7.51911

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:48
SampleId1 : IP100304-3LCS **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:38:37
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE35

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09780	2.05707	1.98605	0.94260	1.94294	0.04752	-0.00709	39.25494	0.04990
#2	0.09774	2.05136	1.99324	0.94700	1.95590	0.04758	-0.00267	39.27015	0.05005
Mean	**0.09777**	**2.05421**	**1.98965**	**0.94480**	**1.94942**	**0.04755**	**-0.00488**	**39.26254**	**0.04997**
%RSD	0.04609	0.19647	0.25563	0.32928	0.46991	0.08945	64.07259	0.02740	0.21414

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47516	0.19180	0.24387	0.99554	38.01926	0.51197	40.27847	0.47415	0.97453
#2	0.47619	0.19201	0.24621	0.99768	38.11168	0.51313	40.34452	0.47512	0.97872
Mean	**0.47568**	**0.19191**	**0.24504**	**0.99661**	**38.06547**	**0.51255**	**40.31149**	**0.47463**	**0.97662**
%RSD	0.15381	0.07590	0.67624	0.15169	0.17168	0.15991	0.11587	0.14332	0.30272

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	37.31625	0.46865	0.00303	0.46419	0.47048	-0.00685	0.47396	2.00099	2.02920
#2	37.37240	0.46932	0.00983	0.46568	0.46485	0.00018	0.47613	2.01422	2.01818
Mean	**37.34433**	**0.46899**	**0.00643**	**0.46494**	**0.46766**	**-0.00334**	**0.47505**	**2.00760**	**2.02369**
%RSD	0.10633	0.10123	74.80240	0.22666	0.85233	149.19847	0.32165	0.46602	0.38500

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.93877	0.48800	0.48498	-0.01444	0.47672	1.96803	-0.01076	0.48561	0.46582
#2	1.94565	0.49719	0.48785	-0.01568	0.47772	1.97059	-0.02109	0.48658	0.46758
Mean	**1.94221**	**0.49260**	**0.48641**	**-0.01506**	**0.47722**	**1.96931**	**-0.01592**	**0.48609**	**0.46670**
%RSD	0.25060	1.31857	0.41690	5.82311	0.14858	0.09195	45.89279	0.14083	0.26669

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00080	0.46839	2.01981
#2	-0.00088	0.46512	2.01686

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Mean	**-0.00084**	**0.46676**	**2.01833CH**
%RSD	6.83978	0.49443	0.10311

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:48
SampleId1 : 1003045-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:40:24
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE36

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00018	0.11234	0.00203	0.00320	0.00133	-0.00006	-0.00323	0.20500	0.00009
#2	0.00014	0.10913	0.00293	0.00265	0.00130	-0.00007	-0.00392	0.20101	0.00015
Mean	**-0.00002**	**0.11073**	**0.00248**	**0.00293**	**0.00132**	**-0.00007**	**-0.00358**	**0.20300**	**0.00012**
%RSD	1142.74657	2.05115	25.46582	13.30779	1.52202	5.73167	13.52424	1.39241	33.25363

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00006	0.00052	-0.00012	0.09422	-0.09708	0.00423	0.04648	0.00134	0.00022
#2	0.00024	0.00101	0.00073	0.09507	-0.10603	0.00420	0.04518	0.00130	-0.00069
Mean	**0.00015**	**0.00076**	**0.00030**	**0.09465**	**-0.10155**	**0.00422**	**0.04583**	**0.00132**	**-0.00023**
%RSD	85.64244	45.37144	197.48007	0.63622	6.23745	0.57349	1.99828	1.97200	278.32678

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.08943	0.00052	0.00703	0.00224	-0.00044	0.07761	-0.00013	-0.00279	0.00120
#2	0.08609	0.00101	0.00543	0.00102	-0.00065	0.07057	0.00051	-0.00382	0.00217
Mean	**0.08776**	**0.00077**	**0.00623**	**0.00163**	**-0.00055**	**0.07409**	**0.00019**	**-0.00331**	**0.00169**
%RSD	2.69161	44.76466	18.16581	52.92842	27.16054	6.71817	233.36347	21.93907	40.92211

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.22446	0.00125	-0.00070	-0.00391	0.00236	0.00326	-0.00670	0.00023	0.01749
#2	0.21687	-0.00305	-0.00072	-0.00233	0.00289	-0.00071	-0.00817	0.00055	0.01769
Mean	**0.22066**	**-0.00090**	**-0.00071**	**-0.00312**	**0.00262**	**0.00127**	**-0.00744**	**0.00039**	**0.01759**
%RSD	2.43317	336.76804	2.14159	35.83487	14.23987	220.39499	14.04230	57.33022	0.81514

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00033	0.00045	-0.00013
#2	-0.00035	-0.00010	0.00018
Mean	**-0.00034**	**0.00018**	**0.00002**
%RSD	4.07682	218.99545	920.90904

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:49
SampleId1 : 1003045-1D **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:42:12
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE37

Final concentrations:**57** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00143	0.11580	-0.00013	-0.00101	0.00071	-0.00016	-0.00176	0.13294	-0.00006
#2	-0.00096	0.11968	-0.00013	-0.00073	0.00074	-0.00016	-0.00981	0.13442	0.00004
Mean	**-0.00119**	**0.11774**	**-0.00013**	**-0.00087**	**0.00072**	**-0.00016**	**-0.00579**	**0.13368**	**-0.00001**
%RSD	27.74507	2.33290	0.00000	22.38549	2.77748	2.66355	98.32734	0.78534	490.88472

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00023	0.00076	-0.00076	0.07767	-0.19732	0.00396	0.02770	0.00112	-0.00094
#2	-0.00028	0.00036	-0.00075	0.07735	-0.21160	0.00396	0.02856	0.00101	-0.00123
Mean	**-0.00026**	**0.00056**	**-0.00075**	**0.07751**	**-0.20446**	**0.00396**	**0.02813**	**0.00106**	**-0.00109**
%RSD	14.30655	50.18410	0.60929	0.29131	4.94093	0.00000	2.17046	7.35105	18.56721

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00087	0.00014	0.00113	-0.00060	0.00188	0.06353	-0.00008	-0.00883	0.00203
#2	0.00111	-0.00030	0.00523	-0.00047	0.00013	0.07198	-0.00121	0.00167	0.00154
Mean	**0.00099**	**-0.00008**	**0.00318**	**-0.00054**	**0.00101**	**0.06775**	**-0.00064**	**-0.00358**	**0.00179**
%RSD	17.53731	386.98483	91.22307	18.18633	123.25296	8.81550	123.99735	207.58029	19.28766

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.25211	-0.00222	-0.00101	-0.00147	0.00270	-0.00158	-0.00816	-0.00027	0.03560
#2	0.24365	-0.00114	-0.00099	-0.00296	0.00247	0.00090	-0.01653	-0.00003	0.03492
Mean	**0.24788**	**-0.00168**	**-0.00100**	**-0.00222**	**0.00259**	**-0.00034**	**-0.01234**	**-0.00015**	**0.03526**
%RSD	2.41351	45.27561	1.01338	47.41934	6.30763	519.98879	47.91158	112.08027	1.35535

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00071	0.00105	-0.00159
#2	-0.00033	-0.00007	0.00159
Mean	**-0.00052**	**0.00049**	**0.00000**
%RSD	51.44730	161.26700	322578.54209

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:49
SampleId1 : 1003045-1L 5X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:44:00
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE38

Final concentrations

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	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00004	0.02960	-0.00277	0.00037	-0.00031	-0.00010	-0.00461	0.02262	-0.00005
#2	-0.00051	0.02951	-0.00053	-0.00124	-0.00037	-0.00011	-0.00196	0.02205	-0.00019
Mean	**-0.00027**	**0.02956**	**-0.00165**	**-0.00044**	**-0.00034**	**-0.00011**	**-0.00329**	**0.02233**	**-0.00012**
%RSD	122.06457	0.22657	95.64174	260.91501	11.74460	5.52317	56.95297	1.80791	85.69314

ted: 3/4/2010 17:29:57 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00010	0.00032	-0.00083	0.01456	-0.16100	0.00399	-0.00900	0.00027	-0.00113
#2	-0.00030	-0.00048	-0.00154	0.01424	-0.15083	0.00404	-0.00965	0.00027	-0.00069
Mean	**-0.00020**	**-0.00008**	**-0.00119**	**0.01440**	**-0.15591**	**0.00401**	**-0.00932**	**0.00027**	**-0.00091**
%RSD	74.09283	710.69334	42.59540	1.56758	4.61221	0.85310	4.91212	0.00000	34.45151

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.04745	-0.00004	0.00043	-0.00006	0.00159	0.01004	0.00082	-0.00171	-0.00077
#2	-0.04770	0.00000	0.00153	-0.00068	0.00040	0.00581	-0.00054	-0.00349	-0.00024
Mean	**-0.04758**	**-0.00002**	**0.00098**	**-0.00037**	**0.00100**	**0.00793**	**0.00014**	**-0.00260**	**-0.00050**
%RSD	0.36490	152.03652	79.52463	118.49393	84.54667	37.67705	695.42321	48.19988	73.32414

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03930	-0.00054	-0.00170	-0.00115	0.00004	-0.00015	-0.00714	-0.00004	0.00397
#2	0.03996	-0.00245	-0.00170	-0.00196	0.00003	-0.00123	0.00074	-0.00031	0.00417
Mean	**0.03963**	**-0.00150**	**-0.00170**	**-0.00156**	**0.00003**	**-0.00069**	**-0.00320**	**-0.00017**	**0.00407**
%RSD	1.19127	90.25888	0.29828	36.68404	23.72158	110.73510	174.02237	105.84125	3.52097

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00055	0.00104	-0.00108
#2	-0.00061	0.00004	-0.00132
Mean	**-0.00058**	**0.00054**	**-0.00120**
%RSD	7.87706	131.05196	14.22873

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:49
SampleId1 : 1003045-1MS SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:45:48
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE39

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09904	2.22710	2.01962	0.95949	1.97100	0.04825	-0.00146	39.98449	0.05144
#2	0.09883	2.22680	2.01670	0.96141	1.98207	0.04835	0.00482	40.07371	0.05143
Mean	**0.09894**	**2.22695**	**2.01816**	**0.96045**	**1.97653**	**0.04830**	**0.00168**	**40.02910**	**0.05143**
%RSD	0.14737	0.00952	0.10209	0.14171	0.39598	0.13842	264.83306	0.15760	0.01017

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.48401	0.19537	0.24960	1.09150	38.45641	0.51812	40.92820	0.48148	0.99328
#2	0.48460	0.19539	0.24932	1.09434	38.54368	0.51963	41.00140	0.48270	0.99383
Mean	**0.48430**	**0.19538**	**0.24946**	**1.09292**	**38.50004**	**0.51888**	**40.96480**	**0.48209**	**0.99356**
%RSD	0.08573	0.00643	0.07807	0.18336	0.16029	0.20640	0.12636	0.17911	0.03881

20000335

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	37.84229	0.47787	0.00983	0.47606	0.46879	0.07479	0.48124	2.03905	2.04076
#2	37.91458	0.47938	0.01013	0.47762	0.46962	0.08324	0.48313	2.05554	2.02852
Mean	**37.87844**	**0.47862**	**0.00998**	**0.47684**	**0.46921**	**0.07902**	**0.48219**	**2.04730**	**2.03464**
%RSD	0.13495	0.22409	2.12601	0.23069	0.12466	7.55915	0.27796	0.56936	0.42520

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.25178	0.50112	0.49292	-0.01640	0.48542	1.99774	-0.00442	0.49326	0.47652
#2	2.25295	0.50326	0.49546	-0.01763	0.48683	2.01648	-0.01427	0.49505	0.47455
Mean	**2.25236**	**0.50219**	**0.49419**	**-0.01702**	**0.48613**	**2.00711**	**-0.00935**	**0.49415**	**0.47553**
%RSD	0.03671	0.30215	0.36263	5.11576	0.20464	0.66019	74.47015	0.25571	0.29195

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00027	0.47121	2.04019
#2	-0.00045	0.47228	2.03752
Mean	**-0.00036**	**0.47175**	**2.03885**
%RSD	35.60954	0.16035	0.09264

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:50
SampleId1 : 1003045-1MSD **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:47:36
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE40

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09980	2.25474	2.06888	0.98860	1.99557	0.04965	0.00091	41.18675	0.05206
#2	0.10119	2.27169	2.08725	0.99853	2.01439	0.04990	-0.00270	41.36253	0.05264
Mean	**0.10050**	**2.26322**	**2.07807**	**0.99356**	**2.00498**	**0.04977**	**-0.00090**	**41.27464**	**0.05235**
%RSD	0.97425	0.52964	0.62481	0.70727	0.66381	0.36042	284.71352	0.30114	0.79086

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49638	0.20033	0.25109	1.11722	38.63491	0.52004	42.07896	0.49273	1.01601
#2	0.49901	0.20090	0.25434	1.12455	38.86085	0.52347	42.27997	0.49547	1.02440
Mean	**0.49769**	**0.20062**	**0.25272**	**1.12089**	**38.74788**	**0.52176**	**42.17946**	**0.49410**	**1.02020**
%RSD	0.37388	0.20177	0.90924	0.46219	0.41233	0.46539	0.33698	0.39191	0.58140

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	38.02828	0.49362	0.00983	0.48683	0.48212	0.07479	0.49148	2.09033	2.08292
#2	38.20541	0.49644	0.00943	0.49053	0.48228	0.07338	0.49645	2.10272	2.08070
Mean	**38.11684**	**0.49503**	**0.00963**	**0.48868**	**0.48220**	**0.07409**	**0.49397**	**2.09653**	**2.08181**
%RSD	0.32859	0.40312	2.93773	0.53555	0.02320	1.34363	0.71135	0.41775	0.07552

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

20000336

	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.28499	0.51268	0.50021	-0.00265	0.49461	2.05364	-0.01822	0.50342	0.49527
#2	2.30822	0.51900	0.50502	-0.00080	0.49775	2.07228	-0.01084	0.50648	0.49791
Mean	**2.29661**	**0.51584**	**0.50262**	**-0.00173**	**0.49618**	**2.06296**	**-0.01453**	**0.50495**	**0.49659**
%RSD	0.71505	0.86627	0.67646	75.61269	0.44835	0.63879	35.89027	0.42755	0.37600

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00136	0.48368	2.08539
#2	-0.00142	0.48502	2.08803
Mean	**-0.00139**	**0.48435**	**2.08671**
%RSD	3.26975	0.19533	0.08951

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:50
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 16:49:24
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19906	50.84999	0.51130	0.97257	0.99659	0.49975	0.50536	49.69014	0.48653
#2	0.19844	50.66865	0.51234	0.96931	0.99224	0.49883	0.50642	49.68099	0.48434
Mean	**0.19875**	**50.75932**	**0.51182**	**0.97094**	**0.99441**	**0.49929**	**0.50589**	**49.68556**	**0.48544**
%RSD	0.22073	0.25261	0.14365	0.23744	0.30983	0.13133	0.14858	0.01303	0.31834

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50235	1.00076	0.98858	20.62417	51.17653	0.52525	51.15884	0.98990	0.99297
#2	0.50211	0.99992	0.98238	20.58833	51.00914	0.52324	51.06195	0.98857	0.99022
Mean	**0.50223**	**1.00034**	**0.98548**	**20.60625**	**51.09283**	**0.52424**	**51.11039**	**0.98923**	**0.99160**
%RSD	0.03367	0.05963	0.44495	0.12300	0.23166	0.27117	0.13405	0.09559	0.19630

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.49893	0.99576	4.90271	0.97750	0.96202	5.06197	0.48495	1.04205	1.00810
#2	49.31907	0.99611	4.92109	0.97786	0.95761	5.04633	0.48529	1.02477	1.00458
Mean	**49.40900**	**0.99594**	**4.91190**	**0.97768**	**0.95982**	**5.05415**	**0.48512**	**1.03341**	**1.00634**
%RSD	0.25740	0.02469	0.26467	0.02615	0.32448	0.21881	0.04954	1.18258	0.24734

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.85689	1.00193	0.49899	0.12707	0.47883	0.51152	4.93447	0.48984	1.03659
#2	4.84793	0.99799	0.49709	0.12578	0.47788	0.50121	4.92263	0.48943	1.03625
Mean	**4.85241**	**0.99996**	**0.49804**	**0.12643**	**0.47835**	**0.50637**	**4.92855**	**0.48963**	**1.03642**
%RSD	0.13056	0.27814	0.27015	0.71768	0.14066	1.43932	0.16977	0.06013	0.02314

	Zr	**Pb**	**Se**
	ppm	calc	calc

#1	0.98320	0.96717	1.01941	**CH**
#2	0.98033	0.96436	1.01131	
Mean	**0.98177**	**0.96577**	**1.01536**	
%RSD	0.20734	0.20628	0.56431	

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:50
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/4/2010 16:51:17
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00120	0.04441	0.00036	-0.00006	-0.00009	0.00025	-0.00295	-0.00319	0.00005
#2	-0.00103	0.04334	-0.00009	0.00053	-0.00009	0.00023	-0.00452	-0.00376	0.00028
Mean	**-0.00111**	**0.04388**	**0.00014**	**0.00023**	**-0.00009**	**0.00024**	**-0.00374**	**-0.00348**	**0.00017**
%RSD	10.51236	1.72320	233.09993	180.12153	0.00000	5.40869	29.61519	11.61494	98.32840

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00051	-0.00014	-0.00109	0.00504	-0.20410	0.00411	0.00439	0.00053	-0.00076
#2	0.00001	0.00030	-0.00125	0.00445	-0.20628	0.00410	0.00352	0.00049	0.00038
Mean	**-0.00025**	**0.00008**	**-0.00117**	**0.00474**	**-0.20519**	**0.00410**	**0.00395**	**0.00051**	**-0.00019**
%RSD	147.18936	409.62222	9.43965	8.72416	0.75103	0.09817	15.44358	5.10271	420.89862

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.06012	0.00011	0.00003	-0.00268	0.00255	0.00018	-0.00310	-0.00659	0.00373
#2	-0.06145	0.00062	-0.00127	-0.00080	0.00173	-0.00967	-0.00262	-0.00355	0.00185
Mean	**-0.06079**	**0.00037**	**-0.00062**	**-0.00174**	**0.00214**	**-0.00474**	**-0.00286**	**-0.00507**	**0.00279**
%RSD	1.54221	97.92818	147.80775	76.67180	27.11157	146.89052	11.88587	42.31523	47.73530

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00275	-0.00054	-0.00191	-0.00051	-0.00034	0.00139	-0.03321	-0.00068	0.00039
#2	0.00001	-0.00209	-0.00192	-0.00009	-0.00015	0.00161	-0.01451	-0.00034	0.00079
Mean	**-0.00137**	**-0.00132**	**-0.00192**	**-0.00030**	**-0.00025**	**0.00150**	**-0.02386**	**-0.00051**	**0.00059**
%RSD	142.02440	83.33663	0.26478	97.47763	52.99078	10.71098	55.41647	46.34237	48.49488

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00058	0.00081	0.00029
#2	-0.00063	0.00089	0.00005
Mean	**-0.00060**	**0.00085**	**0.00017**
%RSD	5.72727	6.71259	101.35435

20000338

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:50
SampleId1 : 1003045-3 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:53:10

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE41

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00021	0.14517	-0.00068	0.08044	0.02745	0.00015	0.00089	100.71133	0.00005
#2	-0.00082	0.14373	0.00144	0.08028	0.02770	0.00015	0.00099	100.94256	0.00028
Mean	**-0.00031**	**0.14445**	**0.00038**	**0.08036**	**0.02757**	**0.00015**	**0.00094**	**100.82695**	**0.00016**
%RSD	237.33386	0.70658	397.48085	0.13841	0.65446	2.25828	7.32000	0.16217	99.59235

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00012	0.00014	-0.00048	0.17998	5.93012	0.04378	55.59590	0.02722	0.00100
#2	0.00028	0.00049	-0.00019	0.18062	5.95846	0.04397	55.77697	0.02733	0.00160
Mean	**0.00020**	**0.00032**	**-0.00034**	**0.18030**	**5.94429**	**0.04388**	**55.68643**	**0.02728**	**0.00130**
%RSD	56.21963	79.35342	60.64954	0.25058	0.33717	0.31603	0.22991	0.28675	32.45680

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	93.47037	0.00084	0.01113	0.00131	-0.00035	150.22644	0.00143	-0.00451	0.00041
#2	93.81851	0.00015	0.00933	0.00026	-0.00033	151.08382	0.00018	0.00109	0.00086
Mean	**93.64444**	**0.00049**	**0.01023**	**0.00078**	**-0.00034**	**150.65513**	**0.00081**	**-0.00171**	**0.00064**
%RSD	0.26288	98.19752	12.44429	95.15340	4.22738	0.40242	109.34853	231.38757	50.36408

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	9.57834	-0.00222	1.14089	-0.01738	0.00367	0.00000	0.00013	0.00068	0.00282
#2	9.62710	0.00005	1.14724	-0.01903	0.00367	0.00224	-0.00626	0.00023	0.00221
Mean	**9.60272**	**-0.00108**	**1.14407**	**-0.01820**	**0.00367**	**0.00112**	**-0.00307**	**0.00045**	**0.00252**
%RSD	0.35910	148.12443	0.39223	6.41433	0.09883	141.40161	147.53517	69.62142	17.08516

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00072	0.00020	-0.00123
#2	-0.00072	-0.00013	0.00094
Mean	**-0.00072**	**0.00004**	**-0.00015**
%RSD	0.21553	668.49785	1051.63202

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:51
SampleId1 : 1003045-6 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:54:58
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE42

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00193	0.43210	0.00069	0.29091	0.05045	0.00016	-0.00539	101.62425	-0.00018
#2	-0.00158	0.42583	-0.00128	0.28545	0.05013	0.00013	-0.00863	100.54859	-0.00012

Mean	**-0.00176**	**0.42896**	**-0.00029**	**0.28818**	**0.05029**	**0.00014**	**-0.00701**	**101.08642**	**-0.00015**
%RSD	14.28989	1.03400	476.81070	1.34087	0.43864	14.96472	32.68643	0.75243	27.85192

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00081	-0.00005	-0.00108	0.32401	7.99586	0.32493	55.22186	0.02261	0.00227
#2	-0.00107	-0.00040	-0.00137	0.32214	7.97885	0.32421	54.66157	0.02247	0.00212
Mean	**-0.00094**	**-0.00023**	**-0.00123**	**0.32307**	**7.98736**	**0.32457**	**54.94171**	**0.02254**	**0.00220**
%RSD	19.70890	109.49487	16.44246	0.40815	0.15060	0.15694	0.72110	0.46269	5.01447

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	182.64875	-0.00001	0.01723	-0.00438	0.00456	183.69000	-0.00438	-0.00094	0.00503
#2	181.82908	-0.00032	0.01803	-0.00675	0.00509	181.85404	-0.00593	-0.01236	0.00632
Mean	**182.23892**	**-0.00017**	**0.01763**	**-0.00556**	**0.00483**	**182.77202**	**-0.00516**	**-0.00665**	**0.00568**
%RSD	0.31804	131.96949	3.20909	30.12472	7.80537	0.71030	21.17064	121.50965	16.05705

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	8.36304	-0.00306	1.55629	-0.00114	0.01263	0.00069	-0.04326	0.00112	0.00282
#2	8.32697	-0.00390	1.54934	-0.00288	0.01265	-0.00191	-0.04080	0.00127	0.00323
Mean	**8.34501**	**-0.00348**	**1.55281**	**-0.00201**	**0.01264**	**-0.00061**	**-0.04203**	**0.00119**	**0.00302**
%RSD	0.30565	16.97629	0.31660	61.08537	0.08607	301.47266	4.14064	8.83777	9.48110

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00192	0.00158	0.00304
#2	-0.00186	0.00115	0.00010
Mean	**-0.00189**	**0.00137**	**0.00157**
%RSD	2.23391	22.48272	132.61755

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:51
SampleId1 : 1003045-7 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 16:56:46
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE43

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00096	0.76798	0.00028	0.27794	0.05237	0.00010	-0.00379	98.23225	0.00000
#2	-0.00037	0.76679	0.00073	0.27857	0.05235	0.00009	-0.00427	97.97409	-0.00002
Mean	**-0.00066**	**0.76738**	**0.00051**	**0.27825**	**0.05236**	**0.00010**	**-0.00403**	**98.10317**	**-0.00001**
%RSD	63.41859	0.10955	62.20787	0.15985	0.03830	9.53564	8.51266	0.18607	89.09224

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00001	0.00075	-0.00054	0.53446	7.82454	0.31521	52.56116	0.05628	0.00173
#2	0.00014	0.00108	-0.00020	0.53377	7.80009	0.31423	52.44669	0.05613	0.00292
Mean	**0.00007**	**0.00091**	**-0.00037**	**0.53412**	**7.81232**	**0.31472**	**52.50393**	**0.05621**	**0.00233**

20000340

%RSD	127.01460	25.60340	65.93780	0.09179	0.22124	0.22033	0.15416	0.18559	36.29913

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	174.09334	0.00092	0.02614	-0.00092	0.00109	169.48341	-0.00208	-0.00172	0.00367
#2	173.22065	0.00172	0.02584	-0.00034	0.00030	169.58738	0.00102	-0.00166	0.00221
Mean	**173.65700**	**0.00132**	**0.02599**	**-0.00063**	**0.00069**	**169.53540**	**-0.00053**	**-0.00169**	**0.00294**
%RSD	0.35535	42.65105	0.81661	64.34651	80.16116	0.04336	414.34238	2.73755	35.23794

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	9.34017	0.00074	1.46814	-0.01469	0.02368	-0.00008	-0.01487	0.00285	0.00735
#2	9.31360	-0.00367	1.46805	-0.01774	0.02417	0.00167	-0.00060	0.00280	0.00654
Mean	**9.32689**	**-0.00146**	**1.46810**	**-0.01622**	**0.02393**	**0.00079**	**-0.00773**	**0.00283**	**0.00694**
%RSD	0.20144	213.29814	0.00394	13.28602	1.44005	154.94333	130.44435	1.40314	8.25840

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00031	0.00042	0.00187
#2	0.00018	0.00009	0.00092
Mean	**-0.00007**	**0.00025**	**0.00140**
%RSD	536.09377	93.36422	48.34335

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:51
SampleId1 : 1003045-14 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 16:58:34
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE44

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00097	0.16359	-0.00102	0.01700	0.03817	0.00005	-0.00471	53.76464	0.00000
#2	-0.00084	0.16817	0.00125	0.01708	0.03839	0.00006	-0.00647	54.06410	0.00021
Mean	**-0.00091**	**0.16588**	**0.00012**	**0.01704**	**0.03828**	**0.00005**	**-0.00559**	**53.91437**	**0.00010**
%RSD	10.10489	1.95370	1373.62834	0.32631	0.41907	18.31420	22.26707	0.39276	146.62138

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00011	-0.00011	-0.00102	0.26386	3.70433	0.01511	19.32958	0.04452	0.00028
#2	-0.00002	0.00017	-0.00075	0.26668	3.74383	0.01516	19.46968	0.04492	0.00092
Mean	**0.00004**	**0.00003**	**-0.00089**	**0.26527**	**3.72408**	**0.01514**	**19.39963**	**0.04472**	**0.00060**
%RSD	222.12238	614.72568	21.55407	0.75253	0.75010	0.23943	0.51066	0.64142	76.50013

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	20.71128	0.00009	0.02153	0.00016	0.00323	18.94523	-0.00369	-0.00745	0.00021
#2	20.90262	0.00070	0.02554	-0.00062	0.00016	19.07957	-0.00148	-0.00134	-0.00184
Mean	**20.80695**	**0.00039**	**0.02354**	**-0.00023**	**0.00170**	**19.01240**	**-0.00259**	**-0.00440**	**-0.00081**
%RSD	0.65027	109.62988	12.02194	237.90356	128.11820	0.49964	60.23619	98.17787	178.55871

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	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	19.84610	-0.00079	0.38551	-0.01221	0.00424	-0.00206	-0.03191	0.00297	0.00248
#2	20.01614	-0.00174	0.38844	-0.01266	0.00429	0.00106	-0.01518	0.00329	0.00282
Mean	**19.93112**	**-0.00126**	**0.38698**	**-0.01243**	**0.00427**	**-0.00050**	**-0.02354**	**0.00313**	**0.00265**
%RSD	0.60328	53.49179	0.53596	2.55407	0.93547	439.66692	50.23895	7.17815	9.00809

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00375	0.00221	-0.00234
#2	-0.00335	-0.00010	-0.00168
Mean	**-0.00355**	**0.00105**	**-0.00201**
%RSD	8.03607	154.83964	23.33203

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:52
SampleId1 : 1003045-15 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 17:00:22
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE45

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00092	0.16234	0.00040	0.01630	0.03791	0.00007	-0.00402	53.80186	-0.00023
#2	-0.00059	0.15996	0.00177	0.01610	0.03785	0.00006	-0.00912	53.59918	-0.00019
Mean	**-0.00075**	**0.16115**	**0.00108**	**0.01620**	**0.03788**	**0.00007**	**-0.00657**	**53.70052**	**-0.00021**
%RSD	30.63420	1.04545	89.78291	0.85836	0.10587	12.79325	54.96115	0.26687	15.26787

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00003	0.00037	-0.00054	0.26349	3.74432	0.01507	19.36461	0.04418	0.00072
#2	-0.00018	0.00017	-0.00132	0.26173	3.73179	0.01503	19.29261	0.04404	-0.00006
Mean	**-0.00010**	**0.00027**	**-0.00093**	**0.26261**	**3.73805**	**0.01505**	**19.32861**	**0.04411**	**0.00033**
%RSD	107.11460	51.69863	58.77615	0.47330	0.23694	0.17392	0.26338	0.23646	168.25156

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	20.72182	0.00055	0.02634	-0.00019	0.00017	18.74086	-0.00024	-0.00328	0.00377
#2	20.71515	-0.00020	0.01983	-0.00236	0.00198	18.74232	-0.00399	-0.00334	0.00481
Mean	**20.71848**	**0.00018**	**0.02308**	**-0.00127**	**0.00107**	**18.74159**	**-0.00211**	**-0.00331**	**0.00429**
%RSD	0.02279	300.79577	19.91655	120.82953	119.39706	0.00551	125.40495	1.25369	17.22665

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	19.89540	-0.00210	0.38275	-0.00808	0.00461	0.00131	-0.00829	0.00334	0.00133
#2	19.87693	-0.00150	0.38193	-0.01029	0.00434	-0.00194	-0.01419	0.00342	0.00120
Mean	**19.88617**	**-0.00180**	**0.38234**	**-0.00918**	**0.00447**	**-0.00031**	**-0.01124**	**0.00338**	**0.00127**
%RSD	0.06568	23.46060	0.15133	16.97453	4.21682	732.50799	37.13520	1.55360	7.54304

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	-0.00347	0.00005	0.00142
#2	-0.00380	0.00053	0.00210
Mean	**-0.00364**	**0.00029**	**0.00176**
%RSD	6.49589	117.30821	27.23361

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:52
SampleId1 : 1003045-20 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 17:02:10
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE46

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00007	0.02731	0.00278	0.26315	0.01324	0.00007	-0.00044	437.15667	-0.00006
#2	-0.00022	0.02269	0.00069	0.26146	0.01318	0.00008	-0.00103	437.91431	-0.00003
Mean	**-0.00008**	**0.02500**	**0.00174**	**0.26231**	**0.01321**	**0.00008**	**-0.00074**	**437.53549**	**-0.00005**
%RSD	268.75410	13.06242	84.90077	0.45572	0.30352	7.37094	56.33405	0.12244	36.42006

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00069	0.00075	-0.00035	0.06303	19.23466	0.12199	226.51677	0.24447	0.00217
#2	0.00058	0.00009	-0.00007	0.06298	19.33378	0.12264	227.14438	0.24573	0.00272
Mean	**0.00064**	**0.00042**	**-0.00021**	**0.06301**	**19.28422**	**0.12232**	**226.83058**	**0.24510**	**0.00244**
%RSD	11.67837	109.60812	94.92430	0.05972	0.36343	0.37764	0.19565	0.36229	15.77894

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	494.25172	0.00251	-0.01518	0.00159	0.00045	982.05421	0.00060	0.01155	0.01140
#2	491.21585	0.00191	-0.02278	0.00044	-0.00016	983.39915	-0.00129	0.00352	0.01185
Mean	**492.73379**	**0.00221**	**-0.01898**	**0.00101**	**0.00014**	**982.72668**	**-0.00034**	**0.00753**	**0.01162**
%RSD	0.43567	19.50858	28.32532	79.76448	300.46346	0.09677	388.38898	75.34902	2.75447

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.59966	0.00066	6.35175	-0.01729	-0.00233	-0.00023	0.19458	0.00084	0.00073
#2	1.60433	0.00197	6.37286	-0.01742	-0.00225	-0.00200	0.19950	0.00079	0.00093
Mean	**1.60199**	**0.00131**	**6.36231**	**-0.01735**	**-0.00229**	**-0.00112**	**0.19704**	**0.00081**	**0.00083**
%RSD	0.20633	70.78333	0.23458	0.51563	2.37531	111.81952	1.76602	4.86075	17.31884

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00029	0.00083	0.01145
#2	0.00043	0.00004	0.00908
Mean	**0.00036**	**0.00043**	**0.01026**
%RSD	28.37206	128.57822	16.34053

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Method : Paragon File : 100304A Printed : 3/4/2010 17:29:52

SampleId1 : 1003045-22 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 17:03:58
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE47

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00014	0.11746	0.00092	0.11508	0.03437	0.00003	-0.00145	149.71881	0.00036
#2	-0.00053	0.11648	0.00043	0.11477	0.03442	0.00002	0.00012	149.79606	0.00000
Mean	**-0.00034**	**0.11697**	**0.00068**	**0.11492**	**0.03439**	**0.00003**	**-0.00067**	**149.75743**	**0.00018**
%RSD	82.09993	0.59472	50.67408	0.19356	0.11660	25.17025	166.18529	0.03648	145.11313

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00008	0.00005	0.00034	0.09140	12.96065	0.05294	90.80841	0.00565	0.00168
#2	0.00045	0.00054	0.00076	0.09204	12.95565	0.05298	90.94280	0.00573	0.00186
Mean	**0.00018**	**0.00030**	**0.00055**	**0.09172**	**12.95815**	**0.05296**	**90.87561**	**0.00569**	**0.00177**
%RSD	201.64521	115.80949	54.65507	0.49239	0.02729	0.05689	0.10457	0.91621	7.26750

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	141.36453	0.00066	0.02954	-0.00166	0.00066	305.48373	0.00037	-0.00065	0.00350
#2	141.31195	0.00130	0.02754	0.00230	0.00014	305.80705	0.00048	-0.00216	0.00095
Mean	**141.33824**	**0.00098**	**0.02854**	**0.00032**	**0.00040**	**305.64539**	**0.00042**	**-0.00141**	**0.00222**
%RSD	0.02630	45.87818	4.95749	872.91504	92.92865	0.07480	19.23551	75.92522	80.83253

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	8.60186	-0.00138	1.85030	-0.02222	0.00264	0.00040	0.04103	0.00128	0.00147
#2	8.60847	-0.00305	1.85066	-0.02021	0.00247	0.00188	0.04005	0.00165	0.00147
Mean	**8.60517**	**-0.00222**	**1.85048**	**-0.02121**	**0.00255**	**0.00114**	**0.04054**	**0.00146**	**0.00147**
%RSD	0.05427	53.33381	0.01376	6.71680	4.69068	91.82108	1.71724	18.03329	0.00000

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00068	-0.00011	0.00212
#2	-0.00062	0.00086	-0.00008
Mean	**-0.00065**	**0.00037**	**0.00102**
%RSD	7.17104	184.66473	153.14293

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:53
SampleId1 : 1003045-24 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 17:05:46
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE48

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Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	-0.00043	0.61372	0.00241	0.27251	0.05079	0.00007	-0.00026	97.99839	-0.00014
#2	-0.00124	0.61066	0.00125	0.27353	0.05107	0.00007	-0.00498	98.01196	-0.00017
Mean	**-0.00083**	**0.61219**	**0.00183**	**0.27302**	**0.05093**	**0.00007**	**-0.00262**	**98.00517**	**-0.00015**
%RSD	68.57691	0.35243	44.60754	0.26474	0.39377	5.30894	127.24378	0.00979	13.38190

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00038	0.00088	-0.00040	0.46008	7.78212	0.31138	52.75562	0.04500	0.00277
#2	0.00025	-0.00001	-0.00067	0.46002	7.80800	0.31273	52.81762	0.04511	0.00214
Mean	**0.00032**	**0.00044**	**-0.00054**	**0.46005**	**7.79506**	**0.31206**	**52.78662**	**0.04505**	**0.00246**
%RSD	29.40494	144.34567	35.45850	0.00819	0.23478	0.30520	0.08306	0.17364	17.93777

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	173.99082	0.00115	0.01863	0.00049	0.00104	168.27136	-0.00058	0.00028	0.00296
#2	174.82820	0.00036	0.02103	-0.00109	0.00145	169.10047	-0.00331	-0.00465	0.00415
Mean	**174.40951**	**0.00075**	**0.01983**	**-0.00030**	**0.00124**	**168.68592**	**-0.00195**	**-0.00218**	**0.00355**
%RSD	0.33950	73.50533	8.55912	372.09180	23.37860	0.34755	99.04968	159.29046	23.57991

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	8.88753	-0.00056	1.45227	-0.01770	0.01808	0.00099	-0.00990	0.00273	0.00208
#2	8.89906	-0.00343	1.45735	-0.01837	0.01879	0.00228	-0.02860	0.00221	0.00228
Mean	**8.89329**	**-0.00200**	**1.45481**	**-0.01804**	**0.01843**	**0.00164**	**-0.01925**	**0.00247**	**0.00218**
%RSD	0.09167	101.56486	0.24680	2.62907	2.75434	55.69211	68.68884	14.96816	6.57804

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00037	0.00085	0.00207
#2	-0.00061	0.00061	0.00122
Mean	**-0.00049**	**0.00073**	**0.00164**
%RSD	34.78306	24.16107	36.53309

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:53
SampleId1 : 1003045-25 SampleId2 : [SAMPLE]
Analysis commenced : 3/4/2010 17:07:34
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE49

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00010	0.72074	0.00267	0.27290	0.05167	0.00001	-0.00437	96.14926	0.00006
#2	0.00020	0.72529	0.00527	0.27275	0.05172	0.00000	0.00073	96.08952	0.00006
Mean	**0.00015**	**0.72301**	**0.00397**	**0.27283**	**0.05169**	**0.00001**	**-0.00182**	**96.11939**	**0.00006**
%RSD	47.79038	0.44574	46.41503	0.04076	0.07759	63.45015	198.13784	0.04394	0.43019

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00019	0.00048	0.00002	0.52236	7.84011	0.31299	51.93531	0.04182	0.00183

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#2	0.00001	0.00065	0.00051	0.52129	7.86623	0.31316	51.90951	0.04175	0.00269
Mean	**0.00010**	**0.00057**	**0.00026**	**0.52182**	**7.85317**	**0.31307**	**51.92241**	**0.04179**	**0.00226**
%RSD	126.05890	21.64559	131.58167	0.14453	0.23519	0.03850	0.03513	0.12480	26.78805

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	174.30074	0.00095	0.02444	0.00179	0.00235	167.25023	0.00209	0.00238	0.00074
#2	174.55273	0.00136	0.02063	0.00055	0.00076	167.36666	0.00061	-0.00123	0.00060
Mean	**174.42674**	**0.00115**	**0.02253**	**0.00117**	**0.00156**	**167.30845**	**0.00135**	**0.00058**	**0.00067**
%RSD	0.10215	25.19796	11.92778	75.35506	72.49482	0.04921	77.73107	440.57539	14.72330

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	9.00589	-0.00069	1.44848	-0.01826	0.02262	-0.00011	-0.00354	0.00295	0.00404
#2	9.02304	-0.00033	1.44680	-0.01681	0.02151	0.00159	0.00088	0.00311	0.00404
Mean	**9.01446**	**-0.00051**	**1.44764**	**-0.01754**	**0.02207**	**0.00074**	**-0.00133**	**0.00303**	**0.00404**
%RSD	0.13455	50.10068	0.08206	5.82324	3.55014	162.61135	235.41953	3.91341	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00009	0.00217	0.00129
#2	0.00043	0.00069	-0.00001
Mean	**0.00026**	**0.00143**	**0.00064**
%RSD	91.78785	73.27543	143.05247

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:53
SampleId1 : 1003045-20 100X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/4/2010 17:11:58
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE50

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00029	0.01758	-0.00254	0.00198	-0.00040	-0.00002	-0.00256	4.52150	0.00019
#2	0.00031	0.01809	0.00304	0.00273	-0.00031	-0.00003	-0.00079	4.53469	-0.00007
Mean	**0.00001**	**0.01784**	**0.00025**	**0.00236**	**-0.00036**	**-0.00003**	**-0.00167**	**4.52810**	**0.00006**
%RSD	3471.88485	2.01154	1597.44589	22.43334	16.91455	28.53725	74.89874	0.20586	300.46538

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00020	0.00030	-0.00118	-0.00326	-0.02662	0.00481	2.35686	0.00289	-0.00053
#2	0.00009	0.00033	-0.00069	-0.00284	-0.02057	0.00481	2.36248	0.00285	-0.00063
Mean	**-0.00005**	**0.00032**	**-0.00094**	**-0.00305**	**-0.02360**	**0.00481**	**2.35967**	**0.00287**	**-0.00058**
%RSD	370.45873	4.79422	36.95525	9.86499	18.13521	0.04186	0.16822	0.90822	12.63143

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	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.23395	-0.00025	-0.00257	0.00001	-0.00027	8.67039	-0.00037	0.00260	-0.00014
#2	4.24480	0.00034	-0.00497	0.00311	-0.00032	8.71478	0.00159	0.00018	-0.00139

Mean	**4.23937**	**0.00004**	**-0.00377**	**0.00156**	**-0.00030**	**8.69258**	**0.00061**	**0.00139**	**-0.00077**
%RSD	0.18109	921.95746	44.99166	140.47212	11.64297	0.36109	226.51431	123.19313	115.51915

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01205	0.00006	0.06851	-0.00449	-0.00046	0.00111	-0.00614	0.00021	0.00039
#2	0.01401	-0.00102	0.06855	-0.00373	-0.00042	0.00195	0.00075	0.00044	0.00039
Mean	**0.01303**	**-0.00048**	**0.06853**	**-0.00411**	**-0.00044**	**0.00153**	**-0.00269**	**0.00033**	**0.00039**
%RSD	10.60645	157.91734	0.04448	12.95870	5.78659	38.59256	180.72829	48.60716	0.00000

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00026	-0.00018	0.00077
#2	-0.00033	0.00082	-0.00087
Mean	**-0.00030**	**0.00032**	**-0.00005**
%RSD	16.60943	219.04512	2349.62229

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:53
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 17:13:47
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19501	49.68811	0.49418	0.93611	0.96661	0.48681	0.48689	48.26727	0.47469
#2	0.19472	49.63078	0.49403	0.93160	0.96567	0.48594	0.49516	48.22261	0.47146
Mean	**0.19486**	**49.65944**	**0.49411**	**0.93386**	**0.96614**	**0.48638**	**0.49102**	**48.24494**	**0.47308**
%RSD	0.10402	0.08163	0.02126	0.34207	0.06877	0.12646	1.19161	0.06546	0.48271

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.48930	0.97630	0.96209	20.07508	50.29228	0.51545	49.83362	0.96546	0.96326
#2	0.48906	0.97561	0.95898	20.05450	50.27193	0.51494	49.78356	0.96435	0.95760
Mean	**0.48918**	**0.97596**	**0.96053**	**20.06479**	**50.28210**	**0.51519**	**49.80859**	**0.96490**	**0.96043**
%RSD	0.03404	0.05021	0.22921	0.07253	0.02862	0.06893	0.07108	0.08166	0.41681

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.08219	0.96101	4.84207	0.94781	0.94621	4.90844	0.46799	0.98174	0.98164
#2	49.02971	0.95790	4.81841	0.94985	0.94551	4.91696	0.46813	0.98797	0.98965
Mean	**49.05595**	**0.95945**	**4.83024**	**0.94883**	**0.94586**	**4.91270**	**0.46806**	**0.98486**	**0.98565**
%RSD	0.07565	0.22887	0.34638	0.15167	0.05202	0.12275	0.02061	0.44750	0.57400

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.74226	0.96855	0.48279	0.12474	0.46786	0.48437	4.79008	0.47732	1.00986
#2	4.73413	0.96724	0.48191	0.12387	0.46745	0.48398	4.80047	0.47754	1.00946
Mean	**4.73819**	**0.96790**	**0.48235**	**0.12431**	**0.46766**	**0.48418**	**4.79528**	**0.47743**	**1.00966**

%RSD	0.12121	0.09578	0.12877	0.49556	0.06189	0.05759	0.15319	0.03249	0.02851

	Zr	Pb	Se
	ppm	calc	calc
#1	0.95560	0.94674	0.98168
#2	0.95431	0.94696	0.98909
Mean	**0.95495**	**0.94685**	**0.98538**
%RSD	0.09540	0.01595	0.53190

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:54
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/4/2010 17:15:39
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00068	0.02920	-0.00016	0.00017	-0.00026	0.00003	-0.00462	-0.00936	-0.00007
#2	0.00012	0.03337	-0.00154	0.00072	-0.00014	0.00003	0.00619	-0.00901	0.00071
Mean	**-0.00028**	**0.03129**	**-0.00085**	**0.00045**	**-0.00020**	**0.00003**	**0.00078**	**-0.00919**	**0.00032**
%RSD	204.56181	9.41951	114.44964	86.92473	40.16862	8.05022	973.38764	2.63715	174.01087

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00012	0.00027	-0.00111	0.00323	-0.21959	0.00398	0.00266	0.00046	-0.00014
#2	0.00046	0.00062	-0.00049	0.00333	-0.20386	0.00401	0.00892	0.00057	-0.00014
Mean	**0.00029**	**0.00044**	**-0.00080**	**0.00328**	**-0.21172**	**0.00399**	**0.00579**	**0.00051**	**-0.00014**
%RSD	84.34868	55.72962	54.61434	2.29367	5.25668	0.50451	76.47368	15.30812	0.00000

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.07029	0.00025	-0.00127	-0.00031	0.00106	-0.00263	-0.00036	0.00006	0.00045
#2	-0.07058	0.00041	-0.00197	0.00372	-0.00161	0.00159	0.00266	0.00806	-0.00049
Mean	**-0.07043**	**0.00033**	**-0.00162**	**0.00171**	**-0.00028**	**-0.00052**	**0.00115**	**0.00406**	**-0.00002**
%RSD	0.29576	34.55170	30.51784	166.90350	682.86949	573.82148	186.27838	139.24632	3734.82916

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00631	-0.00006	-0.00195	-0.00274	-0.00034	0.00050	-0.01008	-0.00018	0.00039
#2	-0.00323	-0.00066	-0.00190	-0.00185	-0.00024	0.00127	0.01452	0.00044	0.00025
Mean	**-0.00477**	**-0.00036**	**-0.00193**	**-0.00230**	**-0.00029**	**0.00088**	**0.00222**	**0.00013**	**0.00032**
%RSD	45.70621	116.64747	2.10637	27.31191	25.23658	61.85929	783.22929	331.98317	29.78143

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00021	0.00060	0.00032
#2	0.00003	0.00016	0.00236
Mean	**-0.00009**	**0.00038**	**0.00134**
%RSD	183.76710	80.88051	107.37787

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ted: 3/4/2010 17:29:57 User: ROY FRENCH
Method : Paragon File : 100304A Printed : 3/4/2010 17:29:54
SampleId1 : CRI SampleId2 : [FLEXQC]
Analysis commenced : 3/4/2010 17:17:32
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD3

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02002	0.44292	0.01152	0.40971	0.42307	0.01056	0.04784	5.37697	0.01018
#2	0.02077	0.44323	0.00736	0.40939	0.42304	0.01055	0.05344	5.37364	0.01051
Mean	**0.02040**	**0.44308**	**0.00944**	**0.40955**	**0.42305**	**0.01055**	**0.05064**	**5.37530**	**0.01035**
%RSD	2.59264	0.04875	31.22311	0.05429	0.00475	0.12554	7.81515	0.04376	2.25075

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10495	0.02150	0.05184	0.22253	4.00539	0.02047	5.43625	0.03168	0.02026
#2	0.10547	0.02183	0.05212	0.22194	4.01261	0.02047	5.43863	0.03168	0.02107
Mean	**0.10521**	**0.02167**	**0.05198**	**0.22224**	**4.00900**	**0.02047**	**5.43744**	**0.03168**	**0.02066**
%RSD	0.35171	1.06385	0.38536	0.18639	0.12742	0.00000	0.03089	0.00000	2.75345

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.34473	0.08359	0.21336	0.00580	0.00649	0.21559	0.12262	0.00989	0.01024
#2	4.34358	0.08436	0.21586	0.00802	0.00590	0.22404	0.12102	0.00951	0.01017
Mean	**4.34416**	**0.08398**	**0.21461**	**0.00691**	**0.00620**	**0.21982**	**0.12182**	**0.00970**	**0.01020**
%RSD	0.01865	0.64953	0.82450	22.77791	6.74943	2.71797	0.92831	2.75047	0.48353

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10681	0.10795	0.01932	0.08819	0.02039	0.02632	0.21120	0.10586	0.04209
#2	0.11000	0.10581	0.01936	0.08972	0.02025	0.02484	0.21120	0.10657	0.04243
Mean	**0.10840**	**0.10688**	**0.01934**	**0.08895**	**0.02032**	**0.02558**	**0.21120**	**0.10622**	**0.04226**
%RSD	2.08005	1.42147	0.15738	1.22013	0.51761	4.09378	0.00013	0.47148	0.56551

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.05221	0.00626	0.01012
#2	0.05262	0.00661	0.00995
Mean	**0.05242**	**0.00643**	**0.01004**
%RSD	0.55182	3.81314	1.21329

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:54
SampleId1 : ICSA SampleId2 : [FLEXQC]
Analysis commenced : 3/4/2010 17:19:26
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD4

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00018	264.72473	-0.00024	-0.00144	-0.00023	0.00049	0.00284	262.99601	-0.00009
#2	-0.00004	267.21947	0.00200	-0.00073	-0.00023	0.00045	0.00490	264.33286	-0.00018
Mean	**0.00007**	**265.97210**	**0.00088**	**-0.00109**	**-0.00023**	**0.00047**	**0.00387**	**263.66443**	**-0.00014**
%RSD	225.04282	0.66325	179.46748	46.09662	0.00000	4.87827	37.68916	0.35852	46.11777

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00148	-0.00061	-0.00468	108.40053	-0.23388	0.00576	275.04221	-0.00054	-0.00180
#2	0.00140	-0.00033	-0.00469	108.99311	-0.24623	0.00575	276.70544	-0.00039	-0.00006
Mean	**0.00144**	**-0.00047**	**-0.00468**	**108.69682**	**-0.24006**	**0.00576**	**275.87382**	**-0.00047**	**-0.00093**
%RSD	3.85922	42.33630	0.12225	0.38549	3.63783	0.10500	0.42631	22.37236	131.99651

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.07034	0.00096	0.00523	0.00232	0.00096	0.01848	0.00237	-0.00179	-0.00046
#2	-0.07073	0.00184	0.00953	0.00365	0.00166	-0.00263	0.00475	0.00059	-0.00382
Mean	**-0.07053**	**0.00140**	**0.00738**	**0.00299**	**0.00131**	**0.00793**	**0.00356**	**-0.00060**	**-0.00214**
%RSD	0.39379	44.58474	41.21113	31.65123	37.50113	188.38268	47.46668	280.11649	110.85321

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00989	-0.00209	0.01118	-0.00685	-0.00081	-0.00255	0.02387	-0.00319	0.00100
#2	-0.00718	0.00065	0.01127	-0.00538	-0.00083	-0.00326	0.03429	-0.00315	0.00147
Mean	**-0.00854**	**-0.00072**	**0.01123**	**-0.00611**	**-0.00082**	**-0.00290**	**0.02908**	**-0.00317**	**0.00123**
%RSD	22.38438	269.87149	0.54211	16.99124	1.77846	17.31356	25.34097	0.89772	27.12398

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00229	0.00142	-0.00090
#2	0.00218	0.00232	-0.00235
Mean	**0.00224**	**0.00187**	**-0.00163**
%RSD	3.44195	34.39114	62.89133

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:55
SampleId1 : ICSAB **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/4/2010 17:21:21
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD5

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20568	263.95230	0.11062	0.98577	0.51140	0.48641	0.53104	260.83240	0.99057
#2	0.20591	266.61201	0.11352	0.99759	0.51780	0.48957	0.52970	262.29880	0.99998
Mean	**0.20579**	**265.28216**	**0.11207**	**0.99168**	**0.51460**	**0.48799**	**0.53037**	**261.56560**	**0.99527**
%RSD	0.07855	0.70894	1.83091	0.84306	0.87862	0.45790	0.17796	0.39642	0.66865

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47647	0.48155	0.51473	107.66393	-0.22831	1.09344	274.03935	0.47563	1.00105
#2	0.48092	0.48461	0.52034	108.38853	-0.24139	1.10181	276.00719	0.47941	1.00829
Mean	**0.47870**	**0.48308**	**0.51754**	**108.02623**	**-0.23485**	**1.09762**	**275.02327**	**0.47752**	**1.00467**
%RSD	0.65862	0.44788	0.76631	0.47430	3.93719	0.53962	0.50595	0.55888	0.50996

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.08187	0.93117	1.03148	0.05737	0.05472	1.03725	0.59083	0.05936	0.05822
#2	-0.08192	0.94056	1.03690	0.05808	0.05525	1.04148	0.59812	0.05466	0.05899
Mean	**-0.08190**	**0.93586**	**1.03419**	**0.05772**	**0.05499**	**1.03936**	**0.59448**	**0.05701**	**0.05861**
%RSD	0.04239	0.70959	0.37052	0.87715	0.68517	0.28788	0.86683	5.82699	0.92984

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.97205	1.01686	0.99879	-0.04161	0.96357	0.10320	10.24942	0.48754	0.92250
#2	0.98039	1.01494	1.00921	-0.04181	0.97150	0.11377	10.30997	0.49124	0.92528
Mean	**0.97622**	**1.01590**	**1.00400**	**-0.04171**	**0.96753**	**0.10848**	**10.27969**	**0.48939**	**0.92389**
%RSD	0.60399	0.13342	0.73391	0.33529	0.58019	6.88840	0.41652	0.53390	0.21280

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.50411	0.05560	0.05860
#2	0.50756	0.05620	0.05755
Mean	**0.50584**	**0.05590**	**0.05807**
%RSD	0.48306	0.75119	1.27898

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:55
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/4/2010 17:23:15
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19541	49.72705	0.49767	0.94016	0.96615	0.49294	0.49142	49.01060	0.47425
#2	0.19541	49.64266	0.50187	0.94008	0.96404	0.49227	0.48324	48.91861	0.47560
Mean	**0.19541**	**49.68486**	**0.49977**	**0.94012**	**0.96510**	**0.49261**	**0.48733**	**48.96460**	**0.47493**
%RSD	0.00157	0.12011	0.59375	0.00591	0.15439	0.09696	1.18765	0.13284	0.20147

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49561	0.99032	0.96054	20.30163	50.26753	0.51363	50.55409	0.97597	0.97344
#2	0.49595	0.98872	0.95792	20.27645	50.17525	0.51258	50.50488	0.97501	0.97095
Mean	**0.49578**	**0.98952**	**0.95923**	**20.28904**	**50.22139**	**0.51311**	**50.52948**	**0.97549**	**0.97220**
%RSD	0.04822	0.11423	0.19370	0.08776	0.12993	0.14376	0.06885	0.07001	0.18133

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

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#1	49.09918	0.97035	4.84116	0.96292	0.96266	4.93402	0.46924	0.99311	0.99302
#2	49.03072	0.96750	4.84898	0.96252	0.96421	4.91270	0.46835	0.99329	1.00162
Mean	**49.06495**	**0.96893**	**4.84507**	**0.96272**	**0.96343**	**4.92336**	**0.46879**	**0.99320**	**0.99732**
%RSD	0.09866	0.20759	0.11412	0.02940	0.11358	0.30622	0.13441	0.01266	0.60916

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.75664	0.98298	0.48303	0.12648	0.47178	0.49143	4.78153	0.48226	1.03083
#2	4.76169	0.98083	0.48184	0.12658	0.47106	0.49104	4.80230	0.48066	1.02995
Mean	**4.75917**	**0.98190**	**0.48243**	**0.12653**	**0.47142**	**0.49124**	**4.79191**	**0.48146**	**1.03039**
%RSD	0.07509	0.15449	0.17344	0.05527	0.10897	0.05585	0.30643	0.23578	0.06052

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.96223	0.96275	0.99305
#2	0.95961	0.96365	0.99884
Mean	**0.96092**	**0.96320**	**0.99595**
%RSD	0.19212	0.06599	0.41107

Method : Paragon File : 100304A Printed : 3/4/2010 17:29:55
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/4/2010 17:25:07
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00010	0.03979	-0.00147	0.00084	-0.00023	0.00016	-0.00246	0.00309	0.00043
#2	-0.00032	0.03812	-0.00098	0.00104	-0.00028	0.00011	-0.00285	-0.00273	0.00021
Mean	**-0.00021**	**0.03895**	**-0.00122**	**0.00094**	**-0.00026**	**0.00013**	**-0.00266**	**0.00018**	**0.00032**
%RSD	73.00244	3.02413	27.97464	14.80009	15.64155	27.55779	10.41056	2310.90132	49.58940

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00012	0.00021	-0.00096	0.00844	-0.12032	0.00420	0.01065	0.00049	-0.00043
#2	0.00032	0.00046	-0.00118	0.00626	-0.12032	0.00417	0.01021	0.00046	-0.00035
Mean	**0.00022**	**0.00033**	**-0.00107**	**0.00735**	**-0.12032**	**0.00418**	**0.01043**	**0.00047**	**-0.00039**
%RSD	67.29228	52.20743	14.44103	20.98462	0.00000	0.48182	2.92710	5.49957	14.24472

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.07294	-0.00077	-0.00077	-0.00032	0.00201	-0.00263	-0.00251	-0.00485	0.00157
#2	-0.07392	0.00003	-0.00187	-0.00024	0.00035	-0.00545	0.00064	-0.00360	-0.00014
Mean	**-0.07343**	**-0.00037**	**-0.00132**	**-0.00028**	**0.00118**	**-0.00404**	**-0.00093**	**-0.00423**	**0.00071**
%RSD	0.94564	151.37790	58.84009	18.70256	99.09482	49.28095	238.87130	20.86238	168.95546

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00582	0.00041	-0.00193	-0.00226	-0.00040	0.00140	-0.01697	-0.00001	0.00019

20000352

#2	-0.00299	-0.00066	-0.00193	-0.00262	-0.00038	-0.00026	-0.00861	-0.00016	0.00059
Mean	**-0.00440**	**-0.00012**	**-0.00193**	**-0.00244**	**-0.00039**	**0.00057**	**-0.01279**	**-0.00008**	**0.00039**
%RSD	45.49574	617.53553	0.00000	10.34226	3.71974	206.21256	46.25662	128.09562	73.80249

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00015	0.00123	-0.00057
#2	-0.00005	0.00015	-0.00129
Mean	**-0.00010**	**0.00069**	**-0.00093**
%RSD	73.86075	109.93720	54.99728

HEADER INFROMATION FOR ANALYTICAL SEQUENCE 100305A
STANDARD SOLUTION CODES

Stock A (ST100301-49) Exp. 5-31-15

Element	ug/ml
Al, Ca, Mg	1000
Na, K	500
Fe	400
Li	20

Standard	Dilution	Procedure
A1	1/2 of Stock A	5ml of Stock A to 10ml final volume.
A2	1/2.5 of Stock A	2ml of Stock A to a 5ml final volume.
A3	1/5 of Stock A	1ml of Stock A to a 5ml final volume.
A4	1/10 of A1	1ml of Standard A1 up to a 10ml final volume.
A5	1/10 of A2	1ml of Standard A2 up to a 10ml final volume.

Stock B (ST100301-50) Exp. 2-28-15

Element	ug/ml
P, Si	100
B, Ba, Cr, Cu, Mn, Mo, Ni, Pb, Sn, Sr, Ti ,Zn	20
As, Cd, Co, Se, Tl, V	10
Ag, Sb	4
Be	2

Stock Ag- 1000 ug/ml (ST090107-6) Exp. 4-06-10
Stock Th – 1000 ug/ml (ST090107-7) Exp. 4-06-10

The following dilutions of Stock Ag and Stock Th are made to provide the daily calibration Standards.

Standard	Dilution	Procedure
B1	1/2 of Stock B 1/500 Ag and 1/500 Th	5ml of Stock B and 0.02ml of Stock Ag and Stock Th up to a 10ml final volume.
B2	1/10 of B1	1.0ml of Standard B1 up to a 10ml final volume.
B3	1/10 of B2	1.0ml of Standard B2 up to a 10ml final volume.

Stock C (ST100301-51) Exp. 6-30-15

Element	ug/ml
S, U	100
Bi, Zr	10

Standard	Dilution	Procedure
C1	1/2 of Stock C	5ml of Stock C up to a 10ml final volume.
C2	1/10 of C1	1.0ml of Standard C1 up to a 10ml final volume.
C3	1/10 of C2	1.0ml of Standard C2 up to a 10ml final volume.

RL STD (Reporting Limit Standard) Intermediate.
(ST100301-54) Exp. 2-28-15

Element	ug/ml
K, Na	500
Ca, Mg	200
Al, U	100
B, Fe, P, S, Si	50
Li, Mo, Sn, Sr, Ti	10
Sb	8
Ni, As, Bi, Se, Tl, Zn, Zr	5
Pb	3
Ag, Ba, Co, Cr, Cu, Mn, V, Th	2
Be, Cd	1

RL STD (working standard) made daily by diluting the intermediate above 1000 fold. This working standard has concentration levels at the normal ALS-FC reporting limits for all elements except Ca, Mg and Na, K which are at 0.2ppm and 0.5ppm; this is below the normal ALS-FC reporting limit.

RL2 (working standard) made daily by diluting the intermediate above 333 fold.

Blank Solution

Double D.I. water, 3% HNO_3 and 5%HCl
Used for Std. Blank, ICB and CCB

CCV (ST100304-2) Exp. 1-1-11

Element	ug/ml
Al, Ca, Mg, K, Na	50
Fe	20
U, P, S, Si	5
B, Ba, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sn, Zn, Zr	1
As, Be, Bi, Cd, Co, Li, Sb, Sr, Ti, Tl, V	0.5
Ag, Th	0.2

ICV (ST100304-2) Exp. 1-1-11
Prepared daily by diluting the CCV (described above) ½.
The 1/2 dilution is made by diluting 5ml of the CCV to a 10ml final volume.
The resulting concentrations are:

Element	ug/ml
Al, Ca, Mg, K, Na	25
Fe	10
U, P, S, Si	2.5
B, Ba, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sn, Zn, Zr	0.5
As, Be, Bi, Cd, Co, Li, Sb, Sr, Ti, Tl, V	0.25
Ag, Th	0.1

CRI (ST100111-17) Exp. 1-1-11
Made By diluting
1.0ml of CRI Stock (ST100111-16) Exp. 1-10-10
to a 100ml final volume.

Element	ug/ml
Ca, Mg, K, Na	5.0
Al, B, Ba	0.4
Fe, U, P, S	0.2
Sb	0.12
Co, Si,, Sn, V, Th	0.1
Ni	0.08
Cu, Bi, Zr	0.05
Zn	0.04
Mn	0.03
Ag, Cr, Li, Mo, Sr, Ti, Tl	0.02
Be, Cd, As, Se,	0.01
Pb	0.006

ICSA (ST100111-7) Exp. 1-1-11

Element	ug/ml
Ca, Mg, Al	250
Fe	100

ICSAB (ST100111-8) Exp. 1-1-11

Element	ug/ml
Ca, Mg, Al	250
Fe	100
U	10
B, Si, Li, Mo, Sn, Sr, Ti, Cd, Zn, Ni, P, S	1.0
Sb	0.6
Ba, Be, Co, V, Cr, Cu, Mn, Bi, Zr	0.5
Ag	0.2
As, Tl	0.1
Se, Pb, Th	0.05

Pipette ID Numbers

1.0ml to 5.0ml --- M-55
0.1ml to 1.0ml --- M-61
0.01ml to 0.1ml --- M-57

Acid Lot Numbers

HCl – H19031
HNO_3 – H14024

Inter Element Correction Information

The following table summarizes spectral interferences that have been identified and for which IEC's are used. If a sample contains a concentration of an interfering element that exceeds the upper analytical range, and an affected element is being determined, it is necessary to dilute the sample to bring the interfering element into analytical range.

Interfering Element (ug/ml)	Affected Element
Al (500)	Pb
Mg (500)	Th
Fe (200)	Se, Tl, V, Pb, U
Si (50)	Zr
U (50)	Al, Cr, Cu, Bi, Pb, Mg, Se, Ag, Tl, Si
Ba (10)	Co
Cr (10)	Sb
Cu (10)	Bi
Mn (10)	Tl
Mo (10)	Al, Si, Pb,, Sb
Ti (10)	Co, Bi, Si, Sn, Tl, Pb, Zr
As (5)	Cd
V (5)	Al, Be, Tl
Zr (5)	Ag

The following table lists element concentrations (ug/ml) that no significant spectral interferences have been observed.

Element	Concentration	Element	Concentration	Element	Concentration
K	500	Se	10		
Na	500	Pb	10	Li	5
Ca	500	Zn	10	Cd	5
P	50	Sr	10	Co	5
S	50	Sn	10	Ag	2
Ni	10	Bi	5	Sb	2
B	10	Tl	5	Be	1

2X – Dilution made by diluting 2.5ml of sample up to a 5ml final volume.
3X - Dilution made by diluting 2.0ml of sample up to a 6ml final volume.
4X - Dilution made by diluting 2.0ml of sample up to a 8ml final volume.
5X - Dilution made by diluting 1.0ml of sample to a 5ml final volume.
10X - Dilution made by diluting 0.5ml of sample to a 5ml final volume.
20X – Dilution made by diluting 0.25ml of sample to a 5ml final volume.
25X – Dilution made by diluting 0.2ml of sample to a 5ml final volume.
50X – Dilution made by diluting 0.1ml of sample to a 5ml final volume.
100X – Dilution made by diluting 0.05ml of sample to a 5ml final volume.
500X – Dilution made by diluting 0.02ml of sample to a 10ml final volume.
1000X – Dilution made by diluting a 10X dilution 100X.

Analytical Spikes

1003045-4 – Post spiked for Sb at 1ppm by diluting 0.2ml of Z spike (ST100302-16) up to a 5ml final volume with sample digestate.

1002176-11MS/MSD – Spiked for Mn at 0.5ppm by diluting 0.1ml of Z spike (ST100302-16) up to a 5ml final volume with sample.

Comments

1. Please see run log and work orders for elements of interest.

Daily Maintenance

1. Check/ Change Peristaltic pump tubing.
2. Check the torch for deposits, clean if necessary.
3. Check/ Empty drain water.

Daily Maintenance done by RF.

Monthly Maintenance

1. Check/Clean nebulizer and spray chamber.
2. Clean air filters
3. Check/Clean entrance slit.
4. Fill water recirculating reservoir.

Monthly maintenance done by: RF 03-04-10.

Major problems / adjustments / repairs recorded in the ICP Maintenance Log (3716).

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Inst Sample Name	Lab ID	DF	Date Analyzed	Time Analyzed
	MIXBHIGH	MIXBHIGH	1	3/5/2010	11:07
	MIXAHIGH	MIXAHIGH	1	3/5/2010	11:09
	MIXCHIGH	MIXCHIGH	1	3/5/2010	11:11
	ICV	ICV	1	3/5/2010	11:15
	ICB	ICB	1	3/5/2010	11:16
	CRI	CRI1	1	3/5/2010	11:18
	ICSA	ICSA1	1	3/5/2010	11:20
	ICSAB	ICSAB1	1	3/5/2010	11:22
	CCV	CCV1	1	3/5/2010	11:24
	CCB	CCB1	1	3/5/2010	11:26
	IP100304-2MB	IP100304-2MB	1	3/5/2010	11:28
	IP100304-2RVS	IP100304-2RVS	1	3/5/2010	11:29
	IP100304-2LCS	IP100304-2LCS	1	3/5/2010	11:31
	1002192-1	1002192-1	1	3/5/2010	11:33
- S	1002192-2	1002192-2	1	3/5/2010	11:35
- S	1002192-3	1002192-3	1	3/5/2010	11:36
- S	1002192-4	1002192-4	1	3/5/2010	11:38
- S	1002192-4D	1002192-4DUP	1	3/5/2010	11:40
- S	1002192-4L 5X	1002192-4SER	5	3/5/2010	11:42
- S	1002192-4MS	1002192-4MS	1	3/5/2010	11:43
	CCV	CCV2	1	3/5/2010	11:45
	CCB	CCB2	1	3/5/2010	11:47
- S	1002192-4MSD	1002192-4MSD	1	3/5/2010	11:49
- S	1002192-5	1002192-5	1	3/5/2010	11:51
- S	1002192-5D	1002192-5DUP	1	3/5/2010	11:53
- S	1002192-5L 5X	1002192-5SER	5	3/5/2010	11:54
- S	1002192-5MS	1002192-5MS	1	3/5/2010	11:56
- S	1002192-5MSD	1002192-5MSD	1	3/5/2010	11:58
- S	1002192-6	1002192-6	1	3/5/2010	12:00
- S	1002192-7	1002192-7	1	3/5/2010	12:02
- S	1002192-8	1002192-8	1	3/5/2010	12:03
- S	1002192-9	1002192-9	1	3/5/2010	12:05
	CCV	CCV3	1	3/5/2010	12:07
	CCB	CCB3	1	3/5/2010	12:09
- S	1002192-9D	1002192-9DUP	1	3/5/2010	12:11

Data Package ID:

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

#Name?

20000358

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Inst Sample Name	Lab ID	DF	Date Analyzed	Time Analyzed
- S	1002192-9L 5X	1002192-9SER	5	3/5/2010	12:12
- S	1002192-9MS	1002192-9MS	1	3/5/2010	12:14
- S	1002192-9MSD	1002192-9MSD	1	3/5/2010	12:16
	IP100304-4MB	IP100304-4MB	1	3/5/2010	12:18
	IP100304-4RVS	IP100304-4RVS	1	3/5/2010	12:19
	IP100304-4LCS	IP100304-4LCS	1	3/5/2010	12:21
	1003045-2	1003045-2	1	3/5/2010	12:23
	1003045-4	1003045-4	1	3/5/2010	12:25
	1003045-4D	1003045-4DUP	1	3/5/2010	12:26
	CCV	CCV4	1	3/5/2010	12:28
	CCB	CCB4	1	3/5/2010	12:30
	1003045-4L 5X	1003045-4SER	5	3/5/2010	12:32
	1003045-4MS	1003045-4MS	1	3/5/2010	12:34
	1003045-4MSD	1003045-4MSD	1	3/5/2010	12:36
	1003045-5	1003045-5	1	3/5/2010	12:37
	1003045-8	1003045-8	1	3/5/2010	12:39
	1003045-9	1003045-9	1	3/5/2010	12:41
	1003045-10	1003045-10	1	3/5/2010	12:43
	1003045-11	1003045-11	1	3/5/2010	12:44
	1003045-12	1003045-12	1	3/5/2010	12:46
	1003045-13	1003045-13	1	3/5/2010	12:48
	CCV	CCV5	1	3/5/2010	12:50
	CCB	CCB5	1	3/5/2010	12:52
	1003045-16	1003045-16	1	3/5/2010	12:54
	1003045-17	1003045-17	1	3/5/2010	12:55
	1003045-18	1003045-18	1	3/5/2010	12:57
	1003045-19	1003045-19	1	3/5/2010	12:59
	1003045-21	1003045-21	1	3/5/2010	13:01
	1003045-23	1003045-23	1	3/5/2010	13:02
- K,Li,Na	1002254-1 50X	1002254-1	50	3/5/2010	13:04
- K,Li,Na	1002254-2 50X	1002254-2	50	3/5/2010	13:06
- K,Li,Na	1002254-3 50X	1002254-3	50	3/5/2010	13:08
- K,Li,Na	1002254-4 50X	1002254-4	50	3/5/2010	13:10
	CCV	CCV6	1	3/5/2010	13:11
	CCB	CCB6	1	3/5/2010	13:15

Data Package ID:

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

#Name?

20000359

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Inst Sample Name	Lab ID	DF	Date Analyzed	Time Analyzed
- K,Li,Na	1002254-5 50X	1002254-5	50	3/5/2010	13:16
- K,Li,Na	1002254-6 50X	1002254-6	50	3/5/2010	13:18
- K,Li,Na	1002254-7 50X	1002254-7	50	3/5/2010	13:20
- K,Li,Na	1002254-8 50X	1002254-8	50	3/5/2010	13:22
- K,Li,Na	1002254-9 50X	1002254-9	50	3/5/2010	13:24
- K,Li,Na	1002254-10 50X	1002254-10	50	3/5/2010	13:25
- K,Li,Na	1002254-11 50X	1002254-11	50	3/5/2010	13:27
- K,Li,Na	1002254-12 50X	1002254-12	50	3/5/2010	13:29
- K,Li,Na	1002254-13 50X	1002254-13	50	3/5/2010	13:31
- K,Li,Na	1002254-14 50X	1002254-14	50	3/5/2010	13:33
	CCV	CCV7	1	3/5/2010	13:34
	CCB	CCB7	1	3/5/2010	13:36
	ZZZ	ZZZ	50	3/5/2010	13:39
- K,Li,Na	1002254-16 50X	1002254-16	50	3/5/2010	13:41
- K,Li,Na	1002254-17 50X	1002254-17	50	3/5/2010	13:43
- K,Li,Na	1002254-18 50X	1002254-18	50	3/5/2010	13:45
- Li,Na	1002254-19 10X	1002254-19	10	3/5/2010	13:46
- K,Li,Na	1002254-20 50X	1002254-20	50	3/5/2010	13:48
- K,Li,Na	1002254-21 50X	1002254-21	50	3/5/2010	13:50
- K,Li,Na	1002254-22 50X	1002254-22	50	3/5/2010	13:52
- K,Li,Na	1002254-23 50X	1002254-23	50	3/5/2010	13:54
- K,Li,Na	1002254-24 50X	1002254-24	50	3/5/2010	13:55
	CCV	CCV8	1	3/5/2010	13:57
	CCB	CCB8	1	3/5/2010	14:01
- K,Li,Na	1002254-25 50X	1002254-25	50	3/5/2010	14:02
- K,Li,Na	1003054-1 10X	1003054-1	10	3/5/2010	14:04
- Li,Na	1003054-2 10X	1003054-2	10	3/5/2010	14:06
- K,Li,Na	1002254-15 50X	1002254-15	50	3/5/2010	14:08
- Ca,Li,Na,S,Sr	1002076-4 10X	1002076-4	10	3/5/2010	14:10
- Ca,Li,Na,Sr	1002076-7 10X	1002076-7	10	3/5/2010	14:11
	CRI	CRI2	1	3/5/2010	14:13
	ICSA	ICSA2	1	3/5/2010	14:15
	ICSAB	ICSAB2	1	3/5/2010	14:17
	CCV	CCV9	1	3/5/2010	14:19
	CCB	CCB9	1	3/5/2010	14:21

Data Package ID:

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

#Name?

20000360

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Inst Sample Name	Lab ID	DF	Date Analyzed	Time Analyzed
	CCV	CCV10	1	3/5/2010	14:59
	CCB	CCB10	1	3/5/2010	15:01
- Na,S	1002176-1 25X	1002176-1	25	3/5/2010	15:03
- Na,S	1002176-2 25X	1002176-2	25	3/5/2010	15:05
- Na,S	1002176-3 10X	1002176-3	10	3/5/2010	15:06
- Na,S	1002176-4 10X	1002176-4	10	3/5/2010	15:08
- S	1002176-5 10X	1002176-5	10	3/5/2010	15:10
- S	1002176-6 10X	1002176-6	10	3/5/2010	15:12
- S	1002176-7 10X	1002176-7	10	3/5/2010	15:13
- S	1002176-8 10X	1002176-8	10	3/5/2010	15:15
- S	1002176-9 10X	1002176-9	10	3/5/2010	15:17
- S	1002176-10 10X	1002176-10	10	3/5/2010	15:19
	CCV	CCV11	1	3/5/2010	15:21
	CCB	CCB11	1	3/5/2010	15:22
	1002176-11	1002176-11	1	3/5/2010	15:24
	1002176-11L 5X	1002176-11SER	5	3/5/2010	15:26
	1002176-11MS	1002176-11MS	1	3/5/2010	15:28
	1002176-11MSD	1002176-11MSD	1	3/5/2010	15:30
- S	1002176-12 10X	1002176-12	10	3/5/2010	15:32
- S	1002219-1	1002219-1	1	3/5/2010	15:33
- S	1002219-2	1002219-2	1	3/5/2010	15:35
- S	1002219-2L 5X	1002219-2SER	5	3/5/2010	15:37
- S	1002219-2MS	1002219-2MS	1	3/5/2010	15:39
- S	1002219-2MSD	1002219-2MSD	1	3/5/2010	15:40
	CCV	CCV12	1	3/5/2010	15:42
	CCB	CCB12	1	3/5/2010	15:44
	1003045-4A	1003045-4A	1	3/5/2010	15:46
	EX100304-1MB	EX100304-1MB	1	3/5/2010	15:48
	EX100304-1RVS	EX100304-1RVS	1	3/5/2010	15:50
	EX100304-1LCS	EX100304-1LCS	1	3/5/2010	15:52
	1002133-3	1002133-3	1	3/5/2010	15:53
	1002133-4	1002133-4	1	3/5/2010	15:55
	1002174-10	1002174-10	1	3/5/2010	15:57
	1002174-11	1002174-11	1	3/5/2010	15:59
	1002174-11D	1002174-11DUP	1	3/5/2010	16:01

Data Package ID:

ICPTrace2 Run Log -- 3/5/2010

Instrument ID: ICPTrace2
File Name: 100305A.
AnalRunID: IT100305-2A1
CalibRefID: IT100305-2A1

Comment	Inst Sample Name	Lab ID	DF	Date Analyzed	Time Analyzed
	1002174-11L 5X	1002174-11SER	5	3/5/2010	16:02
	CCV	CCV13	1	3/5/2010	16:04
	CCB	CCB13	1	3/5/2010	16:06
	1002174-11MS	1002174-11MS	1	3/5/2010	16:08
	1002174-11MSD	1002174-11MSD	1	3/5/2010	16:10
	1002174-12	1002174-12	1	3/5/2010	16:12
	1002174-13	1002174-13	1	3/5/2010	16:13
	1002174-14	1002174-14	1	3/5/2010	16:15
	1002174-15	1002174-15	1	3/5/2010	16:17
	1002174-16	1002174-16	1	3/5/2010	16:19
- Th,Zn	1002174-17	1002174-17	1	3/5/2010	16:21
- Th,Zn	1002174-18	1002174-18	1	3/5/2010	16:22
	1002175-2	1002175-2	1	3/5/2010	16:24
	CCV	CCV14	1	3/5/2010	16:26
	CCB	CCB14	1	3/5/2010	16:28
	CRI	CRI3	1	3/5/2010	16:30
	ICSA	ICSA3	1	3/5/2010	16:32
	ICSAB	ICSAB3	1	3/5/2010	16:34
	CCV	CCV15	1	3/5/2010	16:36
	CCB	CCB15	1	3/5/2010	16:37

Data Package ID:

ALS Laboratory Group -- FC
LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

#Name?

20000362

Sample Id1	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu
MIXBHIGH	H2.03277	0.03792	H5.09242	H10.12379	H10.00670	H1.00748	0.00496	-0.04640	H5.09016	H5.08363	H10.14614	H10.09929
MIXAHIGH	-0.00067	H504.53374	0.00260	0.01632	0.00054	0.00061	0.01317	H503.39520	-0.00036	0.00031	0.00401	-0.00821
MIXCHIGH	0.00127	-0.00771	-0.00344	0.02174	-0.00138	0.00381	4.96176	0.01962	-0.00137	0.00466	-0.00873	0.00183
ICV	0.10096	25.46144	0.26228	0.49606	0.50209	0.25854	0.25620	24.86104	0.25138	0.25688	0.51119	0.49620
ICB	-0.00081	0.02973	0.00129	0.00449	-0.00035	0.00010	0.00122	-0.01939	-0.00020	-0.00013	-0.00028	-0.00064
CRI	0.02084	0.44771	0.01086	0.42720	0.43194	0.01044	0.05070	5.30354	0.01047	0.10593	0.02102	0.05304
ICSA	0.00005	277.41360	-0.00003	0.00099	-0.00025	0.00041	0.01007	277.92640	-0.00012	0.00154	-0.00063	-0.00444
ICSAB	0.21536	281.58838	0.11632	1.05765	0.53516	0.50742	0.55340	280.08073	1.06279	0.49269	0.49404	0.53416
CCV	0.19980	50.62207	0.51416	0.99140	0.99510	0.50484	0.50822	49.40199	0.49958	0.50115	0.99833	0.98110
CCB	-0.00074	0.06776	-0.00123	0.00159	0.00016	0.00038	-0.00051	0.01018	-0.00020	-0.00001	-0.00022	-0.00092
IP100304-2MB	0.00021	0.02745	-0.00010	0.00161	-0.00056	-0.00015	0.00111	-0.02218	-0.00047	-0.00002	-0.00063	-0.00139
IP100304-2RVS	0.00164	0.12069	0.00379	0.00715	0.00429	0.00093	0.00700	0.47769	0.00177	0.00157	0.00414	0.00393
IP100304-2LCS	0.10042	2.10066	2.06750	0.99237	2.00809	0.04790	0.00072	39.55225	0.05055	0.48218	0.19277	0.25108
1002192-1	0.00027	0.01668	0.00089	0.00359	0.00010	-0.00020	0.00003	-0.01575	-0.00039	0.00014	-0.00047	-0.00136
1002192-2	0.00000	0.02048	0.00279	0.11090	0.03894	-0.00011	-0.00159	141.36934	-0.00023	0.00006	0.00506	-0.00107
1002192-3	0.00025	0.01881	0.00268	0.10963	0.03865	-0.00016	-0.00380	139.51636	-0.00029	-0.00001	0.00482	0.00000
1002192-4	-0.00112	0.08418	-0.00003	0.07460	0.02637	-0.00011	-0.00232	145.68609	-0.00063	-0.00034	0.00433	0.00298
1002192-4D	-0.00021	0.08144	0.00071	0.07448	0.02653	-0.00007	0.00187	147.02554	-0.00058	0.00012	0.00460	0.00329
1002192-4L 5X	-0.00090	0.03012	-0.00031	0.01368	0.00465	-0.00019	0.00043	28.43223	-0.00045	-0.00040	-0.00004	-0.00099
1002192-4MS	0.09726	2.14163	2.01545	1.04781	1.97641	0.04557	-0.00025	181.13441	0.04925	0.45563	0.18736	0.24887
CCV	0.19884	49.80187	0.50395	0.97032	0.97620	0.49654	0.50121	48.62221	0.49263	0.49348	0.98295	0.96656
CCB	-0.00064	0.06525	-0.00057	0.00082	0.00003	0.00028	-0.00454	0.01041	-0.00035	-0.00027	-0.00033	-0.00113
1002192-4MSD	0.10006	2.22474	2.09844	1.08944	2.02943	0.04720	0.00077	187.82115	0.05060	0.47241	0.19375	0.25641
1002192-5	-0.00039	0.03944	0.00266	0.06696	0.02230	0.00006	-0.00011	118.49420	-0.00036	-0.00015	0.00039	-0.00100
1002192-5D	-0.00022	0.04073	-0.00035	0.06481	0.02158	0.00007	0.00013	119.85391	-0.00034	-0.00048	0.00004	-0.00096
1002192-5L 5X	-0.00120	0.03851	-0.00245	0.01225	0.00367	-0.00007	-0.00071	23.13912	-0.00072	-0.00072	-0.00104	-0.00227
1002192-5MS	0.10095	2.15455	2.13144	1.09563	2.05352	0.04787	-0.00124	159.56501	0.05095	0.47847	0.19214	0.25547
1002192-5MSD	0.09891	2.12567	2.07162	1.07281	2.02705	0.04658	-0.00073	154.91371	0.05005	0.46633	0.18789	0.25272
1002192-6	-0.00062	0.03754	0.00063	0.22033	0.02084	-0.00005	0.00131	57.58748	-0.00062	-0.00055	0.00297	-0.00097
1002192-7	-0.00017	0.03453	0.00046	0.06231	0.01892	0.00004	0.00417	112.86473	-0.00049	-0.00029	0.00090	-0.00068
1002192-8	-0.00025	0.03326	0.00052	0.11308	0.02146	-0.00006	-0.00199	74.45831	-0.00040	-0.00044	0.00097	-0.00157
1002192-9	0.00005	0.03501	0.00251	0.06001	0.01834	-0.00005	0.00136	108.53174	-0.00033	0.00007	0.03368	-0.00111
CCV	0.19999	50.08922	0.50743	0.97291	0.98174	0.49366	0.50364	48.55220	0.49573	0.49312	0.97947	0.97613
CCB	-0.00031	0.06096	0.00022	0.00129	-0.00021	0.00013	0.00254	-0.00478	-0.00030	0.00004	0.00013	-0.00086
1002192-9D	-0.00006	0.03889	0.00041	0.05795	0.01824	-0.00002	0.00338	106.57004	-0.00053	0.00010	0.03451	-0.00100
1002192-9L 5X	-0.00044	0.03568	0.00119	0.01165	0.00305	-0.00015	-0.00302	21.23197	-0.00054	-0.00047	0.00607	-0.00153
1002192-9MS	0.09834	2.10080	2.06838	1.05735	2.00205	0.04681	-0.00349	148.25274	0.04996	0.46763	0.22181	0.24949
1002192-9MSD	0.09974	2.12804	2.12186	1.07971	2.02471	0.04792	0.00013	151.85021	0.05113	0.47858	0.22786	0.25312
IP100304-4MB	-0.00010	0.05274	-0.00027	0.00115	-0.00031	-0.00009	-0.00139	0.01928	-0.00076	-0.00035	-0.00019	-0.00114
IP100304-4RVS	0.00124	0.13571	0.00356	0.00488	0.00423	0.00083	0.00675	0.49169	0.00151	0.00169	0.00454	0.00336
IP100304-4LCS	0.09786	2.09990	1.95379	0.92191	1.95631	0.04525	0.00039	38.35433	0.04899	0.46717	0.18741	0.24586
1003045-2	-0.00191	54.46544	0.04477	0.03144	0.66587	0.00468	0.01078	127.83801	0.00036	0.04318	0.05691	0.07896
1003045-4	-0.00096	25.51481	0.01419	0.01917	0.71435	0.00172	0.00307	57.40459	-0.00011	0.01458	0.02440	0.02193
1003045-4D	0.00003	21.03635	0.01257	0.01653	0.70381	0.00145	0.00229	54.75815	-0.00014	0.01309	0.02272	0.01692
CCV	0.20312	50.46633	0.51523	0.99046	0.98928	0.50133	0.51797	49.59944	0.50669	0.50163	0.99507	0.99170
CCB	-0.00014	0.08109	-0.00001	-0.00077	-0.00011	0.00027	0.00126	-0.00535	-0.00038	0.00012	-0.00022	-0.00150
1003045-4L 5X	-0.00048	5.28972	0.00365	0.00254	0.14718	0.00051	0.00005	12.03137	-0.00019	0.00270	0.00463	0.00297
1003045-4MS	0.09965	50.07729	2.04967	0.94442	2.60177	0.04945	-0.00036	103.47680	0.05023	0.49614	0.22547	0.27936
1003045-4MSD	0.10068	45.00117	2.06249	0.95339	2.78503	0.04969	-0.00023	95.31513	0.05073	0.50043	0.22877	0.27669
1003045-5	-0.00067	40.06214	0.01661	0.03805	0.73830	0.00296	0.00241	101.71808	0.00010	0.02144	0.03125	0.03521

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Sample Id1	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu
1003045-8	-0.00225	72.93966	0.03545	0.02964	0.89219	0.00509	0.00402	94.85116	0.00038	0.03917	0.06075	0.06851
1003045-9	-0.00058	40.37048	0.01278	0.01471	1.12733	0.00247	0.00285	80.70900	0.00009	0.01796	0.03583	0.02375
1003045-10	-0.00032	54.54231	0.01781	0.01527	0.87736	0.00287	0.00341	72.75840	-0.00023	0.02201	0.03229	0.01524
1003045-11	0.00048	19.31464	0.00296	0.02930	0.19117	0.00120	0.00306	151.02003	-0.00032	0.01720	0.00955	0.01760
1003045-12	-0.00092	48.60298	0.04858	0.01677	0.62897	0.00439	0.00740	115.87892	0.00036	0.04638	0.04964	0.05411
1003045-13	-0.00174	47.41033	0.03487	0.02440	0.74113	0.00388	0.00526	119.11255	0.00015	0.03818	0.05022	0.05677
CCV	0.20299	50.17804	0.51603	0.98478	0.98187	0.49986	0.52109	49.68106	0.50797	0.50089	0.99401	0.98569
CCB	-0.00043	0.08202	-0.00080	-0.00113	-0.00026	0.00020	-0.00385	-0.00404	-0.00030	-0.00055	-0.00040	-0.00171
1003045-16	-0.00091	59.87618	0.03163	0.04321	0.89062	0.00496	0.00707	152.06959	0.00022	0.03702	0.04669	0.06635
1003045-17	-0.00030	24.65323	0.01323	0.02432	1.67961	0.00193	0.00587	79.39812	0.00027	0.01936	0.04377	0.02598
1003045-18	-0.00006	5.44193	0.00354	0.00407	0.46489	0.00038	-0.00242	35.05682	-0.00030	0.00382	0.00652	0.00243
1003045-19	-0.00049	5.51201	0.00773	0.00385	0.60726	0.00039	-0.00189	36.16553	-0.00053	0.00595	0.00953	0.00350
1003045-21	-0.00161	69.90605	0.04926	0.03476	0.80714	0.00555	0.01137	166.72094	0.00037	0.04541	0.06053	0.08462
1003045-23	-0.00081	16.59002	0.01081	0.01493	0.58866	0.00123	0.00030	55.51937	-0.00031	0.00985	0.01222	0.01243
1002254-1 50X	-0.00039	0.07268	0.00101	0.15902	0.00109	0.00004	-0.00248	18.16080	-0.00039	-0.00038	-0.00078	-0.00207
1002254-2 50X	0.00069	0.07075	0.00146	0.14055	0.00146	0.00007	0.00200	22.58222	-0.00028	0.00036	-0.00030	-0.00183
1002254-3 50X	-0.00005	0.07451	0.00078	0.14768	0.00160	0.00010	0.00387	24.48391	-0.00050	0.00036	-0.00063	-0.00211
1002254-4 50X	-0.00021	0.07558	-0.00121	0.14103	0.00117	0.00015	0.00082	21.91385	-0.00059	-0.00007	-0.00063	-0.00193
CCV	0.20357	50.41860	0.51748	0.99507	0.99058	0.49479	0.52808	49.33598	0.51195	0.49915	0.98535	1.00164
CCB	0.00016	0.07792	-0.00001	-0.00298	-0.00041	0.00027	-0.00400	-0.01626	-0.00023	0.00004	-0.00013	-0.00150
1002254-5 50X	-0.00019	0.06747	0.00084	0.17132	0.00138	0.00012	-0.00292	23.85736	-0.00044	0.00007	-0.00077	-0.00174
1002254-6 50X	-0.00031	0.05819	0.00202	0.17257	0.00125	0.00007	0.00072	19.39505	-0.00045	-0.00009	-0.00087	-0.00210
1002254-7 50X	-0.00089	0.05420	0.00024	0.14695	0.00117	0.00005	-0.00022	17.50980	-0.00058	-0.00055	-0.00077	-0.00256
1002254-8 50X	-0.00064	0.05652	-0.00037	0.13751	0.00131	0.00002	0.00057	17.46462	-0.00074	-0.00055	-0.00085	-0.00228
1002254-9 50X	-0.00026	0.05947	-0.00091	0.14218	0.00179	0.00005	0.00293	16.50281	-0.00041	0.00007	-0.00055	-0.00160
1002254-10 50X	-0.00087	0.05271	-0.00153	0.15837	0.00141	-0.00006	-0.00175	17.05980	-0.00062	-0.00027	-0.00100	-0.00238
1002254-11 50X	-0.00020	0.05431	-0.00038	0.17390	0.00143	-0.00003	0.00195	15.40211	-0.00063	-0.00009	-0.00043	-0.00161
1002254-12 50X	-0.00077	0.05445	-0.00119	0.17521	0.00135	-0.00008	0.00096	15.65856	-0.00059	-0.00032	-0.00102	-0.00256
1002254-13 50X	-0.00053	0.05881	0.00159	0.17626	0.00131	-0.00003	0.00067	15.42835	-0.00048	-0.00013	-0.00057	-0.00225
1002254-14 50X	-0.00003	0.05730	0.00035	0.15805	0.00115	-0.00001	0.00097	14.53612	-0.00046	-0.00015	-0.00045	-0.00168
CCV	0.19982	49.61838	0.50678	0.96735	0.97222	0.48875	0.50392	48.49777	0.49524	0.49025	0.97441	0.97720
CCB	0.00080	0.09116	0.00003	-0.00026	0.00012	0.00039	0.00235	0.00296	0.00025	0.00039	0.00055	-0.00098
ZZZ	L-0.01488	-0.01768	L-0.01585	0.14351	-0.00043	0.00018	L-0.05556	17.74323	-0.00432	L-0.01006	L-0.01057	L-0.01420
1002254-16 50X	-0.00055	0.05814	0.00104	0.16720	0.00150	-0.00001	-0.00282	16.76233	-0.00048	-0.00006	-0.00086	-0.00214
1002254-17 50X	-0.00133	0.05687	-0.00162	0.17350	0.00159	0.00003	-0.00303	16.53530	-0.00075	-0.00056	-0.00112	-0.00263
1002254-18 50X	0.00034	0.06395	0.00217	0.18973	0.00159	0.00003	-0.00075	15.96165	-0.00038	-0.00009	-0.00065	-0.00175
1002254-19 10X	-0.00046	0.06264	0.00067	0.00471	-0.00004	0.00002	0.00018	2.98305	-0.00046	-0.00034	-0.00081	-0.00239
1002254-20 50X	-0.00328	0.04475	-0.00371	0.14871	0.00122	-0.00005	-0.00884	15.47231	-0.00102	-0.00227	-0.00244	-0.00446
1002254-21 50X	-0.00088	0.06154	-0.00179	0.14432	0.00114	0.00003	-0.00061	13.99241	-0.00060	-0.00056	-0.00107	-0.00253
1002254-22 50X	-0.00189	0.05453	-0.00251	0.16166	0.00105	0.00004	-0.00608	14.58190	-0.00087	-0.00146	-0.00175	-0.00393
1002254-23 50X	-0.00046	0.06662	-0.00076	0.24117	0.00158	0.00005	-0.00105	15.59706	-0.00070	0.00014	-0.00054	-0.00203
1002254-24 50X	-0.00074	0.07839	-0.00059	0.31090	0.00227	0.00003	-0.00007	14.78558	-0.00067	-0.00022	-0.00072	-0.00218
CCV	0.20239	50.09430	0.52075	0.98695	0.98358	0.49651	0.51456	49.54761	0.50826	0.49935	0.98720	0.99503
CCB	0.00009	0.07492	0.00010	-0.00212	-0.00032	0.00025	0.00033	-0.01871	-0.00041	0.00011	0.00006	-0.00108
1002254-25 50X	0.00014	0.07184	-0.00037	0.34842	0.00235	0.00012	0.00269	16.77655	-0.00048	0.00019	-0.00067	-0.00160
1003054-1 10X	-0.00009	6.62395	0.00012	1.27469	0.02317	0.00046	0.00098	24.89166	-0.00041	0.00235	0.00377	0.00335
1003054-2 10X	-0.00063	0.18209	-0.00130	0.06331	0.00204	-0.00005	-0.00149	9.42528	-0.00046	-0.00065	-0.00070	-0.00200
1002254-15 50X	0.00000	0.06149	0.00025	0.12714	0.00121	0.00003	0.00062	13.81956	-0.00067	-0.00013	-0.00076	-0.00178
1002076-4 10X	0.00008	0.04657	-0.00065	0.27100	0.06359	0.00008	-0.00052	H506.51789	0.00070	0.00147	-0.00087	0.03605
1002076-7 10X	-0.00067	0.04634	-0.00076	0.07018	0.21081	0.00012	-0.00200	H754.98999	-0.00038	-0.00018	-0.00109	-0.00230

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Sample Id1	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu
CRI	0.02103	0.48410	0.01216	0.42678	0.43279	0.01074	0.05325	5.51013	0.01054	0.10681	0.02105	0.05323
ICSA	-0.00107	278.13115	-0.00333	-0.00359	-0.00039	0.00050	0.00780	277.33412	-0.00039	0.00057	-0.00167	-0.00645
ICSAB	0.21352	274.36050	0.11549	1.02159	0.52085	0.48825	0.54960	271.13514	1.04403	0.47768	0.47915	0.52961
CCV	0.19859	49.57343	0.50421	0.96260	0.97089	0.48914	0.49835	48.26570	0.49089	0.48941	0.97271	0.97643
CCB	0.00010	0.08462	-0.00202	0.00074	-0.00001	0.00027	-0.00243	0.00330	-0.00001	0.00008	0.00010	-0.00157
CCV	0.20175	50.87190	0.51289	0.97740	0.98727	0.50680	0.50449	49.55639	0.49382	0.50411	1.00382	0.98624
CCB	-0.00019	0.06247	0.00127	-0.00149	0.00013	0.00035	-0.00272	0.01240	-0.00017	0.00022	0.00030	-0.00017
1002176-1 25X	-0.00067	0.03093	0.00125	0.07095	0.00046	0.00001	-0.00103	33.63929	-0.00056	-0.00025	-0.00063	-0.00085
1002176-2 25X	-0.00109	0.00589	-0.00328	0.04075	0.00003	-0.00011	-0.00490	21.69744	-0.00105	-0.00075	-0.00139	-0.00178
1002176-3 10X	-0.00030	0.01472	-0.00003	0.07202	0.00218	-0.00014	0.00157	53.98642	-0.00071	0.00015	-0.00082	-0.00130
1002176-4 10X	-0.00047	0.01334	-0.00187	0.07039	0.00204	-0.00013	-0.00152	53.07870	-0.00038	0.00034	-0.00059	-0.00109
1002176-5 10X	-0.00094	0.01141	-0.00179	0.04875	0.00071	-0.00011	-0.00344	44.17907	-0.00052	-0.00058	-0.00116	0.00023
1002176-6 10X	-0.00066	0.01514	-0.00134	0.04897	0.00063	-0.00010	-0.00132	44.72736	-0.00059	-0.00026	-0.00077	0.00038
1002176-7 10X	-0.00067	0.00915	-0.00027	0.04830	0.00066	-0.00015	-0.00147	43.71872	-0.00064	-0.00031	-0.00110	0.00001
1002176-8 10X	0.00043	0.01595	0.00076	0.04798	0.00070	-0.00008	0.00378	42.18239	-0.00029	0.00032	-0.00030	0.00024
1002176-9 10X	-0.00081	0.00995	0.00082	0.04689	0.00061	-0.00016	-0.00243	41.56429	-0.00056	-0.00047	-0.00086	-0.00114
1002176-10 10X	-0.00058	0.01065	-0.00134	0.04171	0.00056	-0.00016	-0.00111	42.44283	-0.00062	-0.00039	-0.00109	-0.00119
CCV	0.20154	50.31087	0.51334	0.96197	0.97070	0.51021	0.49641	49.83207	0.49018	0.50532	1.00842	0.97241
CCB	-0.00163	0.04561	0.00266	-0.00214	-0.00011	0.00026	-0.00686	0.00409	-0.00028	-0.00056	-0.00033	-0.00137
1002176-11	-0.00131	0.01682	-0.00014	-0.00401	-0.00057	-0.00003	-0.00223	0.28224	-0.00063	-0.00005	-0.00127	-0.00106
1002176-11L 5X	-0.00080	0.00818	-0.00185	-0.00397	-0.00073	-0.00023	-0.00258	0.02195	-0.00071	-0.00054	-0.00091	-0.00164
1002176-11MS	-0.00089	2.35444	2.45657	1.14493	2.26848	0.05491	-0.00253	0.26859	0.06067	0.57574	0.22782	0.29029
1002176-11MSD	-0.00131	2.27195	2.36032	1.10808	2.19321	0.05292	-0.00273	0.25823	0.05812	0.55460	0.21840	0.28072
1002176-12 10X	-0.00029	0.01145	0.00063	0.04998	0.00092	-0.00019	0.00190	40.73042	-0.00061	0.00001	-0.00049	-0.00068
1002219-1	-0.00157	0.04302	-0.00023	0.42254	0.03524	-0.00004	-0.00425	148.55196	-0.00103	0.00021	-0.00162	0.00092
1002219-2	0.00007	0.01753	0.00046	0.09362	0.03493	-0.00007	-0.00118	93.96698	-0.00058	0.00037	-0.00108	0.00077
1002219-2L 5X	0.00019	0.01580	0.00086	0.01626	0.00623	-0.00019	0.00230	17.88410	-0.00042	0.00001	-0.00038	-0.00086
1002219-2MS	-0.00150	2.44053	2.48337	1.25062	2.33812	0.05439	-0.00247	90.73981	0.05957	0.56305	0.22127	0.29265
1002219-2MSD	-0.00159	2.44554	2.50157	1.26086	2.34293	0.05514	-0.00467	91.13429	0.06081	0.56924	0.22408	0.29294
CCV	0.19852	49.50111	0.49770	0.94974	0.96073	0.49318	0.49317	47.98662	0.48006	0.48994	0.97631	0.96716
CCB	0.00007	0.06216	-0.00080	0.00151	0.00010	0.00026	0.00034	0.00370	0.00004	0.00073	0.00061	-0.00012
1003045-4A	-0.00037	29.12197	4.15425	1.96054	4.72346	0.09830	0.00448	57.35556	0.10143	1.00740	0.42088	0.53789
EX100304-1MB	-0.00014	0.04197	0.00052	0.00167	0.00247	-0.00010	-0.00006	-0.01507	-0.00037	-0.00013	0.00000	-0.00068
EX100304-1RVS	0.00269	0.13350	0.00358	0.00453	0.00439	0.00096	0.01104	0.46847	0.00165	0.00194	0.00501	0.00410
EX100304-1LCS	0.10101	2.12560	2.06065	0.95800	2.01469	0.04689	-0.00093	-0.01882	0.05060	0.49521	0.19656	0.26037
1002133-3	-0.00075	0.13163	-0.00106	0.00407	0.00696	-0.00004	0.00105	0.01649	-0.00037	0.00601	0.00422	0.00455
1002133-4	-0.00061	0.08872	-0.00143	0.21518	0.00486	-0.00016	-0.00413	0.26756	0.00045	0.01045	0.00141	0.00801
1002174-10	-0.00013	0.03491	0.00099	0.00270	0.00623	-0.00010	-0.00246	0.01860	-0.00024	-0.00025	0.00020	0.00465
1002174-11	-0.00057	0.04670	-0.00164	0.00441	0.01075	-0.00011	-0.00351	1.08485	-0.00042	-0.00011	0.00265	-0.00118
1002174-11D	0.00009	0.04825	-0.00070	0.00340	0.01078	-0.00013	-0.00115	1.07916	-0.00030	0.00002	0.00366	-0.00097
1002174-11L 5X	-0.00029	0.02401	-0.00113	-0.00168	0.00158	-0.00010	-0.00120	0.19492	-0.00045	-0.00040	-0.00056	-0.00156
CCV	0.19882	50.03306	0.50198	0.95018	0.96803	0.49332	0.49103	48.20522	0.48325	0.49056	0.97863	0.97516
CCB	-0.00046	0.05064	-0.00112	-0.00083	-0.00021	0.00013	-0.00135	-0.00637	-0.00029	-0.00030	-0.00002	-0.00113
1002174-11MS	0.10056	2.11614	2.05135	0.95020	1.99114	0.04745	-0.00280	1.09687	0.05099	0.49923	0.19915	0.25620
1002174-11MSD	0.10097	2.10240	2.05248	0.94626	1.97388	0.04747	0.00039	1.09607	0.05088	0.49887	0.20015	0.25401
1002174-12	-0.00011	0.32016	0.00106	0.02890	0.01043	-0.00013	-0.00104	0.43768	0.00027	0.00006	0.00070	0.00244
1002174-13	-0.00035	0.02868	0.00014	0.00520	0.01401	-0.00015	0.00279	1.23420	-0.00050	0.00493	0.00112	-0.00208
1002174-14	0.00053	0.02669	0.00067	0.00352	0.01463	-0.00022	0.00235	0.48605	-0.00043	0.00641	0.00075	-0.00090
1002174-15	0.00029	0.02891	0.00050	0.00320	0.00978	-0.00013	0.00072	0.79439	-0.00025	0.00422	0.00059	-0.00122
1002174-16	-0.00084	0.02464	-0.00132	0.00270	0.01487	-0.00020	-0.00135	0.77150	-0.00053	0.00370	0.00281	-0.00156

20000365 20000365

Sample Id1	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu
1002174-17	-0.00020	0.02582	-0.00106	0.00223	0.00774	-0.00023	-0.00134	0.28332	0.00093	-0.00033	0.00101	-0.00063
1002174-18	-0.00012	0.02921	0.00138	0.00169	0.01177	-0.00015	0.00126	0.30102	0.00803	0.00032	0.00007	-0.00086
1002175-2	-0.00046	0.37876	0.00345	0.01064	0.03418	-0.00007	-0.00189	20.66416	0.01409	0.00306	0.00526	2.13401
CCV	0.20082	50.00857	0.50758	0.95591	0.96683	0.49867	0.50482	48.88980	0.48775	0.49600	0.98868	0.97712
CCB	-0.00023	0.05040	0.00037	-0.00143	-0.00024	0.00005	0.00058	-0.01041	0.00000	0.00008	-0.00025	-0.00103
CRI	0.02067	0.45416	0.01282	0.41594	0.42423	0.01050	0.05443	5.36008	0.01040	0.10594	0.02109	0.05291
ICSA	-0.00043	273.59158	-0.00029	-0.00317	-0.00041	0.00029	0.00259	269.68261	-0.00047	0.00100	-0.00118	-0.00546
ICSAB	0.21157	273.93163	0.11293	1.00328	0.51483	0.48723	0.53645	268.22011	1.01978	0.47468	0.47710	0.52778
CCV	0.20144	50.02777	0.50735	0.95951	0.96740	0.49614	0.50236	48.62620	0.48701	0.49442	0.98431	0.97815
CCB	-0.00002	0.05898	0.00024	-0.00093	-0.00035	0.00018	0.00062	-0.01194	-0.00017	-0.00005	-0.00046	-0.00128

20000366

Sample Id1	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Pb I	Pb II
MIXBHIGH	-0.01509	-0.27291	0.00248	-0.05478	H10.07085	H10.21194	-0.11546	H10.32616	H50.53641	10.12520	H10.19676	H10.08947
MIXAHIGH	198.25794	H253.13903	H10.10748	H501.04934	-0.00634	-0.00022	H252.57451	-0.00002	0.01777	0.00317	L-0.01028	0.00988
MIXCHIGH	-0.00575	-0.28303	0.00276	-0.35808	0.00383	-0.00096	-0.16267	-0.00086	0.00980	0.00071	L-0.00487	0.00349
ICV	10.31930	24.47618	0.24383	25.46757	0.50654	0.49800	24.84770	0.51171	2.47550	0.49686	0.49886	0.49587
ICB	0.00047	-0.28101	0.00221	-0.01151	-0.00009	0.00012	-0.17394	-0.00033	-0.00063	-0.00076	-0.00036	-0.00095
CRI	0.21704	3.80197	0.01837	5.37278	0.03123	0.02044	4.35998	0.08508	0.21639	0.00555	0.00739	0.00463
ICSA	114.45145	-0.46053	0.00366	285.90148	-0.00085	-0.00083	-0.17811	0.00118	0.00825	0.00043	0.00201	-0.00036
ICSAB	115.66268	-0.46458	1.11535	289.17608	0.49060	1.04457	-0.18648	0.99351	1.05271	0.05744	0.05433	0.05900
CCV	20.54509	49.93261	0.51509	50.71732	0.98915	0.99781	49.16669	1.01729	4.91443	0.97273	0.97451	0.97185
CCB	0.01243	-0.32814	0.00224	0.01404	0.00034	-0.00004	-0.15639	-0.00028	-0.00123	0.00024	-0.00210	0.00141
IP100304-2MB	-0.00321	-0.39386	0.00185	-0.02738	-0.00035	-0.00144	-0.18807	-0.00088	0.00233	-0.00056	0.00061	-0.00115
IP100304-2RVS	0.10150	0.33877	0.00520	0.47658	0.00448	0.00911	0.59729	0.00488	0.10362	0.00406	0.00358	0.00431
IP100304-2LCS	1.01017	38.39246	0.51837	40.47710	0.47995	1.00111	38.32569	0.48832	0.00559	0.47013	0.47055	0.46992
1002192-1	-0.00506	-0.38779	0.00196	-0.01629	-0.00031	-0.00086	-0.17620	-0.00081	0.00609	-0.00049	0.00031	-0.00089
1002192-2	0.00769	5.12113	0.02983	70.07585	0.00008	0.01369	69.05163	0.17952	0.00444	-0.00109	0.00126	-0.00226
1002192-3	0.00963	5.07966	0.02977	69.41267	0.00008	0.01314	69.01157	0.17773	0.00549	0.00003	0.00159	-0.00075
1002192-4	0.19515	3.13552	0.02582	69.80394	0.04202	0.00790	38.52690	0.02573	0.00173	0.00033	L-0.00330	0.00214
1002192-4D	0.17732	3.13729	0.02574	70.39842	0.04112	0.00870	38.32795	0.02518	0.00203	0.00031	0.00085	0.00004
1002192-4L 5X	0.03371	0.15351	0.00568	13.81980	0.00822	0.00047	7.07959	0.00478	-0.00339	-0.00050	-0.00245	0.00048
1002192-4MS	1.11491	45.33691	0.57737	108.02990	0.49631	0.97068	75.52514	0.48181	0.00439	0.44625	0.44863	0.44507
CCV	20.15651	49.51443	0.50826	49.85320	0.97147	0.97558	48.68974	0.99298	4.87030	0.95422	0.96077	0.95096
CCB	0.00997	-0.38779	0.00211	0.01263	0.00028	-0.00056	-0.15932	-0.00082	-0.00364	0.00016	-0.00277	0.00163
1002192-4MSD	1.21483	46.17481	0.58926	111.81125	0.51056	1.00595	76.54482	0.50306	0.00895	0.46137	0.46761	0.45826
1002192-5	0.00007	3.09472	0.02247	64.16155	-0.00015	0.00570	35.99534	0.00017	0.00173	-0.00082	-0.00175	-0.00035
1002192-5D	-0.00151	3.10158	0.02227	64.67173	-0.00037	0.00613	35.95552	-0.00029	-0.00163	-0.00091	-0.00089	-0.00092
1002192-5L 5X	-0.00752	0.07168	0.00501	12.63589	-0.00059	0.00003	6.67849	-0.00040	-0.00629	0.00013	L-0.00300	0.00169
1002192-5MS	0.99375	45.94601	0.58497	105.86680	0.47619	1.02535	74.14491	0.49190	0.00729	0.46818	0.47058	0.46699
1002192-5MSD	0.97157	45.64976	0.58153	102.82834	0.46513	0.99778	73.69045	0.47883	0.00043	0.45548	0.45865	0.45389
1002192-6	-0.00281	3.94216	0.03844	33.15994	-0.00004	0.01042	79.75448	0.00022	-0.00349	0.00031	-0.00023	0.00059
1002192-7	0.00515	3.26216	0.02367	71.14167	-0.00037	0.00567	35.22476	0.00162	0.00078	-0.00012	0.00068	-0.00052
1002192-8	-0.00318	3.05569	0.03535	53.33189	-0.00033	0.00539	57.23126	-0.00050	-0.00283	-0.00058	-0.00051	-0.00062
1002192-9	0.27351	2.87942	0.02197	67.29052	0.00179	0.00523	34.25011	0.01166	-0.00058	-0.00025	0.00039	-0.00058
CCV	20.11837	49.81085	0.51193	49.72069	0.96647	0.97954	48.99301	1.00260	4.91500	0.94713	0.95739	0.94200
CCB	0.00462	-0.38814	0.00203	0.00230	0.00006	-0.00104	-0.16957	-0.00028	-0.00409	0.00040	0.00081	0.00020
1002192-9D	0.28189	2.81304	0.02174	66.09766	0.00201	0.00522	33.85745	0.01116	0.00043	-0.00003	-0.00087	0.00040
1002192-9L 5X	0.05009	0.09570	0.00504	13.19812	-0.00005	0.00003	6.26302	0.00204	-0.00514	-0.00100	-0.00223	-0.00038
1002192-9MS	1.25717	45.01413	0.57205	107.95219	0.46790	0.99460	71.97400	0.48713	0.00198	0.46050	0.45382	0.46384
1002192-9MSD	1.27021	45.28435	0.57548	110.37468	0.47705	1.01675	72.38870	0.49813	0.00273	0.46891	0.46910	0.46882
IP100304-4MB	0.03863	-0.39088	0.00189	-0.00868	0.00000	-0.00084	-0.18288	-0.00092	0.01847	0.00004	0.00046	-0.00017
IP100304-4RVS	0.12679	0.26576	0.00478	0.45341	0.00446	0.00870	0.57953	0.00421	0.12524	0.00481	0.00404	0.00520
IP100304-4LCS	1.00613	37.86610	0.48298	38.84947	0.46221	0.97186	36.46891	0.47813	0.02128	0.44691	0.45285	0.44395
1003045-2	148.82600	11.46243	0.07851	34.88743	1.32437	0.00367	2.03222	0.08480	2.69412	0.07996	0.07935	0.08026
1003045-4	46.93435	5.37288	0.03117	11.55392	0.69748	0.00010	1.44132	0.02945	1.09960	0.02726	0.02671	0.02753
1003045-4D	38.29213	4.29087	0.02562	9.17983	0.60912	0.00025	1.20419	0.02250	0.92054	0.02231	0.02444	0.02124
CCV	20.39681	49.95881	0.51234	50.57226	0.97688	0.99875	49.03131	1.02988	4.95873	0.96126	0.97214	0.95583
CCB	0.00801	-0.36838	0.00208	-0.00161	0.00011	-0.00007	-0.17265	0.00044	-0.00178	0.00046	0.00049	0.00044
1003045-4L 5X	9.47309	0.64386	0.00701	2.44468	0.14747	-0.00096	0.10731	0.00596	0.23255	0.00541	0.00578	0.00522
1003045-4MS	52.46595	47.21729	0.56580	54.59014	1.15979	0.98602	40.23244	0.53317	1.13507	0.48470	0.49604	0.47904
1003045-4MSD	49.22288	46.16240	0.55988	53.22849	1.09936	1.00098	39.77562	0.53530	1.00678	0.48457	0.49645	0.47863
1003045-5	62.71952	9.07806	0.05939	19.58103	1.20980	0.00040	2.03853	0.03825	1.59491	0.04104	0.04138	0.04087

2000080867 2000080867

Sample Id1	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Pb I	Pb II
1003045-8	132.60570	14.53791	0.08084	27.27943	0.93862	0.00238	1.57251	0.08099	2.25775	0.07613	0.07697	0.07571
1003045-9	58.71863	6.99522	0.03447	14.15540	0.68670	-0.00005	0.63606	0.04082	1.29141	0.03244	0.03230	0.03251
1003045-10	55.89515	7.84174	0.04011	15.29350	0.57673	-0.00023	1.24525	0.04090	0.58084	0.03769	0.03855	0.03726
1003045-11	29.59437	3.57940	0.02768	18.90670	4.03285	0.00176	11.61668	0.02297	0.54792	0.03177	0.03163	0.03184
1003045-12	175.58300	9.04670	0.08733	29.35323	1.59864	0.00298	2.02501	0.07660	3.51730	0.06644	0.06956	0.06488
1003045-13	129.82032	10.73634	0.06490	30.14685	1.72713	0.00316	0.82159	0.07287	2.84243	0.06463	0.06550	0.06420
CCV	20.31121	49.73067	0.50953	50.51602	0.97354	0.99734	48.99704	1.03277	4.96042	0.95773	0.97360	0.94981
CCB	0.01108	-0.41374	0.00198	-0.00672	0.00008	-0.00143	-0.17734	-0.00104	-0.00258	-0.00003	-0.00147	0.00069
1003045-16	107.46664	13.68129	0.09371	30.21104	2.20763	0.00198	3.05505	0.06139	2.49136	0.06996	0.07174	0.06907
1003045-17	66.34783	6.85357	0.03010	11.91740	1.00646	0.00100	0.23444	0.03291	1.73651	0.03385	0.03684	0.03236
1003045-18	11.85479	0.75494	0.00846	2.67800	0.26398	-0.00069	0.65350	0.00737	0.34519	0.00788	0.00845	0.00760
1003045-19	14.70397	0.78559	0.00853	2.83341	0.33364	-0.00061	0.47141	0.00876	0.38787	0.00976	0.00944	0.00992
1003045-21	147.67235	15.60093	0.09850	41.55675	1.58325	0.00410	2.89988	0.08933	2.79645	0.09561	0.09943	0.09370
1003045-23	29.42529	3.50496	0.02403	8.94171	0.66395	-0.00041	1.03888	0.01856	0.79756	0.01965	0.01888	0.02004
1002254-1 50X	0.00378	39.98170	2.66445	8.65376	0.05701	-0.00106	H619.23713	-0.00083	-0.00424	-0.00117	-0.00014	-0.00168
1002254-2 50X	-0.00342	67.95280	3.88031	9.98217	0.04375	0.01292	H728.22759	-0.00006	-0.01707	-0.00083	0.00325	-0.00287
1002254-3 50X	-0.00691	72.32016	4.11410	11.09201	0.04232	0.01512	H770.60446	-0.00052	-0.01642	-0.00090	0.00206	-0.00237
1002254-4 50X	-0.00723	60.49134	3.58846	9.98162	0.04585	0.01121	H694.64464	-0.00026	-0.01306	-0.00153	-0.00035	-0.00212
CCV	20.13131	50.07588	0.51289	50.09275	0.96208	0.99676	48.37715	1.04587	4.91264	0.94258	0.96503	0.93138
CCB	0.00290	-0.34755	0.00222	-0.00922	-0.00013	-0.00054	-0.16123	-0.00029	-0.00429	-0.00071	-0.00069	-0.00073
1002254-5 50X	-0.00784	62.92364	3.79797	11.10490	0.05626	0.00906	H740.59530	-0.00060	-0.01712	-0.00084	-0.00027	-0.00113
1002254-6 50X	-0.00763	45.55424	3.09793	10.27299	0.07466	-0.00048	H704.90317	-0.00102	-0.01105	-0.00063	-0.00087	-0.00051
1002254-7 50X	-0.00847	41.93045	2.84847	9.50122	0.06008	-0.00045	H658.54219	-0.00121	-0.01146	-0.00070	-0.00175	-0.00018
1002254-8 50X	-0.00816	44.63711	3.00276	9.78107	0.04408	0.00053	H693.15518	-0.00076	-0.00960	-0.00018	-0.00139	0.00042
1002254-9 50X	-0.00757	47.39988	3.16855	9.93416	0.04360	0.00211	H738.73667	-0.00073	-0.01040	-0.00086	-0.00007	-0.00125
1002254-10 50X	-0.00866	49.63507	3.36939	9.93591	0.06341	0.00204	H755.97912	-0.00077	-0.01492	-0.00088	-0.00069	-0.00097
1002254-11 50X	-0.00810	43.45762	3.19311	9.53777	0.08348	0.00030	H758.80723	-0.00062	-0.01035	-0.00077	0.00204	-0.00218
1002254-12 50X	-0.00853	45.22463	3.31137	9.83792	0.08458	0.00004	H764.93427	-0.00080	-0.01065	-0.00021	-0.00105	0.00021
1002254-13 50X	-0.00763	44.03641	3.23171	9.57410	0.08123	0.00278	H762.77656	-0.00062	-0.01116	-0.00126	0.00013	-0.00196
1002254-14 50X	-0.00805	39.86062	2.96411	9.04643	0.07987	0.00094	H697.99549	-0.00017	-0.01040	-0.00128	0.00129	-0.00256
CCV	19.85268	49.28800	0.50511	49.40967	0.95313	0.97544	47.85173	1.00283	4.90501	0.93565	0.94875	0.92911
CCB	0.00984	-0.32731	0.00248	0.01274	0.00037	0.00019	-0.11586	0.00012	-0.00078	0.00035	0.00260	-0.00077
ZZZ	-0.01474	48.62644	3.36632	10.16310	0.05861	-0.00126	H848.67527	-0.01060	-0.01928	0.00055	L-0.06203	0.03179
1002254-16 50X	-0.00768	51.54729	3.46682	9.78173	0.06298	0.00636	H779.94943	-0.00019	-0.01752	-0.00087	0.00100	-0.00180
1002254-17 50X	-0.00853	48.57543	3.41283	10.28510	0.06575	0.00722	H819.42849	-0.00063	-0.02203	-0.00100	L-0.00329	0.00014
1002254-18 50X	-0.00768	46.51583	3.18035	9.36529	0.05692	0.00857	H760.03372	-0.00013	-0.02389	-0.00101	0.00065	-0.00183
1002254-19 10X	-0.00850	0.11343	4.99911	5.52649	-0.00050	-0.00105	H619.43460	-0.00069	-0.00394	-0.00075	-0.00075	-0.00075
1002254-20 50X	-0.01027	53.24342	3.47557	9.60410	0.04152	0.01936	H781.94978	-0.00275	-0.02459	-0.00036	L-0.01312	0.00601
1002254-21 50X	-0.00842	42.23089	2.89304	8.52158	0.05156	0.01321	H679.59908	-0.00121	-0.02083	-0.00082	-0.00150	-0.00047
1002254-22 50X	-0.00932	43.79264	3.05871	9.01884	0.05444	0.01515	H731.95947	-0.00187	-0.02043	-0.00049	L-0.00603	0.00227
1002254-23 50X	-0.00808	47.66506	3.30822	9.53875	0.05399	0.01274	H771.03420	-0.00083	-0.01998	-0.00134	0.00046	-0.00223
1002254-24 50X	-0.00533	49.00416	3.37191	8.96767	0.03086	0.01317	H768.78337	-0.00016	-0.02614	-0.00051	0.00067	-0.00109
CCV	20.14093	49.47272	0.50705	50.23236	0.96227	0.99554	47.64181	1.04091	4.94803	0.94483	0.96536	0.93458
CCB	0.00140	-0.35922	0.00230	-0.01162	-0.00013	-0.00070	-0.13001	-0.00059	-0.00118	-0.00019	0.00112	-0.00085
1002254-25 50X	-0.00363	54.26551	3.64977	9.99844	0.03412	0.01262	H848.12568	-0.00023	-0.01662	-0.00078	0.00270	-0.00251
1003054-1 10X	4.47511	68.83600	2.31111	10.99639	0.13659	-0.00002	H482.31089	0.00589	0.05006	0.00134	0.00215	0.00093
1003054-2 10X	0.75436	0.30881	0.02633	2.52195	0.02060	-0.00076	17.85331	-0.00017	-0.00028	-0.00056	-0.00144	-0.00012
1002254-15 50X	-0.00615	40.25246	2.79030	8.01908	0.04762	0.00316	H641.48936	-0.00031	-0.00820	-0.00116	0.00055	-0.00201
1002076-4 10X	-0.00842	142.81311	H12.94747	102.92466	0.44996	0.00221	H1043.47246	0.03523	-0.03386	-0.00088	-0.00123	-0.00070
1002076-7 10X	-0.00689	93.93314	8.09703	122.66249	0.16015	-0.00186	H846.25895	-0.00051	-0.01612	-0.00055	-0.00233	0.00034

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Sample Id1	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Pb I	Pb II
CRI	0.21868	3.86965	0.02031	5.48367	0.03123	0.02122	4.52309	0.08813	0.21840	0.00545	0.00461	0.00588
ICSA	112.76364	-0.48102	0.00447	284.79793	-0.00148	-0.00153	-0.04775	0.00002	0.00418	0.00120	L-0.00607	0.00483
ICSAB	110.51661	-0.48399	1.09037	279.66113	0.46929	1.01647	-0.11240	0.96861	1.04082	0.05415	0.05490	0.05377
CCV	19.86438	48.92614	0.50361	49.50352	0.95349	0.97303	48.04864	0.99809	4.87081	0.93632	0.94416	0.93240
CCB	0.00894	-0.35779	0.00232	0.00893	0.00017	-0.00071	-0.13187	0.00040	-0.00404	-0.00032	-0.00059	-0.00018
CCV	20.50545	49.52068	0.51542	51.13469	0.98766	0.99642	49.26907	1.00748	4.96887	0.96787	0.97977	0.96194
CCB	0.01397	-0.36493	0.00228	0.01904	0.00049	0.00054	-0.14409	-0.00001	0.00103	0.00021	-0.00065	0.00063
1002176-1 25X	-0.00382	23.69947	0.03287	26.82455	0.03110	0.00930	H457.22113	0.00012	-0.00268	-0.00126	-0.00112	-0.00134
1002176-2 25X	0.12883	27.08125	0.03622	42.09486	0.19282	0.02813	H396.07125	0.00040	-0.00298	-0.00056	L-0.00503	0.00167
1002176-3 10X	-0.00347	24.69702	0.06942	95.12835	0.44588	0.04869	H500.90696	0.00177	-0.00103	-0.00102	0.00004	-0.00155
1002176-4 10X	-0.00456	24.24762	0.06836	93.61083	0.43930	0.04778	H489.93783	0.00174	-0.00339	-0.00127	0.00002	-0.00191
1002176-5 10X	-0.00773	13.27316	0.06707	72.25207	0.27672	0.05717	224.17819	0.00141	-0.00023	-0.00111	L-0.00391	0.00028
1002176-6 10X	-0.00850	13.26944	0.06705	73.09524	0.27972	0.05779	225.61909	0.00141	0.00414	-0.00082	-0.00103	-0.00071
1002176-7 10X	-0.00816	13.12942	0.06638	71.48945	0.27663	0.05616	222.36487	0.00084	-0.00028	-0.00105	-0.00114	-0.00101
1002176-8 10X	-0.00808	13.77823	0.05577	62.68732	0.53650	0.08522	236.76540	0.00180	0.00514	-0.00100	0.00314	L-0.00307
1002176-9 10X	-0.00898	14.01280	0.05656	61.91436	0.53489	0.08416	238.22074	0.00063	-0.00133	-0.00061	-0.00156	-0.00014
1002176-10 10X	-0.00887	12.32926	0.05198	59.52475	0.40683	0.09122	221.39669	0.00150	0.00038	-0.00046	-0.00259	0.00060
CCV	20.53488	48.85965	0.50653	51.49797	0.98971	0.99016	48.55793	0.99601	4.95976	0.97560	0.98495	0.97093
CCB	0.00933	-0.33505	0.00238	0.00426	0.00019	-0.00096	-0.12870	-0.00030	0.00052	-0.00047	L-0.00318	0.00088
1002176-11	-0.00527	-0.31053	0.00202	-0.01031	0.00647	-0.00125	-0.14389	-0.00137	-0.00303	-0.00039	-0.00162	0.00023
1002176-11L 5X	-0.00808	-0.42279	0.00190	-0.03108	0.00078	-0.00156	-0.17695	-0.00074	-0.00394	-0.00023	-0.00193	0.00063
1002176-11MS	1.16548	-0.41731	0.00179	-0.02314	0.57069	1.14152	-0.15855	0.57349	-0.00113	0.54982	0.55656	0.54645
1002176-11MSD	1.12308	-0.45351	0.00169	-0.02705	0.55055	1.09837	-0.16046	0.54781	-0.00489	0.54277	0.53199	0.54816
1002176-12 10X	-0.00826	13.78009	0.05540	60.61886	0.52234	0.08474	236.56129	0.00103	0.00138	0.00013	0.00164	-0.00062
1002219-1	0.02590	10.03016	0.08389	50.03441	1.31267	0.13643	185.34906	-0.00042	0.01697	0.00002	L-0.00379	0.00193
1002219-2	0.03715	4.28638	0.04278	31.14477	0.55261	0.02062	49.85919	0.00061	0.02424	-0.00022	-0.00017	-0.00025
1002219-2L 5X	0.00055	0.23211	0.00863	6.02232	0.11000	0.00363	9.03762	0.00036	-0.00063	-0.00054	0.00142	-0.00152
1002219-2MS	1.18313	4.20023	0.04277	30.29975	1.09219	1.15951	49.85709	0.55750	0.02003	0.53544	0.54203	0.53215
1002219-2MSD	1.19723	4.17568	0.04224	30.33955	1.09819	1.17439	49.26985	0.56541	0.02329	0.54231	0.54841	0.53926
CCV	19.90610	48.46074	0.50089	49.66911	0.95897	0.96303	47.98502	0.96829	4.81818	0.93913	0.95124	0.93309
CCB	0.00931	-0.34148	0.00232	0.01198	0.00032	0.00003	-0.14583	0.00043	-0.00409	0.00065	0.00470	-0.00138
1003045-4A	49.12320	5.19842	0.03050	11.65164	1.67061	2.02264	1.41036	1.02563	1.08011	0.97451	0.98610	0.96872
EX100304-1MB	0.00417	-0.44196	0.00176	-0.02966	0.00008	-0.00080	110.87653	-0.00048	0.00779	-0.00090	-0.00019	-0.00125
EX100304-1RVS	0.11922	0.31356	0.00484	0.47342	0.00452	0.00928	0.63047	0.00485	0.09996	0.00415	0.00537	0.00355
EX100304-1LCS	1.00645	-0.47530	0.00180	-0.03510	0.48104	1.01374	110.11103	0.50302	0.00539	0.47289	0.47693	0.47087
1002133-3	0.82448	-0.38053	0.00186	-0.02640	0.00766	-0.00044	110.33551	0.00538	0.00694	0.00242	0.00137	0.00294
1002133-4	6.59172	-0.39648	0.00343	7.12314	1.70144	-0.00041	133.52261	0.02464	1.65974	-0.00026	-0.00051	-0.00013
1002174-10	3.93999	-0.38612	0.00191	-0.00846	0.01484	0.00381	111.50710	0.00381	0.01015	0.00282	0.00343	0.00251
1002174-11	5.04755	-0.34826	0.00197	-0.01781	0.02062	-0.00179	110.41956	0.00102	0.00785	0.00534	0.00568	0.00517
1002174-11D	5.03118	-0.35695	0.00192	-0.01716	0.02052	-0.00099	110.36340	0.00142	0.00769	0.00463	0.00567	0.00412
1002174-11L 5X	1.02983	-0.33624	0.00218	-0.03488	0.00368	-0.00125	22.20427	-0.00028	-0.00138	0.00126	0.00022	0.00177
CCV	19.97419	49.01974	0.50858	49.74305	0.96078	0.96817	48.76842	0.97573	4.83477	0.94685	0.94825	0.94616
CCB	0.00708	-0.40327	0.00213	-0.00161	0.00011	-0.00125	-0.14829	-0.00038	-0.00283	0.00045	-0.00205	0.00169
1002174-11MS	6.10987	-0.31362	0.00210	-0.02129	0.50500	1.01090	110.25089	0.49983	0.00439	0.48412	0.48673	0.48281
1002174-11MSD	6.11849	-0.27863	0.00217	-0.01792	0.50418	1.00892	109.39164	0.49781	0.00544	0.48508	0.48980	0.48273
1002174-12	0.02188	0.22533	0.00218	0.14842	0.01504	0.00045	137.26866	0.00178	7.44306	0.00082	0.00088	0.00079
1002174-13	22.51321	-0.35576	0.00193	-0.01890	0.06609	-0.00046	109.54334	0.00491	0.00694	0.00018	0.00127	-0.00037
1002174-14	3.20727	-0.42660	0.00174	-0.02096	0.01461	-0.00100	108.99071	0.00433	0.00880	0.00050	0.00185	-0.00017
1002174-15	1.18374	-0.31874	0.00203	-0.01825	0.00701	-0.00131	108.80928	0.00433	0.00689	0.00122	0.00328	0.00019
1002174-16	4.02434	-0.42577	0.00178	-0.02053	0.01751	-0.00114	109.05531	0.00150	0.00724	0.00175	-0.00045	0.00285

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Sample Id1	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Pb I	Pb II
1002174-17	0.94700	-0.39838	0.00182	-0.02260	0.00915	-0.00099	107.96491	0.00045	0.03166	0.01530	0.01500	0.01545
1002174-18	3.72430	-0.33755	0.00200	-0.01466	0.02536	-0.00078	109.95266	0.00157	0.05267	0.00894	0.01039	0.00821
1002175-2	0.32786	5.72291	0.00548	4.38776	0.24480	0.04588	138.73834	0.01543	0.54782	0.00854	0.00670	0.00946
CCV	20.13770	48.80832	0.50528	50.34185	0.96806	0.97385	48.45143	0.98790	4.80826	0.94313	0.96153	0.93394
CCB	0.00534	-0.42470	0.00209	-0.00585	-0.00002	-0.00073	-0.14988	-0.00031	-0.00063	0.00029	-0.00008	0.00048
CRI	0.21672	3.74764	0.01857	5.42136	0.03086	0.02058	4.34206	0.08516	0.20982	0.00576	0.00693	0.00517
ICSA	110.37023	-0.54091	0.00366	279.03654	-0.00119	-0.00113	-0.15408	0.00063	0.00739	0.00113	-0.00251	0.00294
ICSAB	109.95229	-0.52781	1.08723	278.94131	0.46846	0.99842	-0.17389	0.94094	1.02279	0.05335	0.05383	0.05311
CCV	20.04041	48.93072	0.50656	50.16305	0.96333	0.97321	48.68656	0.98554	4.80493	0.94637	0.96005	0.93955
CCB	0.00476	-0.37160	0.00214	-0.00846	-0.00007	-0.00028	-0.16369	-0.00057	-0.00308	-0.00006	-0.00151	0.00067

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Sample Id1	S	Sb	Se	Se I	Se II	Si	Sn	Sr	Th	Ti	Tl	U
MIXBHIGH	-0.00874	H2.00656	5.02571	H5.06732	H5.00494	H50.00093	H10.25438	H10.18738	1.99031	9.99588	H5.13666	-0.05389
MIXAHIGH	0.02314	0.00425	-0.00028	0.00207	-0.00146	-0.00304	-0.00103	0.00318	0.00733	-0.00146	-0.00763	0.08870
MIXCHIGH	49.54706	0.00179	-0.00322	L-0.00985	0.00009	-0.03362	0.01635	-0.00058	L-0.33075	0.00870	0.00001	49.37886
ICV	2.48518	0.24527	0.50677	0.50895	0.50568	2.41411	0.50825	0.25042	0.06679	0.24362	0.25718	2.50551
ICB	-0.00520	0.00159	-0.00077	0.00182	-0.00205	-0.00597	-0.00140	-0.00223	-0.00296	-0.00082	0.00085	-0.00235
CRI	0.21516	0.12705	0.01030	0.01206	0.00942	0.10586	0.10824	0.01926	0.09358	0.02007	0.02096	0.22281
ICSA	0.00826	0.00673	0.00065	0.00725	-0.00264	-0.00814	0.00134	0.01107	-0.00877	-0.00138	0.00142	0.05530
ICSAB	1.06595	0.64131	0.05817	0.06212	0.05619	0.99670	1.06314	1.05654	-0.02516	0.99034	0.10868	10.62838
CCV	4.93813	0.49239	1.01582	1.01577	1.01585	4.80350	1.00709	0.49912	0.13750	0.47477	0.50915	4.91181
CCB	-0.00024	-0.00055	-0.00046	-0.00121	-0.00008	-0.00617	-0.00262	-0.00201	-0.00110	-0.00051	-0.00408	-0.00682
IP100304-2MB	-0.00732	0.00143	-0.00002	0.00050	-0.00028	-0.00703	-0.00237	-0.00239	-0.00205	-0.00079	0.00002	-0.00482
IP100304-2RVS	0.10037	0.01033	0.00475	0.00573	0.00426	0.02408	0.00948	0.00254	-0.00152	0.00402	0.00899	0.04096
IP100304-2LCS	-0.00095	0.49901	2.06086	2.06668	2.05796	1.95550	0.50310	0.49829	-0.01489	0.48029	2.07056	-0.01320
1002192-1	-0.00945	0.00001	-0.00011	0.00085	-0.00059	-0.00914	-0.00231	-0.00222	-0.00360	-0.00082	-0.00035	-0.00309
1002192-2	H161.35143	-0.00037	0.00649	0.00883	0.00533	12.72646	-0.00067	5.86294	-0.02137	-0.00145	-0.00142	-0.00681
1002192-3	H160.32337	0.00001	0.00738	0.01234	0.00491	12.68346	-0.00134	5.85571	-0.02287	-0.00151	0.00080	0.00161
1002192-4	H136.42174	-0.00118	0.00172	0.00081	0.00217	10.76312	-0.00177	3.50475	-0.02195	0.00012	-0.00114	-0.02702
1002192-4D	H136.48241	-0.00059	0.00003	-0.00169	0.00090	10.76143	-0.00171	3.47982	-0.02340	0.00045	-0.00277	-0.00519
1002192-4L 5X	26.79109	-0.00111	-0.00094	0.00007	-0.00144	2.15818	-0.00122	0.70148	-0.01151	-0.00078	0.00065	-0.01129
1002192-4MS	H131.51045	0.48760	1.98170	2.00184	1.97164	12.25359	0.49105	3.85366	-0.02276	0.46173	1.98787	-0.01203
CCV	4.87899	0.48757	0.98378	0.98889	0.98122	4.71818	0.99310	0.48907	0.13745	0.46747	0.50490	4.84707
CCB	0.00614	-0.00055	-0.00207	-0.00122	-0.00249	-0.00990	-0.00079	-0.00190	-0.00305	-0.00078	0.00123	-0.01747
1002192-4MSD	H136.20915	0.50407	2.06171	2.09705	2.04407	12.60987	0.51287	3.97518	-0.02347	0.47325	2.06177	-0.01235
1002192-5	H114.42067	0.00157	0.00278	0.00243	0.00296	13.76910	-0.00207	2.37337	-0.02095	-0.00117	0.00087	-0.00086
1002192-5D	H114.85876	-0.00074	0.00124	0.00495	-0.00061	13.81314	-0.00158	2.37903	-0.02078	-0.00132	-0.00065	-0.00557
1002192-5L 5X	22.57500	-0.00140	0.00068	0.00127	0.00038	2.76024	-0.00316	0.48216	-0.00896	-0.00109	-0.00288	-0.01845
1002192-5MS	H113.17330	0.50667	2.11090	2.13073	2.10100	15.47624	0.51634	2.85141	-0.02046	0.47499	2.09324	-0.00625
1002192-5MSD	H110.30825	0.50139	2.05498	2.07863	2.04318	15.15612	0.50342	2.81230	-0.02131	0.46617	2.04529	-0.01119
1002192-6	H92.44352	-0.00017	0.00309	0.00332	0.00297	24.94209	-0.00395	1.90364	-0.01508	-0.00102	-0.00300	0.00038
1002192-7	H117.31799	-0.00069	0.00368	0.00718	0.00193	13.31405	-0.00152	2.29389	-0.02032	-0.00133	-0.00158	0.00558
1002192-8	H100.11044	-0.00182	0.00020	0.00037	0.00012	17.94299	-0.00401	3.02817	-0.01828	-0.00113	-0.00236	-0.00829
1002192-9	H107.15908	0.00176	0.00079	0.00136	0.00051	13.48078	-0.00237	2.37472	-0.02178	-0.00146	-0.00193	0.00019
CCV	4.88469	0.49093	0.98439	0.99091	0.98113	4.70837	0.99463	0.49190	0.13342	0.46504	0.50940	4.85652
CCB	0.00543	-0.00071	-0.00099	0.00021	-0.00158	-0.00979	-0.00146	-0.00204	-0.00290	-0.00079	-0.00220	-0.00012
1002192-9D	H105.90048	-0.00211	0.00096	0.00027	0.00131	13.30003	-0.00432	2.34002	-0.01854	-0.00122	0.00000	0.00217
1002192-9L 5X	21.12185	-0.00172	-0.00058	-0.00001	-0.00086	2.69055	0.00024	0.47795	-0.00739	-0.00108	-0.00170	-0.00585
1002192-9MS	H106.37546	0.49248	2.03379	2.04182	2.02978	15.13144	0.50440	2.82266	-0.02109	0.46651	2.04548	-0.03022
1002192-9MSD	H108.28305	0.50167	2.06716	2.08734	2.05708	15.35654	0.51835	2.85384	-0.02044	0.47454	2.08395	-0.01684
IP100304-4MB	0.01464	0.00007	-0.00033	0.00099	-0.00099	0.01342	-0.00012	-0.00182	-0.00263	-0.00062	-0.00270	-0.00411
IP100304-4RVS	0.09399	0.00786	0.00405	0.00370	0.00423	0.02650	0.00972	0.00249	-0.00241	0.00354	0.00603	0.03797
IP100304-4LCS	0.00118	0.47508	1.82851	1.84861	1.81848	1.63821	0.49525	0.48741	-0.01709	0.46472	1.99877	-0.01047
1003045-2	4.43514	0.00472	0.00415	-0.00096	0.00670	9.84353	0.00643	0.67074	0.04631	0.84452	-0.00231	0.01083
1003045-4	1.71172	0.00199	0.00061	-0.00050	0.00117	7.41727	0.01074	0.26974	0.01365	0.53636	-0.00564	0.00387
1003045-4D	1.51794	0.00403	0.00126	0.00405	-0.00014	6.84116	0.00878	0.23317	0.00851	0.60137	-0.00108	0.01248
CCV	4.90749	0.50087	0.99293	1.00395	0.98742	4.74311	1.01548	0.49731	0.13668	0.46851	0.52081	4.88164
CCB	-0.00166	-0.00028	0.00092	0.00080	0.00098	-0.00925	-0.00031	-0.00215	0.00046	-0.00068	-0.00340	0.00335
1003045-4L 5X	0.35831	-0.00070	-0.00067	0.00112	-0.00156	1.54881	0.00121	0.05414	-0.00018	0.11134	-0.00225	-0.01028
1003045-4MS	1.72379	0.31759	1.88795	1.92854	1.86768	11.57945	0.52184	0.78276	0.00314	1.04111	2.06685	0.00183
1003045-4MSD	1.91833	0.33343	1.90917	1.93768	1.89493	12.05380	0.52965	0.75978	0.00394	1.19848	2.08082	-0.00166
1003045-5	1.95810	0.00097	0.00046	-0.00250	0.00194	10.61752	0.00658	0.49851	0.01910	0.56010	-0.00735	0.00526

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Sample Id1	S	Sb	Se	Se I	Se II	Si	Sn	Sr	Th	Ti	Tl	U
1003045-8	2.71614	0.00217	0.00542	0.00248	0.00689	10.59727	0.00835	0.63737	0.04362	0.50032	-0.00449	0.03451
1003045-9	1.62795	0.00042	0.00048	-0.00144	0.00144	10.18615	0.00805	0.30670	0.01565	0.76280	-0.00614	-0.00317
1003045-10	1.27808	0.00283	0.00039	-0.00027	0.00071	6.23190	0.00591	0.28721	0.00911	0.41063	-0.00188	0.00867
1003045-11	42.99382	0.00177	0.00280	0.00243	0.00298	4.71400	0.00531	1.70373	-0.00044	0.14228	-0.00342	0.00576
1003045-12	2.04687	0.00616	0.00644	0.00605	0.00663	5.90240	0.00811	0.42955	0.03425	2.17107	-0.00474	0.03871
1003045-13	2.77656	0.00276	0.00295	0.00037	0.00425	8.33269	0.00944	0.46039	0.03606	1.60415	-0.00646	0.01608
CCV	4.84336	0.49605	0.98592	0.99883	0.97947	4.70674	1.01940	0.49432	0.13383	0.46502	0.51638	4.84721
CCB	-0.00024	-0.00038	0.00000	-0.00236	0.00118	-0.01153	-0.00195	-0.00218	-0.00072	-0.00066	-0.00154	-0.00335
1003045-16	3.03605	0.00347	0.00216	-0.00001	0.00325	10.57359	0.00583	0.81250	0.03010	0.53144	-0.00496	0.00825
1003045-17	1.94887	0.00406	0.00328	0.00545	0.00219	6.15751	0.00896	0.32543	0.01506	1.34150	-0.00449	0.02658
1003045-18	0.71915	0.00149	0.00011	-0.00338	0.00185	3.49010	0.00584	0.11425	0.00391	0.36509	-0.00541	0.00049
1003045-19	0.86665	0.00044	-0.00001	0.00313	-0.00158	3.51657	0.01016	0.12824	0.00341	0.30639	-0.00123	-0.00467
1003045-21	5.01582	0.00400	0.00989	0.00828	0.01070	7.36400	0.00776	0.90712	0.04978	0.43647	-0.00474	0.04061
1003045-23	1.15817	0.00182	-0.00124	-0.00074	-0.00148	7.00766	0.00353	0.27289	0.00603	0.51983	-0.00443	-0.00875
1002254-1 50X	17.26925	0.00058	-0.00072	0.00296	-0.00256	0.34178	-0.00116	1.48295	-0.00513	-0.00095	-0.00001	-0.00755
1002254-2 50X	24.53941	0.00334	-0.00103	0.00356	-0.00332	0.07339	-0.00225	1.37188	-0.00722	-0.00085	0.00018	0.00509
1002254-3 50X	25.67840	0.00279	-0.00063	0.00358	-0.00273	0.07099	-0.00085	1.57702	-0.00475	-0.00105	-0.00080	-0.00259
1002254-4 50X	22.51534	0.00104	-0.00129	0.00107	-0.00247	0.09497	-0.00201	1.45946	-0.00592	-0.00101	0.00104	-0.00482
CCV	4.87827	0.50355	0.99138	1.01436	0.97990	4.68098	1.01684	0.49864	0.13467	0.46104	0.52186	4.88331
CCB	-0.00378	0.00120	0.00071	0.00235	-0.00010	-0.00971	-0.00207	-0.00226	-0.00182	-0.00093	-0.00138	-0.00780
1002254-5 50X	24.42712	0.00019	-0.00184	-0.00221	-0.00165	0.16105	-0.00116	1.69059	-0.00270	-0.00096	-0.00079	-0.01077
1002254-6 50X	19.56672	-0.00061	-0.00225	-0.00371	-0.00151	0.35577	-0.00468	1.63182	-0.00311	-0.00099	-0.00347	-0.01399
1002254-7 50X	17.72131	-0.00001	-0.00242	-0.00422	-0.00151	0.20508	-0.00219	1.50662	-0.00632	-0.00095	-0.00248	-0.01473
1002254-8 50X	18.59645	0.00032	-0.00115	-0.00290	-0.00028	0.10707	-0.00189	1.54116	-0.00593	-0.00091	-0.00049	-0.01126
1002254-9 50X	19.17818	0.00045	-0.00190	0.00037	-0.00303	0.12830	-0.00140	1.49658	-0.00895	-0.00118	0.00026	-0.00755
1002254-10 50X	20.26593	-0.00008	-0.00156	-0.00360	-0.00054	0.18696	-0.00304	1.49505	-0.00256	-0.00089	-0.00059	-0.01647
1002254-11 50X	19.46596	0.00079	-0.00156	0.00056	-0.00261	0.29119	-0.00225	1.40070	-0.00733	-0.00108	-0.00221	0.00113
1002254-12 50X	19.88723	-0.00120	-0.00201	-0.00130	-0.00237	0.28535	-0.00152	1.45914	-0.01027	-0.00142	-0.00191	-0.01696
1002254-13 50X	19.61964	0.00126	-0.00117	-0.00052	-0.00150	0.26146	-0.00140	1.43065	-0.00439	-0.00100	-0.00392	-0.00829
1002254-14 50X	17.83274	0.00255	-0.00104	0.00405	-0.00358	0.26842	-0.00055	1.32956	-0.00646	-0.00097	-0.00136	0.00559
CCV	4.82412	0.48600	0.97311	0.98587	0.96674	4.62972	0.99036	0.48857	0.13598	0.45827	0.50606	4.81452
CCB	-0.00449	0.00120	-0.00062	0.00258	-0.00221	-0.01083	-0.00122	-0.00202	-0.00102	-0.00061	-0.00019	0.01128
ZZZ	20.53759	L-0.03635	-0.00138	L-0.06146	0.02861	0.08562	-0.02213	1.40374	0.02082	0.00019	L-0.02188	L-0.29826
1002254-16 50X	21.23227	0.00008	-0.00091	-0.00014	-0.00129	0.14416	-0.00274	1.41604	-0.00351	-0.00085	-0.00124	-0.00358
1002254-17 50X	20.90695	-0.00152	-0.00077	-0.00045	-0.00092	0.14974	-0.00176	1.49883	-0.00496	-0.00108	-0.00213	-0.02068
1002254-18 50X	19.97502	0.00191	-0.00023	0.00431	-0.00249	0.08984	-0.00134	1.34391	-0.00424	-0.00090	0.00060	-0.00011
1002254-19 10X	0.86381	0.00061	-0.00220	-0.00046	-0.00306	0.71313	-0.00219	0.01437	-0.00407	-0.00094	-0.00052	-0.00829
1002254-20 50X	21.30273	-0.00687	-0.00070	L-0.01434	0.00611	0.05317	-0.00681	1.46787	-0.00554	-0.00110	-0.00721	-0.05538
1002254-21 50X	17.69165	0.00031	-0.00058	-0.00111	-0.00031	0.13033	-0.00359	1.28685	-0.00475	-0.00088	-0.00128	-0.01226
1002254-22 50X	18.65595	-0.00308	-0.00190	L-0.00774	0.00102	0.14217	-0.00316	1.35252	-0.00710	-0.00110	-0.00439	-0.04101
1002254-23 50X	20.22166	0.00057	-0.00144	-0.00100	-0.00165	0.11914	-0.00183	1.44839	-0.00604	-0.00083	-0.00178	-0.00656
1002254-24 50X	20.95124	0.00085	-0.00207	-0.00159	-0.00231	0.09290	-0.00304	1.39724	-0.00339	-0.00080	-0.00057	-0.00631
CCV	4.88397	0.49846	0.98755	1.00882	0.97693	4.67055	1.01782	0.49493	0.13304	0.45939	0.51742	4.83095
CCB	-0.00024	0.00102	-0.00166	0.00386	-0.00442	-0.00912	-0.00043	-0.00227	-0.00262	-0.00087	-0.00128	0.00459
1002254-25 50X	23.61251	0.00295	-0.00112	0.00347	-0.00341	0.09165	-0.00073	1.50217	-0.00200	-0.00060	0.00199	-0.01325
1003054-1 10X	14.38170	0.00066	0.00209	0.00458	0.00085	22.35624	0.00185	0.76064	-0.00493	0.23735	-0.00415	0.00179
1003054-2 10X	7.77007	-0.00124	0.00091	0.00323	-0.00025	1.63956	-0.00213	0.17113	-0.01297	0.00364	-0.00289	-0.00658
1002254-15 50X	16.81961	-0.00093	-0.00181	-0.00060	-0.00242	0.11791	-0.00256	1.16711	-0.00488	-0.00091	-0.00191	-0.00904
1002076-4 10X	H59.10020	-0.00136	-0.00218	-0.00120	-0.00266	0.92949	-0.00134	H15.28634	-0.01933	-0.00335	-0.00062	-0.02539
1002076-7 10X	19.84372	-0.00237	-0.00152	-0.00185	-0.00136	2.49941	-0.00134	H26.31025	-0.01801	-0.00420	-0.00025	-0.02861

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Sample Id1	S	Sb	Se	Se I	Se II	Si	Sn	Sr	Th	Ti	Tl	U
CRI	0.22224	0.12622	0.01062	0.01192	0.00996	0.10046	0.10909	0.02229	0.09257	0.01969	0.02090	0.21116
ICSA	0.01039	0.00362	-0.00040	-0.00474	0.00177	-0.01869	-0.00073	0.01158	-0.00391	-0.00130	-0.00293	0.02175
ICSAB	1.05105	0.62005	0.05515	0.05963	0.05291	0.95616	1.02746	1.02630	-0.03192	0.94922	0.10919	10.37179
CCV	4.80773	0.48181	0.96883	0.97780	0.96435	4.63605	0.98675	0.48592	0.13270	0.45786	0.50511	4.79913
CCB	-0.00803	0.00033	-0.00106	0.00209	-0.00263	-0.01262	-0.00207	-0.00206	-0.00043	-0.00068	-0.00069	-0.00136
CCV	4.98731	0.48630	1.00514	1.01678	0.99933	4.81887	1.01364	0.49334	0.14124	0.47421	0.50828	4.91630
CCB	-0.00095	-0.00171	-0.00005	0.00082	-0.00049	-0.00439	-0.00116	-0.00198	-0.00081	-0.00050	-0.00108	-0.00831
1002176-1 25X	H97.93259	-0.00160	0.00226	0.00528	0.00075	0.35553	-0.00031	0.88392	-0.01679	-0.00112	-0.00143	0.08093
1002176-2 25X	H178.89585	-0.00292	-0.00044	L-0.00566	0.00216	0.32704	-0.00237	0.81670	-0.01559	-0.00095	-0.00244	0.12546
1002176-3 10X	H356.97867	-0.00117	0.00340	0.00786	0.00118	0.63394	0.00328	1.89575	-0.02646	-0.00117	-0.00029	0.25072
1002176-4 10X	H351.78750	0.00031	0.00433	0.00502	0.00398	0.62562	0.00122	1.87021	-0.02162	-0.00096	-0.00134	0.25246
1002176-5 10X	H257.41499	-0.00151	0.00380	0.00526	0.00307	1.06125	0.00103	1.14558	-0.02348	-0.00113	-0.00298	0.25246
1002176-6 10X	H259.17022	0.00016	0.00298	0.00687	0.00104	1.06761	0.00286	1.14825	-0.02219	-0.00099	0.00084	0.24948
1002176-7 10X	H255.11610	-0.00051	0.00297	0.00478	0.00207	1.05646	0.00249	1.13620	-0.02548	-0.00123	-0.00287	0.25717
1002176-8 10X	H265.62114	0.00166	0.00348	0.00733	0.00156	1.03486	0.00182	1.06083	-0.01202	-0.00050	-0.00146	0.19718
1002176-9 10X	H266.21587	-0.00054	0.00315	0.00424	0.00260	1.02796	0.00061	1.06893	-0.02017	-0.00113	-0.00379	0.17562
1002176-10 10X	H242.01733	-0.00158	0.00496	0.00564	0.00462	1.11522	0.00000	1.04389	-0.02397	-0.00115	-0.00488	0.15653
CCV	4.99800	0.48180	1.00073	1.00728	0.99746	4.79755	1.01700	0.48596	0.13951	0.47489	0.50832	4.85524
CCB	0.01960	-0.00356	0.00016	-0.00099	0.00073	-0.00954	-0.00329	-0.00207	0.00036	-0.00063	-0.00196	-0.03185
1002176-11	0.05715	-0.00192	-0.00097	0.00121	-0.00205	-0.00325	-0.00146	0.00171	0.00147	-0.00049	0.00148	-0.02118
1002176-11L 5X	0.00968	-0.00225	-0.00129	L-0.00539	0.00076	-0.01151	-0.00207	-0.00169	-0.00207	-0.00099	-0.00254	-0.01201
1002176-11MS	0.04369	0.56417	2.52178	2.56757	2.49891	2.35526	0.58713	0.56425	0.00232	0.55700	2.34879	-0.03437
1002176-11MSD	0.04439	0.54637	2.49979	2.49535	2.50200	2.27991	0.56476	0.54461	0.00281	0.53917	2.27137	-0.03831
1002176-12 10X	H261.39439	0.00175	0.00269	0.00363	0.00222	1.01880	0.00310	1.05181	-0.02415	-0.00097	-0.00090	0.18950
1002219-1	H225.87558	-0.00107	0.04062	0.04326	0.03930	8.75064	0.01514	1.28889	-0.01813	-0.00035	-0.00667	0.51171
1002219-2	H98.09573	0.00172	0.00912	0.01466	0.00636	7.97024	0.00918	0.67290	-0.01447	-0.00068	0.00029	0.02514
1002219-2L 5X	18.23079	0.00026	0.00231	0.00541	0.00077	1.51739	0.00006	0.13050	-0.00566	-0.00090	0.00024	0.00038
1002219-2MS	H96.37918	0.56370	2.59990	2.67807	2.56087	10.17308	0.59562	1.24508	-0.01292	0.55139	2.37305	0.00527
1002219-2MSD	H95.70305	0.57068	2.60527	2.68577	2.56508	10.12592	0.60562	1.24397	-0.01073	0.55601	2.40126	0.00675
CCV	4.88540	0.47696	0.97973	0.98810	0.97555	4.69485	0.98295	0.47958	0.13103	0.46385	0.49370	4.81027
CCB	0.01535	0.00250	-0.00077	0.00298	-0.00264	-0.00548	0.00164	-0.00202	-0.00235	-0.00064	0.00031	0.01475
1003045-4A	1.72379	0.96624	3.95108	4.01491	3.91921	11.95579	1.04701	1.26387	0.01230	1.49875	4.15759	-0.01770
EX100304-1MB	0.00260	-0.00014	0.00070	0.00369	-0.00080	0.00895	0.01520	-0.00211	-0.00019	-0.00059	-0.00268	-0.00285
EX100304-1RVS	0.09116	0.01131	0.00582	0.00692	0.00527	0.02601	0.01015	0.00247	-0.00020	0.00379	0.00800	0.05012
EX100304-1LCS	-0.00166	0.48555	1.97628	1.98813	1.97036	1.83499	0.51682	0.49743	-0.00032	0.47963	2.09616	-0.01195
1002133-3	0.02597	0.00107	0.00178	0.00343	0.00095	0.00682	-0.00122	0.01638	-0.00048	-0.00056	0.00022	0.44002
1002133-4	0.13438	-0.00004	0.00108	0.00207	0.00058	0.41999	-0.00073	0.00102	-0.00448	-0.00092	-0.00540	-0.00807
1002174-10	0.02739	0.00016	-0.00045	0.00123	-0.00128	0.00803	-0.00262	-0.00214	-0.00114	-0.00113	-0.00378	-0.01023
1002174-11	0.02668	-0.00089	0.00055	0.00259	-0.00047	0.00864	0.00036	-0.00156	-0.00008	-0.00096	-0.00252	-0.00430
1002174-11D	0.02243	-0.00048	0.00074	0.00284	-0.00032	0.00873	-0.00061	-0.00154	0.00023	-0.00093	-0.00049	0.00588
1002174-11L 5X	0.00189	-0.00103	0.00023	0.00135	-0.00033	-0.00708	-0.00249	-0.00233	-0.00128	-0.00110	-0.00297	-0.01420
CCV	4.86616	0.47496	0.98573	0.98522	0.98599	4.71084	0.98191	0.48314	0.13519	0.46435	0.49514	4.82412
CCB	0.00260	-0.00217	0.00002	0.00135	-0.00064	-0.01154	-0.00201	-0.00218	-0.00155	-0.00073	-0.00168	-0.01698
1002174-11MS	0.03093	0.47866	1.94985	1.96669	1.94144	1.79603	0.51981	0.49208	0.01152	0.48317	2.08832	-0.01964
1002174-11MSD	0.02456	0.47812	1.95197	1.97008	1.94293	1.78487	0.52170	0.48821	-0.00005	0.48008	2.08818	-0.01048
1002174-12	8.12983	0.01779	0.00203	0.00082	0.00263	0.03735	-0.00146	-0.00001	-0.00171	-0.00078	-0.00040	-0.00980
1002174-13	0.17264	0.00134	-0.00004	0.00260	-0.00136	0.00430	0.00055	-0.00112	0.00189	-0.00100	-0.00096	0.01083
1002174-14	0.08761	-0.00033	-0.00067	0.00028	-0.00115	0.00325	-0.00225	-0.00142	0.00034	-0.00083	-0.00193	0.00241
1002174-15	0.05998	0.00092	0.00139	0.00707	-0.00144	0.00835	-0.00183	-0.00163	-0.00275	-0.00088	0.00040	0.00775
1002174-16	0.03731	-0.00145	0.00248	0.00385	0.00179	0.00648	0.00079	-0.00156	0.00021	-0.00111	-0.00447	-0.01451

20000373

Sample Id1	S	Sb	Se	Se I	Se II	Si	Sn	Sr	Th	Ti	Tl	U
1002174-17	0.07132	0.00065	-0.00015	0.00033	-0.00040	0.01472	-0.00073	0.00087	0.00007	-0.00091	-0.00296	-0.01191
1002174-18	0.03660	0.00128	0.00039	0.00352	-0.00118	0.02387	-0.00103	0.00148	0.00206	-0.00085	-0.00214	0.00156
1002175-2	18.84344	0.00460	0.00705	0.00660	0.00727	0.04009	-0.00158	0.04296	-0.00516	0.00159	-0.00501	-0.01224
CCV	4.90607	0.48150	0.97615	0.99794	0.96527	4.72452	0.99781	0.48434	0.13495	0.46656	0.50391	4.82946
CCB	-0.00095	0.00072	0.00122	0.00393	-0.00014	-0.01197	-0.00237	-0.00221	-0.00142	-0.00070	-0.00200	-0.00235
CRI	0.21657	0.12362	0.01077	0.01391	0.00920	0.10127	0.10788	0.01939	0.09251	0.01971	0.02200	0.21463
ICSA	0.00755	0.00320	-0.00107	0.00441	-0.00381	-0.01563	0.00036	0.01077	-0.00475	-0.00116	-0.00535	0.03205
ICSAB	1.03403	0.60746	0.05799	0.06392	0.05502	0.95740	1.01681	1.01274	-0.03301	0.95467	0.10787	10.34063
CCV	4.89253	0.47944	0.98164	0.99612	0.97441	4.71301	0.99133	0.48371	0.13573	0.46515	0.50627	4.83598
CCB	-0.00378	-0.00022	-0.00100	-0.00178	-0.00061	-0.01036	-0.00116	-0.00224	-0.00139	-0.00065	-0.00252	-0.00855

20000374

Sample Id1	V	Zn	Zr
MIXBHIGH	H5.05299	H10.17822	L-0.04092
MIXAHIGH	-0.00353	0.02330	0.00290
MIXCHIGH	-0.00692	-0.00212	H5.00956
ICV	0.24928	0.52400	0.49553
ICB	-0.00001	-0.00068	0.00026
CRI	0.10669	0.04010	0.05344
ICSA	-0.00115	-0.00033	0.00288
ICSAB	0.50441	0.93907	0.52344
CCV	0.48704	1.02697	0.98106
CCB	-0.00009	-0.00037	0.00038
IP100304-2MB	-0.00031	0.00183	0.00011
IP100304-2RVS	0.00437	0.00571	0.00496
IP100304-2LCS	0.49376	0.46468	-0.00005
1002192-1	-0.00006	0.00077	-0.00019
1002192-2	0.00193	0.03320	-0.00106
1002192-3	0.00190	0.00588	-0.00103
1002192-4	0.00023	0.03426	-0.00124
1002192-4D	0.00094	0.02990	-0.00074
1002192-4L 5X	-0.00030	0.00609	-0.00018
1002192-4MS	0.47474	0.46312	-0.00106
CCV	0.48069	1.00326	0.96482
CCB	-0.00038	-0.00082	0.00042
1002192-4MSD	0.48892	0.48260	-0.00087
1002192-5	0.00154	0.01801	-0.00161
1002192-5D	0.00145	0.01674	-0.00172
1002192-5L 5X	-0.00031	0.00248	-0.00077
1002192-5MS	0.49603	0.47362	-0.00276
1002192-5MSD	0.48537	0.45649	-0.00267
1002192-6	0.01447	0.00506	-0.00407
1002192-7	0.00155	0.02897	-0.00143
1002192-8	0.00809	0.00310	-0.00257
1002192-9	0.00208	0.01413	-0.00152
CCV	0.48035	0.99363	0.96835
CCB	0.00003	-0.00082	0.00053
1002192-9D	0.00150	0.01272	-0.00156
1002192-9L 5X	-0.00012	0.00238	-0.00059
1002192-9MS	0.48503	0.45801	-0.00239
1002192-9MSD	0.49476	0.47342	-0.00282
IP100304-4MB	-0.00014	0.00001	0.00011
IP100304-4RVS	0.00443	0.00863	0.00462
IP100304-4LCS	0.47967	0.44475	-0.00001
1003045-2	0.13702	0.29628	0.05578
1003045-4	0.06373	0.09308	0.02728
1003045-4D	0.05789	0.07489	0.02408
CCV	0.48696	1.00844	0.98248
CCB	0.00000	-0.00082	0.00031
1003045-4L 5X	0.01345	0.01911	0.00567
1003045-4MS	0.56323	0.55156	0.03866
1003045-4MSD	0.57254	0.55108	0.03421
1003045-5	0.08515	0.13494	0.04214

20000375 20000375

Sample Id1	V	Zn	Zr
1003045-8	0.14438	0.25872	0.05816
1003045-9	0.10287	0.09958	0.03975
1003045-10	0.08892	0.08881	0.03533
1003045-11	0.04894	0.05585	0.01432
1003045-12	0.16831	0.28518	0.06182
1003045-13	0.14130	0.25620	0.06086
CCV	0.48674	1.00903	0.97882
CCB	-0.00051	-0.00085	-0.00002
1003045-16	0.11591	0.23980	0.07066
1003045-17	0.11800	0.11960	0.03609
1003045-18	0.02028	0.02554	0.00699
1003045-19	0.02946	0.02217	0.00754
1003045-21	0.13950	0.31218	0.05675
1003045-23	0.04008	0.05956	0.01904
1002254-1 50X	-0.00016	-0.00130	-0.00012
1002254-2 50X	0.00041	-0.00044	0.00047
1002254-3 50X	-0.00015	-0.00123	-0.00014
1002254-4 50X	-0.00044	-0.00095	-0.00014
CCV	0.48483	0.98313	0.98289
CCB	-0.00013	-0.00092	0.00014
1002254-5 50X	-0.00025	-0.00099	-0.00021
1002254-6 50X	-0.00031	-0.00068	-0.00035
1002254-7 50X	-0.00053	-0.00088	-0.00032
1002254-8 50X	-0.00064	-0.00095	-0.00029
1002254-9 50X	-0.00030	-0.00082	0.00007
1002254-10 50X	-0.00062	-0.00068	-0.00062
1002254-11 50X	0.00009	-0.00095	0.00021
1002254-12 50X	-0.00044	-0.00171	-0.00009
1002254-13 50X	-0.00027	-0.00092	-0.00011
1002254-14 50X	0.00007	-0.00057	0.00008
CCV	0.47756	0.97986	0.96395
CCB	0.00059	-0.00051	0.00072
ZZZ	L-0.01086	0.00101	-0.00875
1002254-16 50X	-0.00027	-0.00071	-0.00022
1002254-17 50X	-0.00063	-0.00057	-0.00045
1002254-18 50X	-0.00003	-0.00088	-0.00006
1002254-19 10X	-0.00009	-0.00112	-0.00052
1002254-20 50X	-0.00236	-0.00130	-0.00172
1002254-21 50X	-0.00066	-0.00085	-0.00042
1002254-22 50X	-0.00138	-0.00126	-0.00089
1002254-23 50X	-0.00040	-0.00109	-0.00013
1002254-24 50X	-0.00066	-0.00112	-0.00029
CCV	0.48410	0.99244	0.98015
CCB	-0.00009	-0.00102	0.00038
1002254-25 50X	-0.00024	-0.00057	-0.00017
1003054-1 10X	0.00772	0.00939	0.01073
1003054-2 10X	-0.00025	0.00475	0.00023
1002254-15 50X	-0.00019	-0.00027	-0.00001
1002076-4 10X	-0.00034	0.01433	0.00028
1002076-7 10X	-0.00052	-0.00023	-0.00013

20000376 20000376

Sample Id1	V	Zn	Zr
CRI	0.10768	0.04031	0.05374
ICSA	-0.00166	-0.00078	0.00195
ICSAB	0.49104	0.88621	0.51190
CCV	0.47652	0.97983	0.96254
CCB	-0.00021	-0.00044	0.00032
CCV	0.48971	1.04015	0.98065
CCB	0.00011	0.00001	0.00056
1002176-1 25X	-0.00037	-0.00013	0.00068
1002176-2 25X	-0.00122	-0.00085	0.00042
1002176-3 10X	-0.00017	0.00255	0.00128
1002176-4 10X	0.00001	0.00296	0.00112
1002176-5 10X	-0.00040	-0.00030	0.00057
1002176-6 10X	-0.00052	-0.00051	0.00075
1002176-7 10X	-0.00011	-0.00068	0.00091
1002176-8 10X	0.00071	0.00001	0.00058
1002176-9 10X	0.00017	-0.00102	0.00055
1002176-10 10X	0.00126	-0.00123	0.00055
CCV	0.48925	1.05302	0.97521
CCB	-0.00062	-0.00009	0.00000
1002176-11	-0.00075	0.00358	-0.00087
1002176-11L 5X	-0.00085	-0.00030	-0.00045
1002176-11MS	0.57203	0.56861	-0.00239
1002176-11MSD	0.55198	0.54482	-0.00262
1002176-12 10X	0.00042	-0.00088	0.00096
1002219-1	0.00166	0.00056	-0.00178
1002219-2	0.00232	0.00200	-0.00122
1002219-2L 5X	0.00048	-0.00088	-0.00031
1002219-2MS	0.57066	0.54489	-0.00322
1002219-2MSD	0.57675	0.55564	-0.00361
CCV	0.47673	0.99974	0.95658
CCB	0.00052	-0.00033	0.00089
1003045-4A	1.06623	1.04971	0.02424
EX100304-1MB	-0.00016	0.00317	-0.00027
EX100304-1RVS	0.00496	0.00513	0.00490
EX100304-1LCS	0.49787	0.48367	-0.00126
1002133-3	-0.00007	0.03072	-0.00023
1002133-4	-0.00015	0.16102	-0.00025
1002174-10	-0.00019	0.02598	-0.00016
1002174-11	-0.00030	0.16240	-0.00033
1002174-11D	-0.00010	0.16360	-0.00021
1002174-11L 5X	-0.00093	0.03265	-0.00040
CCV	0.47801	0.99877	0.96123
CCB	-0.00034	-0.00023	0.00017
1002174-11MS	0.49955	0.65750	-0.00215
1002174-11MSD	0.49885	0.65809	-0.00129
1002174-12	0.00028	0.08018	-0.00025
1002174-13	-0.00054	0.06619	-0.00003
1002174-14	-0.00021	0.10147	-0.00009
1002174-15	-0.00012	0.14602	0.00011
1002174-16	-0.00094	0.07647	-0.00050

20000377 20000377

Sample Id1	V	Zn	Zr
1002174-17	-0.00043	H15.63448	-0.00028
1002174-18	-0.00022	H34.65593	-0.00031
1002175-2	0.00167	1.13783	0.00075
CCV	0.48270	1.02019	0.96688
CCB	-0.00004	0.00052	0.00029
CRI	0.10704	0.04100	0.05326
ICSA	-0.00193	-0.00033	0.00212
ICSAB	0.48766	0.89135	0.50742
CCV	0.48065	1.00691	0.96595
CCB	-0.00021	-0.00047	0.00012

20000378

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:30
SampleId1 : BLANK **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:23:20
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE1

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.901	2.343	4.405	1.454	0.342	5.354	2.971	0.911	2.144
#2	1.904	2.340	4.369	1.460	0.346	5.403	2.982	0.950	2.147
Mean	**1.903**	**2.342**	**4.387**	**1.457**	**0.344**	**5.379**	**2.977**	**0.931**	**2.146**
%RSD	0.112	0.091	0.580	0.291	0.822	0.644	0.261	2.964	0.099

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.996	3.661	1.005	0.905	10.403	1.667	2.066	0.223	1.600
#2	1.990	3.650	1.008	0.939	10.420	1.675	2.086	0.224	1.598
Mean	**1.993**	**3.656**	**1.007**	**0.922**	**10.412**	**1.671**	**2.076**	**0.224**	**1.599**
%RSD	0.213	0.213	0.211	2.608	0.115	0.339	0.681	0.316	0.088

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.377	4.163	1.281	47.023	13.359	0.150	3.803	8.302	6.197
#2	2.440	4.200	1.284	46.827	13.240	0.148	3.785	8.315	6.223
Mean	**2.409**	**4.182**	**1.283**	**46.925**	**13.300**	**0.149**	**3.794**	**8.308**	**6.210**
%RSD	1.850	0.626	0.165	0.295	0.633	0.949	0.335	0.111	0.296

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	4.884	1.476	0.610	9.727	3.507	5.266	2.627	2.520	0.444
#2	4.878	1.473	0.616	9.738	3.516	5.267	2.620	2.514	0.446
Mean	**4.881**	**1.475**	**0.613**	**9.733**	**3.512**	**5.267**	**2.624**	**2.517**	**0.445**
%RSD	0.087	0.144	0.692	0.080	0.181	0.013	0.189	0.169	0.318

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.384		
#2	4.387		
Mean	**4.386**	**0.000**	**0.000**
%RSD	0.048	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:30
SampleId1 : RL **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:25:13
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE2

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.011	2.737	4.550	2.984	0.452	7.019	3.094	2.954	2.325
#2	2.010	2.736	4.518	2.984	0.453	7.028	3.085	2.967	2.352
Mean	**2.011**	**2.737**	**4.534**	**2.984**	**0.453**	**7.024**	**3.090**	**2.961**	**2.338**
%RSD	0.035	0.026	0.499	0.000	0.156	0.091	0.206	0.311	0.816

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.097	3.901	1.054	1.952	14.425	5.586	3.230	0.286	2.067
#2	2.098	3.891	1.060	1.973	14.414	5.575	3.244	0.286	2.065
Mean	**2.098**	**3.896**	**1.057**	**1.963**	**14.420**	**5.581**	**3.237**	**0.286**	**2.066**
%RSD	0.034	0.181	0.401	0.757	0.054	0.139	0.306	0.000	0.068

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	15.383	4.728	1.822	47.870	13.530	0.188	3.981	8.410	6.348
#2	15.347	4.754	1.814	47.989	13.580	0.191	3.975	8.426	6.366
Mean	**15.365**	**4.741**	**1.818**	**47.930**	**13.555**	**0.190**	**3.978**	**8.418**	**6.357**
%RSD	0.166	0.388	0.311	0.176	0.261	1.119	0.107	0.134	0.200

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.741	1.573	2.704	10.151	5.734	5.444	2.889	2.688	0.532
#2	5.747	1.567	2.702	10.166	5.742	5.457	2.887	2.692	0.534
Mean	**5.744**	**1.570**	**2.703**	**10.159**	**5.738**	**5.451**	**2.888**	**2.690**	**0.533**
%RSD	0.074	0.270	0.052	0.104	0.099	0.169	0.049	0.105	0.265

	Zr	Pb	Se
	Reading	Reading	Reading
#1	5.225		
#2	5.243		
Mean	**5.234**	**0.000**	**0.000**
%RSD	0.243	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:31
SampleId1 : RL2 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:27:04
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE3

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.202	3.470	4.926	5.977	0.631	10.251	3.301	6.895	2.728
#2	2.188	3.475	4.949	5.948	0.632	10.248	3.297	6.902	2.677
Mean	**2.195**	**3.473**	**4.938**	**5.963**	**0.632**	**10.250**	**3.299**	**6.899**	**2.703**
%RSD	0.451	0.102	0.329	0.344	0.112	0.021	0.086	0.072	1.334

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.331	4.398	1.156	3.937	19.710	13.091	5.449	0.406	3.003
#2	2.321	4.376	1.158	3.952	19.642	13.047	5.431	0.408	3.016
Mean	**2.326**	**4.387**	**1.157**	**3.944**	**19.676**	**13.069**	**5.440**	**0.407**	**3.010**
%RSD	0.304	0.355	0.122	0.269	0.244	0.238	0.234	0.347	0.305

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	39.248	5.839	2.864	50.298	14.439	0.266	4.416	8.845	6.861
#2	39.132	5.861	2.908	50.124	14.459	0.268	4.401	8.807	6.800
Mean	**39.190**	**5.850**	**2.886**	**50.211**	**14.449**	**0.267**	**4.409**	**8.826**	**6.831**
%RSD	0.209	0.266	1.078	0.245	0.098	0.530	0.241	0.304	0.631

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	7.451	1.795	6.135	11.055	9.960	5.976	3.446	3.016	0.707
#2	7.424	1.793	6.120	11.011	9.944	5.949	3.418	3.005	0.708
Mean	**7.438**	**1.794**	**6.128**	**11.033**	**9.952**	**5.963**	**3.432**	**3.011**	**0.708**
%RSD	0.257	0.079	0.173	0.282	0.114	0.320	0.577	0.258	0.100

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	6.932		
#2	6.897		
Mean	**6.915**	**0.000**	**0.000**
%RSD	0.358	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:31
SampleId1 : B3 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:28:55
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE4

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.566	2.354	5.899	4.389	4.410	19.105	3.056	0.856	8.741
#2	2.544	2.366	5.930	4.415	4.411	19.099	3.107	0.866	8.822
Mean	**2.555**	**2.360**	**5.915**	**4.402**	**4.411**	**19.102**	**3.082**	**0.861**	**8.782**
%RSD	0.609	0.360	0.371	0.418	0.016	0.022	1.170	0.821	0.652

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	4.004	11.938	2.602	0.866	10.732	1.710	2.100	2.989	5.870
#2	4.005	11.918	2.594	0.871	10.712	1.704	2.099	2.988	5.901
Mean	**4.005**	**11.928**	**2.598**	**0.869**	**10.722**	**1.707**	**2.100**	**2.989**	**5.886**
%RSD	0.018	0.119	0.218	0.407	0.132	0.249	0.034	0.024	0.372

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading

#1	2.352	13.981	6.424	62.223	20.948	0.153	4.296	9.429	7.702
#2	2.354	13.957	6.398	62.103	20.865	0.152	4.277	9.393	7.733
Mean	**2.353**	**13.969**	**6.411**	**62.163**	**20.907**	**0.153**	**4.287**	**9.411**	**7.718**
%RSD	0.060	0.121	0.287	0.137	0.281	0.464	0.313	0.270	0.284

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	12.538	2.366	17.095	10.798	23.762	6.923	2.712	5.406	2.013
#2	12.534	2.375	17.095	10.804	23.723	7.008	2.705	5.361	2.005
Mean	**12.536**	**2.370**	**17.095**	**10.801**	**23.743**	**6.966**	**2.709**	**5.384**	**2.009**
%RSD	0.023	0.268	0.000	0.039	0.116	0.863	0.183	0.591	0.282

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.716		
#2	4.685		
Mean	**4.701**	**0.000**	**0.000**
%RSD	0.466	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:31
SampleId1 : B2 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:30:45
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE5

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	7.811	2.495	18.927	30.506	40.536	142.654	3.091	0.890	66.864
#2	7.792	2.490	18.927	30.389	40.186	142.079	3.168	0.900	66.645
Mean	**7.802**	**2.493**	**18.927**	**30.448**	**40.361**	**142.367**	**3.130**	**0.895**	**66.755**
%RSD	0.172	0.142	0.000	0.272	0.613	0.286	1.740	0.790	0.232

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	21.430	84.165	16.593	0.897	10.591	1.677	2.077	27.483	43.796
#2	21.323	83.792	16.503	0.904	10.658	1.690	2.093	27.328	43.633
Mean	**21.377**	**83.979**	**16.548**	**0.901**	**10.625**	**1.684**	**2.085**	**27.406**	**43.715**
%RSD	0.354	0.314	0.385	0.550	0.446	0.546	0.543	0.400	0.264

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.742	99.940	51.703	186.663	87.159	0.151	7.958	17.870	20.995
#2	2.764	99.635	51.484	186.073	86.713	0.151	7.928	17.828	20.964
Mean	**2.753**	**99.788**	**51.594**	**186.368**	**86.936**	**0.151**	**7.943**	**17.849**	**20.980**
%RSD	0.565	0.216	0.300	0.224	0.363	0.000	0.267	0.166	0.104

20000382

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	79.729	10.021	160.738	17.819	202.760	20.885	2.687	30.060	15.691

#2	79.311	9.995	159.544	17.865	201.681	20.920	2.712	29.953	15.672
Mean	**79.520**	**10.008**	**160.141**	**17.842**	**202.221**	**20.903**	**2.700**	**30.007**	**15.682**
%RSD	0.372	0.184	0.527	0.182	0.377	0.118	0.655	0.252	0.086

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	6.074		
#2	6.096		
Mean	**6.085**	**0.000**	**0.000**
%RSD	0.256	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:32
SampleId1 : B1 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:32:35
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE6

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	59.994	4.117	145.803	284.723	383.544	1337.470	4.217	0.980	618.975
#2	60.135	4.122	146.109	285.464	384.415	1339.869	4.225	0.980	619.346
Mean	**60.065**	**4.120**	**145.956**	**285.094**	**383.980**	**1338.670**	**4.221**	**0.980**	**619.161**
%RSD	0.166	0.086	0.148	0.184	0.160	0.127	0.134	0.000	0.042

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	190.879	794.135	155.355	1.342	10.507	1.764	2.322	256.064	408.000
#2	191.151	795.911	155.542	1.341	10.515	1.770	2.313	256.695	408.579
Mean	**191.015**	**795.023**	**155.449**	**1.341**	**10.511**	**1.767**	**2.318**	**256.380**	**408.290**
%RSD	0.101	0.158	0.085	0.053	0.054	0.240	0.275	0.174	0.100

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	3.488	929.755	463.273	1402.684	737.437	0.214	44.485	100.397	151.176
#2	3.493	931.569	463.440	1406.858	733.853	0.213	44.551	100.517	150.395
Mean	**3.491**	**930.662**	**463.357**	**1404.771**	**735.645**	**0.214**	**44.518**	**100.457**	**150.786**
%RSD	0.101	0.138	0.025	0.210	0.344	0.331	0.105	0.084	0.366

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	724.048	84.388	1386.695	88.629	1991.365	158.458	2.911	272.326	145.110
#2	727.500	84.603	1396.855	88.790	1994.873	158.732	2.933	272.583	145.564
Mean	**725.774**	**84.495**	**1391.775**	**88.710**	**1993.119**	**158.595**	**2.922**	**272.455**	**145.337**
%RSD	0.336	0.180	0.516	0.128	0.124	0.122	0.532	0.067	0.221

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	20.425		
#2	20.463		

Mean	**20.444**	**0.000**	**0.000CH**
%RSD	0.131	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:32
SampleId1 : ZZZ **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:34:25
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE7

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.940	18.775	4.582	2.417	0.517	5.744	2.970	45.775	2.413
#2	1.948	18.739	4.605	2.373	0.576	5.944	3.013	45.730	2.487
Mean	**1.944**	**18.757**	**4.594**	**2.395**	**0.547**	**5.844**	**2.992**	**45.753**	**2.450**
%RSD	0.291	0.136	0.354	1.299	7.634	2.420	1.016	0.070	2.136

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.059	4.018	1.073	38.623	23.824	37.685	26.302	0.327	1.831
#2	2.091	4.130	1.095	38.584	23.784	37.626	26.282	0.366	1.873
Mean	**2.075**	**4.074**	**1.084**	**38.604**	**23.804**	**37.656**	**26.292**	**0.347**	**1.852**
%RSD	1.090	1.944	1.435	0.071	0.119	0.111	0.054	7.959	1.604

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	60.024	4.523	1.486	48.115	13.518	0.148	3.868	8.401	6.234
#2	59.870	4.667	1.558	48.357	13.614	0.154	3.890	8.420	6.334
Mean	**59.947**	**4.595**	**1.522**	**48.236**	**13.566**	**0.151**	**3.879**	**8.410**	**6.284**
%RSD	0.182	2.216	3.345	0.355	0.500	2.810	0.401	0.160	1.125

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.630	1.514	1.592	10.821	4.422	5.337	2.720	2.658	0.519
#2	5.654	1.526	1.839	10.827	4.700	5.461	2.721	2.705	0.539
Mean	**5.642**	**1.520**	**1.716**	**10.824**	**4.561**	**5.399**	**2.721**	**2.681**	**0.529**
%RSD	0.301	0.558	10.181	0.039	4.310	1.624	0.026	1.239	2.673

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.419		
#2	4.405		
Mean	**4.412**	**0.000**	**0.000**
%RSD	0.224	0.000	0.000

20000384

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:32
SampleId1 : ZZZ **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:36:16
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE8

Raw intensities **16:42:36** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.923	163.104	4.972	1.967	0.373	5.424	2.946	434.948	2.231
#2	1.923	163.547	4.978	1.941	0.368	5.376	2.968	435.309	2.198
Mean	**1.923**	**163.326**	**4.975**	**1.954**	**0.371**	**5.400**	**2.957**	**435.129**	**2.215**
%RSD	0.000	0.192	0.085	0.941	0.954	0.629	0.526	0.059	1.054

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.002	4.079	1.021	360.986	116.246	361.178	237.345	0.276	1.917
#2	1.993	4.038	1.014	361.523	116.613	362.382	237.743	0.271	1.892
Mean	**1.998**	**4.059**	**1.018**	**361.255**	**116.430**	**361.780**	**237.544**	**0.274**	**1.905**
%RSD	0.319	0.714	0.486	0.105	0.223	0.235	0.118	1.293	0.928

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	490.874	4.223	1.466	53.584	15.267	0.157	4.514	9.569	6.978
#2	492.169	4.193	1.440	53.498	15.338	0.158	4.561	9.572	7.108
Mean	**491.522**	**4.208**	**1.453**	**53.541**	**15.302**	**0.158**	**4.537**	**9.570**	**7.043**
%RSD	0.186	0.504	1.265	0.114	0.328	0.449	0.732	0.022	1.305

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.428	1.664	0.850	16.239	4.036	5.871	3.110	2.789	0.584
#2	5.397	1.658	0.830	16.228	4.014	5.935	3.108	2.779	0.584
Mean	**5.412**	**1.661**	**0.840**	**16.234**	**4.025**	**5.903**	**3.109**	**2.784**	**0.584**
%RSD	0.405	0.255	1.684	0.048	0.386	0.767	0.045	0.254	0.000

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.493		
#2	4.488		
Mean	**4.491**	**0.000**	**0.000**
%RSD	0.079	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:33
SampleId1 : ZZZ **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:38:06
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE9

Raw intensities

20000385

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.935	319.193	5.494	1.930	0.348	5.427	2.964	844.184	2.221
#2	1.954	320.404	5.501	1.909	0.346	5.451	3.017	845.893	2.231
Mean	**1.945**	**319.799**	**5.498**	**1.920**	**0.347**	**5.439**	**2.991**	**845.039**	**2.226**
%RSD	0.691	0.268	0.090	0.774	0.408	0.312	1.253	0.143	0.318

ted: 3/5/2010 16:42:36 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.036	4.247	1.018	687.621	231.741	768.741	463.921	0.290	2.204
#2	2.032	4.241	1.018	688.935	232.764	771.749	465.537	0.290	2.199
Mean	**2.034**	**4.244**	**1.018**	**688.278**	**232.253**	**770.245**	**464.729**	**0.290**	**2.202**
%RSD	0.139	0.100	0.000	0.135	0.311	0.276	0.246	0.000	0.161

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	936.859	4.236	1.532	61.543	17.541	0.171	5.435	10.963	8.060
#2	940.665	4.259	1.526	61.632	17.507	0.173	5.433	11.023	8.091
Mean	**938.762**	**4.248**	**1.529**	**61.588**	**17.524**	**0.172**	**5.434**	**10.993**	**8.076**
%RSD	0.287	0.383	0.277	0.102	0.137	0.822	0.026	0.386	0.271

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.641	1.855	0.828	19.419	4.104	6.654	3.416	2.951	0.709
#2	5.659	1.865	0.836	19.408	4.133	6.724	3.402	2.944	0.714
Mean	**5.650**	**1.860**	**0.832**	**19.414**	**4.119**	**6.689**	**3.409**	**2.948**	**0.712**
%RSD	0.225	0.380	0.680	0.040	0.498	0.740	0.290	0.168	0.497

	Zr	Pb	Se
	Reading	Reading	Reading
#1	4.604		
#2	4.614		
Mean	**4.609**	**0.000**	**0.000**
%RSD	0.153	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:33
SampleId1 : ZZZ SampleId2 : [STD]
Analysis commenced : 3/5/2010 10:39:56
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE10

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.018	625.936	6.877	2.067	0.360	5.748	3.186	1643.944	2.431
#2	2.027	624.591	6.871	2.077	0.360	5.727	3.167	1638.068	2.437
Mean	**2.023**	**625.264**	**6.874**	**2.072**	**0.360**	**5.738**	**3.177**	**1641.006**	**2.434**
%RSD	0.315	0.152	0.062	0.341	0.000	0.259	0.423	0.253	0.174

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.182	4.645	1.058	1296.425	453.899	1612.912	927.536	0.362	2.899
#2	2.185	4.636	1.055	1292.033	453.275	1608.353	923.994	0.362	2.881
Mean	**2.184**	**4.640**	**1.057**	**1294.229**	**453.587**	**1610.633**	**925.765**	**0.362**	**2.890**
%RSD	0.097	0.137	0.201	0.240	0.097	0.200	0.271	0.000	0.440

20000386

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1689.580	4.506	1.792	79.017	22.774	0.208	7.232	14.124	10.354
#2	1685.774	4.489	1.808	78.864	22.845	0.210	7.218	14.027	10.289
Mean	**1687.677**	**4.498**	**1.800**	**78.941**	**22.810**	**0.209**	**7.225**	**14.076**	**10.322**
%RSD	0.159	0.267	0.629	0.137	0.220	0.677	0.137	0.487	0.445

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	6.124	2.282	1.017	23.697	4.480	8.456	3.949	3.306	0.988
#2	6.143	2.288	1.018	23.722	4.462	8.441	3.940	3.280	1.000
Mean	**6.134**	**2.285**	**1.018**	**23.710**	**4.471**	**8.448**	**3.944**	**3.293**	**0.994**
%RSD	0.219	0.186	0.069	0.075	0.285	0.126	0.161	0.558	0.854

	Zr	Pb	Se
	Reading	Reading	Reading
#1	4.899		
#2	4.890		
Mean	**4.895**	**0.000**	**0.000**
%RSD	0.130	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:33
SampleId1 : A1 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:41:57
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE11

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.080	1450.079	10.337	2.620	0.389	6.300	3.497	3654.278	2.843
#2	2.086	1450.169	10.341	2.629	0.388	6.301	3.495	3654.758	2.865
Mean	**2.083**	**1450.124**	**10.339**	**2.625**	**0.389**	**6.301**	**3.496**	**3654.518**	**2.854**
%RSD	0.204	0.004	0.027	0.242	0.182	0.011	0.040	0.009	0.545

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.469	5.439	1.101	2672.194	1026.469	4013.952	2192.002	0.546	4.748
#2	2.476	5.453	1.106	2673.769	1026.501	4012.155	2194.422	0.545	4.719
Mean	**2.473**	**5.446**	**1.104**	**2672.982**	**1026.485**	**4013.054**	**2193.212**	**0.546**	**4.734**
%RSD	0.200	0.182	0.320	0.042	0.002	0.032	0.078	0.130	0.433

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	3215.157	4.975	2.410	124.092	35.758	0.289	12.171	22.361	16.263
#2	3210.577	4.982	2.436	124.380	35.938	0.294	12.192	22.277	16.353
Mean	**3212.867**	**4.979**	**2.423**	**124.236**	**35.848**	**0.292**	**12.182**	**22.319**	**16.308**
%RSD	0.101	0.099	0.759	0.164	0.355	1.213	0.122	0.266	0.390

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	6.963	3.474	1.509	31.218	5.156	12.892	5.170	3.978	1.777
#2	6.981	3.480	1.506	31.188	5.167	12.979	5.181	3.979	1.775
Mean	**6.972**	**3.477**	**1.508**	**31.203**	**5.162**	**12.936**	**5.175**	**3.979**	**1.776**
%RSD	0.183	0.122	0.141	0.068	0.151	0.476	0.150	0.018	0.080

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	5.294		
#2	5.289		
Mean	**5.291**	**0.000**	**0.000**
%RSD	0.067	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:33
SampleId1 : C3 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:43:48
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE12

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.960	2.533	4.341	1.516	0.336	5.317	3.600	1.348	2.147
#2	1.951	2.482	4.342	1.504	0.336	5.324	3.598	1.222	2.155
Mean	**1.956**	**2.508**	**4.342**	**1.510**	**0.336**	**5.321**	**3.599**	**1.285**	**2.151**
%RSD	0.325	1.438	0.016	0.562	0.000	0.093	0.039	6.933	0.263

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.995	3.747	1.022	1.300	10.489	1.948	2.386	0.222	1.578
#2	1.999	3.734	1.020	1.180	10.450	1.881	2.316	0.223	1.597
Mean	**1.997**	**3.741**	**1.021**	**1.240**	**10.470**	**1.915**	**2.351**	**0.223**	**1.588**
%RSD	0.142	0.246	0.139	6.843	0.263	2.475	2.105	0.318	0.846

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.839	4.183	1.261	47.187	13.303	0.504	3.800	8.300	6.186
#2	2.711	4.181	1.282	47.049	13.247	0.504	3.800	8.401	6.164
Mean	**2.775**	**4.182**	**1.272**	**47.118**	**13.275**	**0.504**	**3.800**	**8.351**	**6.175**
%RSD	3.262	0.034	1.168	0.207	0.298	0.000	0.000	0.855	0.252

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	4.915	1.486	0.606	10.647	3.581	5.310	3.677	2.554	0.445
#2	4.939	1.484	0.606	10.607	3.568	5.338	3.689	2.552	0.445
Mean	**4.927**	**1.485**	**0.606**	**10.627**	**3.575**	**5.324**	**3.683**	**2.553**	**0.445**
%RSD	0.344	0.095	0.000	0.266	0.257	0.372	0.230	0.055	0.000

	Zr	**Pb**	**Se**
	Reading	Reading	Reading

#1	11.292		**CH**
#2	11.363		
Mean	**11.328**	**0.000**	**0.000**
%RSD	0.443	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:34
SampleId1 : C2 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:45:39
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE13

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.323	2.621	4.498	1.622	0.342	5.875	9.073	1.050	2.216
#2	2.326	2.624	4.514	1.612	0.341	5.862	9.072	1.034	2.213
Mean	**2.325**	**2.623**	**4.506**	**1.617**	**0.342**	**5.869**	**9.073**	**1.042**	**2.215**
%RSD	0.091	0.081	0.251	0.437	0.207	0.157	0.008	1.086	0.096

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.079	4.600	1.154	1.052	10.488	1.719	2.800	0.258	1.602
#2	2.075	4.610	1.154	1.039	10.484	1.709	2.809	0.260	1.610
Mean	**2.077**	**4.605**	**1.154**	**1.046**	**10.486**	**1.714**	**2.805**	**0.259**	**1.606**
%RSD	0.136	0.154	0.000	0.879	0.027	0.413	0.227	0.546	0.352

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.534	4.441	1.309	49.065	13.919	3.730	3.885	8.491	6.265
#2	2.525	4.396	1.319	48.971	13.836	3.742	3.896	8.533	6.264
Mean	**2.529**	**4.419**	**1.314**	**49.018**	**13.878**	**3.736**	**3.891**	**8.512**	**6.265**
%RSD	0.252	0.720	0.538	0.136	0.423	0.227	0.200	0.349	0.011

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.604	1.514	0.637	18.511	4.049	5.425	13.273	2.866	0.458
#2	5.593	1.530	0.638	18.520	4.046	5.399	13.299	2.868	0.459
Mean	**5.598**	**1.522**	**0.638**	**18.516**	**4.048**	**5.412**	**13.286**	**2.867**	**0.459**
%RSD	0.139	0.743	0.111	0.034	0.052	0.340	0.138	0.049	0.154

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	75.148		
#2	75.413		
Mean	**75.280**	**0.000**	**0.000**
%RSD	0.249	0.000	0.000

20000389

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:34
SampleId1 : C1 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:47:30

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE14

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.941	4.968	4.940	2.742	0.362	10.787	62.594	2.092	2.627
#2	5.928	4.954	4.897	2.699	0.358	10.838	63.278	2.081	2.633
Mean	**5.935**	**4.961**	**4.919**	**2.721**	**0.360**	**10.813**	**62.936**	**2.087**	**2.630**
%RSD	0.155	0.200	0.618	1.118	0.786	0.334	0.768	0.373	0.161

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.681	12.853	2.402	2.023	10.349	1.783	9.190	0.556	1.787
#2	2.673	12.904	2.407	2.018	10.253	1.755	9.209	0.557	1.777
Mean	**2.677**	**12.879**	**2.405**	**2.021**	**10.301**	**1.769**	**9.200**	**0.557**	**1.782**
%RSD	0.211	0.280	0.147	0.175	0.659	1.119	0.146	0.127	0.397

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.390	5.605	1.568	64.408	19.394	34.922	4.305	9.703	6.896
#2	2.353	5.569	1.575	64.292	19.381	35.257	4.296	9.668	6.902
Mean	**2.372**	**5.587**	**1.572**	**64.350**	**19.388**	**35.090**	**4.300**	**9.685**	**6.899**
%RSD	1.103	0.456	0.315	0.127	0.047	0.675	0.148	0.256	0.061

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	11.962	1.827	0.921	95.893	8.562	6.029	107.900	5.727	0.496
#2	12.029	1.826	0.918	96.516	8.572	6.030	108.860	5.727	0.500
Mean	**11.996**	**1.827**	**0.920**	**96.205**	**8.567**	**6.030**	**108.380**	**5.727**	**0.498**
%RSD	0.395	0.039	0.231	0.458	0.083	0.012	0.626	0.000	0.568

	Zr	Pb	Se
	Reading	Reading	Reading
#1	708.400		
#2	713.214		
Mean	**710.807**	**0.000**	**0.000**
%RSD	0.479	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:34
SampleId1 : A5 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 10:59:53
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE7

20000390

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.032	18.846	4.562	1.557	0.444	5.651	3.166	46.758	2.348
#2	2.037	18.823	4.580	1.554	0.442	5.677	3.176	46.818	2.378

Mean	**2.035**	**18.835**	**4.571**	**1.556**	**0.443**	**5.664**	**3.171**	**46.788**	**2.363**
%RSD	0.174	0.086	0.278	0.136	0.319	0.325	0.223	0.091	0.898

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.109	4.064	1.076	39.007	24.074	37.326	26.848	0.282	1.749
#2	2.126	4.059	1.078	39.079	24.104	37.311	26.870	0.282	1.739
Mean	**2.117**	**4.062**	**1.077**	**39.043**	**24.089**	**37.319**	**26.859**	**0.282**	**1.744**
%RSD	0.568	0.087	0.131	0.130	0.088	0.028	0.058	0.000	0.405

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	59.562	4.522	1.402	49.892	14.091	0.157	4.012	8.637	6.436
#2	59.472	4.569	1.420	50.097	14.135	0.156	4.029	8.728	6.448
Mean	**59.517**	**4.546**	**1.411**	**49.995**	**14.113**	**0.157**	**4.021**	**8.683**	**6.442**
%RSD	0.107	0.731	0.902	0.290	0.220	0.452	0.299	0.741	0.132

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.243	1.548	1.248	11.318	4.141	5.462	2.864	2.768	0.497
#2	5.240	1.544	1.252	11.398	4.141	5.491	2.874	2.770	0.505
Mean	**5.242**	**1.546**	**1.250**	**11.358**	**4.141**	**5.477**	**2.869**	**2.769**	**0.501**
%RSD	0.040	0.183	0.226	0.498	0.000	0.374	0.246	0.051	1.129

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.669		
#2	4.713		
Mean	**4.691**	**0.000**	**0.000**
%RSD	0.663	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:35
SampleId1 : A4 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 11:01:43
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE8

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1.986	162.347	5.053	1.552	0.364	5.498	3.075	440.951	2.246
#2	2.000	162.757	5.009	1.548	0.367	5.501	3.058	441.382	2.273
Mean	**1.993**	**162.552**	**5.031**	**1.550**	**0.366**	**5.500**	**3.067**	**441.167**	**2.260**
%RSD	0.497	0.178	0.618	0.182	0.580	0.039	0.392	0.069	0.845

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.061	4.168	1.038	362.584	115.664	357.105	240.189	0.270	1.925
#2	2.065	4.188	1.036	362.873	115.949	358.114	240.461	0.271	1.952
Mean	**2.063**	**4.178**	**1.037**	**362.729**	**115.807**	**357.610**	**240.325**	**0.271**	**1.939**

20000391

%RSD	0.137	0.338	0.136	0.056	0.174	0.200	0.080	0.261	0.985

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	487.623	4.282	1.467	55.430	15.706	0.167	4.663	9.824	7.239
#2	488.896	4.326	1.466	55.277	15.699	0.167	4.682	9.744	7.225
Mean	**488.260**	**4.304**	**1.467**	**55.354**	**15.703**	**0.167**	**4.673**	**9.784**	**7.232**
%RSD	0.184	0.723	0.048	0.195	0.032	0.000	0.288	0.578	0.137

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.455	1.692	0.792	16.641	4.068	6.117	3.225	2.881	0.590
#2	5.454	1.703	0.796	16.697	4.075	6.159	3.240	2.882	0.591
Mean	**5.454**	**1.698**	**0.794**	**16.669**	**4.072**	**6.138**	**3.233**	**2.882**	**0.591**
%RSD	0.013	0.458	0.356	0.238	0.122	0.484	0.328	0.025	0.120

	Zr	**Pb**	**Se**
	Reading	Reading	Reading
#1	4.718		
#2	4.736		
Mean	**4.727**	**0.000**	**0.000**
%RSD	0.269	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:35
SampleId1 : A3 **SampleId2 :** **[STD]**
Analysis commenced : 3/5/2010 11:03:34
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE9

Raw intensities

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.010	320.514	5.608	1.653	0.356	5.582	3.096	860.040	2.302
#2	1.992	321.561	5.635	1.654	0.356	5.576	3.077	862.008	2.299
Mean	**2.001**	**321.038**	**5.621**	**1.654**	**0.356**	**5.579**	**3.087**	**861.024**	**2.301**
%RSD	0.636	0.231	0.340	0.043	0.000	0.076	0.435	0.162	0.092

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.091	4.345	1.032	694.367	232.596	768.722	471.868	0.296	2.255
#2	2.093	4.336	1.040	696.579	233.538	771.898	473.293	0.298	2.240
Mean	**2.092**	**4.341**	**1.036**	**695.473**	**233.067**	**770.310**	**472.581**	**0.297**	**2.248**
%RSD	0.068	0.147	0.546	0.225	0.286	0.292	0.213	0.476	0.472

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	940.468	4.349	1.564	63.201	18.008	0.180	5.508	11.175	8.237
#2	942.623	4.362	1.533	63.395	17.988	0.176	5.527	11.301	8.232
Mean	**941.546**	**4.356**	**1.549**	**63.298**	**17.998**	**0.178**	**5.518**	**11.238**	**8.235**
%RSD	0.162	0.211	1.416	0.217	0.079	1.589	0.243	0.793	0.043

20000392

ted: 3/5/2010 16:42:37 User: ROY FRENCH

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	5.713	1.907	0.844	19.819	4.195	6.851	3.498	3.022	0.726
#2	5.712	1.901	0.842	19.830	4.199	6.978	3.497	3.027	0.734
Mean	**5.713**	**1.904**	**0.843**	**19.825**	**4.197**	**6.915**	**3.498**	**3.025**	**0.730**
%RSD	0.012	0.223	0.168	0.039	0.067	1.299	0.020	0.117	0.775

	Zr	Pb	Se
	Reading	Reading	Reading
#1	4.770		
#2	4.755		
Mean	**4.762**	**0.000**	**0.000**
%RSD	0.223	0.000	0.000

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:35
SampleId1 : A2 SampleId2 : [STD]
Analysis commenced : 3/5/2010 11:05:25
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE10

Raw intensities

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.048	622.497	6.873	1.863	0.366	5.810	3.205	1643.650	2.455
#2	2.044	625.121	6.832	1.849	0.362	5.834	3.179	1643.571	2.430
Mean	**2.046**	**623.809**	**6.853**	**1.856**	**0.364**	**5.822**	**3.192**	**1643.611**	**2.443**
%RSD	0.138	0.297	0.423	0.533	0.777	0.291	0.576	0.003	0.724

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	2.201	4.709	1.060	1289.162	453.084	1604.883	925.576	0.364	2.861
#2	2.189	4.671	1.056	1290.971	454.938	1611.431	926.963	0.362	2.896
Mean	**2.195**	**4.690**	**1.058**	**1290.066**	**454.011**	**1608.157**	**926.270**	**0.363**	**2.878**
%RSD	0.387	0.573	0.267	0.099	0.289	0.288	0.106	0.390	0.860

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	1687.474	4.553	1.798	79.342	22.801	0.207	7.211	14.022	10.354
#2	1690.575	4.520	1.769	79.167	22.845	0.210	7.275	14.131	10.347
Mean	**1689.025**	**4.537**	**1.784**	**79.255**	**22.823**	**0.209**	**7.243**	**14.077**	**10.351**
%RSD	0.130	0.514	1.150	0.156	0.136	1.017	0.625	0.548	0.048

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
#1	6.140	2.302	1.015	23.846	4.496	8.426	3.986	3.339	0.997
#2	6.148	2.301	1.010	23.758	4.478	8.461	3.970	3.319	1.004
Mean	**6.144**	**2.302**	**1.013**	**23.802**	**4.487**	**8.444**	**3.978**	**3.329**	**1.001**
%RSD	0.092	0.031	0.349	0.261	0.284	0.293	0.284	0.425	0.495

20000393

	Zr	Pb	SeCH
	Reading	Reading	Reading
#1	4.965		
#2	4.932		
Mean	**4.949**	**0.000**	**0.000**
%RSD	0.472	0.000	0.000

20000394

Line calibration information

Analyte	Reporting name	C0	C1	C2	C3	Correlation coefficient	Low limit	High limit	Date of last regression
Ag 328.068	Ag	0.0004439	0.0364494	0.0000076	0	1.0000	-0.037	54.241	3/5/2010 11:06:56
Al 308.215	Al	-0.0294991	0.3179484	0.0000305	0	1.0000	0.048	1387.138	3/5/2010 11:06:56
As 189.042/2	As	0.0047987	0.0375522	0.0000092	0	1.0000	-0.162	128.931	3/5/2010 11:06:57
B 249.678/2	B	-0.0054364	0.0396942	0.0000037	0	1.0000	0.082	246.377	3/5/2010 11:06:57
Ba 493.409	Ba	-0.0008008	0.028287	0.000004	0	1.0000	0.005	337.328	3/5/2010 11:06:57
Be 313.042	Be	-0.0041144	0.0007291	0.0000000	0	1.0000	5.379	1338.670	3/5/2010 11:06:58
Bi 223.061	Bi	0.0022025	0.0983725	0.0000089	0	1.0000	-0.061	50.574	3/5/2010 11:06:58
Ca 317.933	Ca	-0.0460628	0.1137314	0.0000089	0	0.99989	0.228	3474.558	3/5/2010 11:06:58
Cd 226.502/2	Cd	-0.0007406	0.0092335	0.0000009	0	1.0000	0.019	514.576	3/5/2010 11:06:59
Co 228.616	Co	0.0004514	0.0264184	0.0000041	0	1.0000	-0.037	184.042	3/5/2010 11:06:59
Cr 267.716	Cr	-0.0006658	0.0126797	0.0000003	0	1.0000	-0.015	776.556	3/5/2010 11:06:59
Cu 324.753	Cu	-0.0127872	0.0714282	0.0000029	0	1.0000	0.164	139.399	3/5/2010 11:07:00
Fe 259.94	Fe	-0.0092146	0.052918	0.0000088	0	1.0000	0.100	2619.289	3/5/2010 11:07:00
K 766.491	K	-2.8707046	0.2392683	-0.0000568	6.201016628	0.99999	10.412	1026.485	3/5/2010 11:07:00
Li 670.784	Li	-0.0028165	0.0028241	-0.0000003	5.301333428	0.99999	1.671	4013.054	3/5/2010 11:07:01
Mg 279.078	Mg	-0.0319448	0.2174352	0.0000087	0	0.99993	0.026	2121.831	3/5/2010 11:07:01
Mn 257.61	Mn	-0.0006479	0.0371699	0.0000102	0	1.0000	0.008	251.738	3/5/2010 11:07:01
Mo 202.03/2	Mo	-0.0013896	0.0260594	0.0000028	0	1.0000	0.017	369.045	3/5/2010 11:07:02
Na 588.995	Na	-0.2982385	0.0496532	0.0000024	2.004495795	1.0000	2.409	3212.867	3/5/2010 11:07:02
Ni 231.604	Ni	-0.0013252	0.0125436	0.0000006	0	1.0000	0.037	770.362	3/5/2010 11:07:03
P 178.287/2	P	-0.0086988	0.1002587	0.0000222	0	1.0000	0.039	453.321	3/5/2010 11:07:03
Pb 220.351	Pb I	0.0019693	0.00742	0.0000002	0	1.0000	-0.744	1309.983	3/5/2010 11:07:03
Pb 220.352/2	Pb II	-0.00314	0.0142056	0.0000004	0	1.0000	0.297	689.905	3/5/2010 11:07:04
S 182.04/2	S	-0.0151164	1.4168673	0.0012149	0	1.0000	0.008	34.292	3/5/2010 11:07:04
Sb 206.838/2	Sb	-0.0007006	0.0594592	0.000049	0	1.0000	-0.008	32.764	3/5/2010 11:07:04
Se 196.021	Se I	0.002541	0.0535419	0.0000254	0	1.0000	-0.054	89.531	3/5/2010 11:07:05
Se 196.021/2	Se II	-0.0033058	0.0347936	0.0000059	0	1.0000	0.138	140.444	3/5/2010 11:07:05
Si 288.158	Si	-0.1002395	0.0681305	0.0000037	0	1.0000	1.397	708.241	3/5/2010 11:07:05
Sn 189.989	Sn	-0.0012185	0.1216088	0.0000435	0	1.0000	-0.020	79.952	3/5/2010 11:07:06
Sr 421.552	Sr	-0.002517	0.0071498	0.000001	0	1.0000	0.047	1197.898	3/5/2010 11:07:06

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Th 283.73/2	Th	-0.0145038	0.0272223	0.000001	0	0.99999	0.484	73.801	3/5/2010 11:07:06
Ti 334.941	Ti	-0.0005164	0.0051444	0.0	0	1.0000	-0.063	1950.441	3/5/2010 11:07:07
Tl 190.864/2	Tl	0.0050985	0.0367871	0.0000053	0	1.0000	-0.156	133.235	3/5/2010 11:07:07
U 385.958	U	0.0045929	0.4957041	0.0000262	0	1.0000	-0.030	100.326	3/5/2010 11:07:07
V 292.402	V	-0.0001788	0.0187755	0.0000013	0	1.0000	-0.022	261.414	3/5/2010 11:07:08
Zn 206.2	Zn	-0.0016732	0.0686956	0.0000287	0	1.0000	0.015	137.685	3/5/2010 11:07:08
Zr 339.198	Zr	-0.0006182	0.0073463	0.0000000	0	1.0000	0.049	679.665	3/5/2010 11:07:08

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:46
SampleId1 : MIXBHIGH SampleId2 : [CV]
Analysis commenced : 3/5/2010 11:07:38
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.03271	0.03885	5.08806	10.11286	10.00116	1.00754	0.00307	-0.04527	5.08322
#2	2.03282	0.03699	5.09678	10.13471	10.01223	1.00741	0.00684	-0.04754	5.09710
Mean	**2.03277**	**0.03792**	**5.09242**	**10.12379**	**10.00670**	**1.00748**	**0.00496**	**-0.04640**	**5.09016**
%RSD	0.00390	3.46434	0.12101	0.15265	0.07823	0.00902	53.80477	3.46609	0.19279

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	5.08228	10.14355	10.09337	-0.01451	-0.27172	0.00250	-0.05434	10.06622	10.20501
#2	5.08498	10.14873	10.10521	-0.01567	-0.27410	0.00246	-0.05521	10.07549	10.21888
Mean	**5.08363**	**10.14614**	**10.09929**	**-0.01509**	**-0.27291**	**0.00248**	**-0.05478**	**10.07085**	**10.21194**
%RSD	0.03750	0.03610	0.08293	5.45570	0.61679	1.28904	1.12276	0.06507	0.09602

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.11484	10.31724	50.57306	10.19697	10.11161	-0.00095	1.99869	5.06837	5.01595
#2	-0.11608	10.33508	50.49976	10.19656	10.06733	-0.01653	2.01443	5.06628	4.99393
Mean	**-0.11546**	**10.32616**	**50.53641**	**10.19676**	**10.08947**	**-0.00874**	**2.00656**	**5.06732**	**5.00494**
%RSD	0.76050	0.12212	0.10257	0.00282	0.31033	126.08907	0.55471	0.02919	0.31111

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.90816	10.25316	10.19965	1.98907	9.99552	5.12423	-0.05488	5.05461	10.16982
#2	50.09370	10.25561	10.17511	1.99154	9.99623	5.14909	-0.05290	5.05137	10.18662
Mean	**50.00093**	**10.25438**	**10.18738**	**1.99031**	**9.99588**	**5.13666**	**-0.05389**	**5.05299**	**10.17822**
%RSD	0.26239	0.01686	0.17033	0.08796	0.00506	0.34214	2.60274	0.04527	0.11673

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.04072	10.14004	5.03340
#2	-0.04113	10.11037	5.01802
Mean	**-0.04092**	**10.12520**	**5.02571**
%RSD	0.70101	0.20720	0.21646

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:47
SampleId1 : MIXAHIGH SampleId2 : [CV]
Analysis commenced : 3/5/2010 11:09:29
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE11

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00040	504.37528	0.00371	0.01735	0.00050	0.00062	0.01145	503.30803	-0.00032
#2	-0.00094	504.69220	0.00149	0.01529	0.00059	0.00060	0.01489	503.48237	-0.00039
Mean	**-0.00067**	**504.53374**	**0.00260**	**0.01632**	**0.00054**	**0.00061**	**0.01317**	**503.39520**	**-0.00036**
%RSD	57.63850	0.04442	60.21010	8.94572	11.05406	2.41364	18.48500	0.02449	13.46225

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00043	0.00409	-0.00829	198.21109	252.90632	10.10943	500.99375	-0.00626	-0.00001
#2	0.00019	0.00393	-0.00814	198.30478	253.37174	10.10553	501.10493	-0.00641	-0.00043
Mean	**0.00031**	**0.00401**	**-0.00821**	**198.25794**	**253.13903**	**10.10748**	**501.04934**	**-0.00633**	**-0.00022**
%RSD	54.17058	2.88737	1.24359	0.03342	0.13001	0.02732	0.01569	1.65951	135.91441

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	252.55241	-0.00003	0.01697	-0.01138	0.01109	0.02314	0.00497	-0.00152	0.00104
#2	252.59661	-0.00001	0.01857	-0.00918	0.00867	0.02314	0.00354	0.00566	-0.00395
Mean	**252.57451**	**-0.00002**	**0.01777**	**-0.01028**	**0.00988**	**0.02314**	**0.00425**	**0.00207**	**-0.00145**
%RSD	0.01237	85.90819	6.38358	15.12803	17.34993	0.00000	23.77123	245.05830	242.76384

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00008	-0.00146	0.00315	0.00677	-0.00141	-0.00523	0.08973	-0.00336	0.02285
#2	-0.00600	-0.00061	0.00321	0.00789	-0.00150	-0.01003	0.08768	-0.00370	0.02375
Mean	**-0.00304**	**-0.00103**	**0.00318**	**0.00733**	**-0.00146**	**-0.00763**	**0.08871**	**-0.00353**	**0.02330**
%RSD	137.81314	58.20037	1.27133	10.74244	4.49138	44.51059	1.63151	6.77425	2.71086

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00299	0.00361	0.00019
#2	0.00281	0.00272	-0.00075
Mean	**0.00290**	**0.00316**	**-0.00028**
%RSD	4.39530	19.75426	237.14014

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:47
SampleId1 : MIXCHIGH SampleId2 : [CV]
Analysis commenced : 3/5/2010 11:11:19
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE14

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00130	-0.00354	-0.00192	0.02187	-0.00137	0.00383	4.96606	0.02263	-0.00123
#2	0.00123	-0.01188	-0.00496	0.02160	-0.00139	0.00380	4.95746	0.01661	-0.00151
Mean	**0.00127**	**-0.00771**	**-0.00344**	**0.02174**	**-0.00138**	**0.00381**	**4.96176**	**0.01962**	**-0.00137**
%RSD	4.03635	76.52248	62.45221	0.90404	1.44870	0.70434	0.12254	21.72603	14.67302

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00424	-0.00883	0.00162	-0.00429	-0.28839	0.00282	-0.36090	0.00385	-0.00092
#2	0.00508	-0.00864	0.00203	-0.00720	-0.27767	0.00271	-0.35525	0.00381	-0.00100
Mean	**0.00466**	**-0.00873**	**0.00183**	**-0.00575**	**-0.28303**	**0.00276**	**-0.35808**	**0.00383**	**-0.00096**
%RSD	12.83082	1.55355	15.54935	35.80203	2.67639	2.67186	1.11624	0.68606	5.76066

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.16083	-0.00089	0.01085	-0.00729	0.00391	49.65277	0.00129	-0.01393	-0.00054
#2	-0.16451	-0.00084	0.00875	-0.00245	0.00306	49.44135	0.00229	-0.00578	0.00072
Mean	**-0.16267**	**-0.00086**	**0.00980**	**-0.00487**	**0.00349**	**49.54706**	**0.00179**	**-0.00985**	**0.00009**
%RSD	1.59763	4.12028	15.19316	70.35073	17.17197	0.30173	39.83264	58.49094	1002.47365

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03438	0.01689	-0.00056	-0.33001	0.00867	-0.00111	49.49932	-0.00730	-0.00257
#2	-0.03286	0.01580	-0.00060	-0.33148	0.00873	0.00114	49.25839	-0.00654	-0.00167
Mean	**-0.03362**	**0.01634**	**-0.00058**	**-0.33075**	**0.00870**	**0.00002**	**49.37886**	**-0.00692**	**-0.00212**
%RSD	3.20077	4.73573	5.23659	0.31482	0.50190	10583.76149	0.34501	7.66787	29.78978

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	5.02082	0.00018	-0.00500
#2	4.99830	0.00123	-0.00145
Mean	**5.00956**	**0.00071**	**-0.00322**
%RSD	0.31788	105.04739	77.94680

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:47
SampleId1 : ICV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 11:15:07
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD1

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10070	25.54977	0.26179	0.49721	0.50259	0.25865	0.25586	24.88767	0.25177
#2	0.10122	25.37311	0.26277	0.49490	0.50160	0.25843	0.25654	24.83441	0.25099
Mean	**0.10096**	**25.46144**	**0.26228**	**0.49606**	**0.50209**	**0.25854**	**0.25620**	**24.86104**	**0.25138**
%RSD	0.36273	0.49064	0.26412	0.32895	0.14013	0.05963	0.18788	0.15148	0.21867

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.25710	0.51151	0.49720	10.32908	24.55582	0.24448	25.49994	0.50712	0.49722
#2	0.25667	0.51088	0.49520	10.30951	24.39654	0.24318	25.43520	0.50596	0.49879
Mean	**0.25688**	**0.51119**	**0.49620**	**10.31930**	**24.47618**	**0.24383**	**25.46757**	**0.50654**	**0.49800**
%RSD	0.11653	0.08755	0.28474	0.13409	0.46016	0.37639	0.17976	0.16205	0.22293

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	24.93942	0.51230	2.48944	0.49766	0.49615	2.48660	0.24379	0.51054	0.50299
#2	24.75597	0.51111	2.46156	0.50005	0.49559	2.48375	0.24674	0.50735	0.50837
Mean	**24.84770**	**0.51171**	**2.47550**	**0.49886**	**0.49587**	**2.48518**	**0.24527**	**0.50895**	**0.50568**
%RSD	0.52206	0.16354	0.79614	0.33980	0.07916	0.08087	0.85143	0.44323	0.75255

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.41920	0.50990	0.25072	0.06647	0.24409	0.25683	2.50749	0.24982	0.52359
#2	2.40902	0.50661	0.25012	0.06712	0.24315	0.25753	2.50353	0.24874	0.52442
Mean	**2.41411**	**0.50825**	**0.25042**	**0.06679**	**0.24362**	**0.25718**	**2.50551**	**0.24928**	**0.52400**
%RSD	0.29814	0.45802	0.16922	0.68294	0.27470	0.19094	0.11160	0.30522	0.11195

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.49608	0.49665	0.50551
#2	0.49499	0.49708	0.50803
Mean	**0.49553**	**0.49686**	**0.50677**
%RSD	0.15556	0.06092	0.35265

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:48
SampleId1 : ICB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 11:16:59
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00090	0.02836	0.00206	0.00437	-0.00035	0.00010	0.00062	-0.01820	-0.00033
#2	-0.00073	0.03111	0.00052	0.00461	-0.00035	0.00010	0.00181	-0.02059	-0.00006
Mean	**-0.00081**	**0.02973**	**0.00129**	**0.00449**	**-0.00035**	**0.00010**	**0.00121**	**-0.01939**	**-0.00020**
%RSD	14.78872	6.55039	84.54683	3.75308	0.00000	1.46437	68.99124	8.70906	97.36905

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00002	-0.00042	-0.00064	0.00095	-0.27815	0.00222	-0.01281	-0.00009	0.00023
#2	-0.00023	-0.00014	-0.00065	-0.00001	-0.28386	0.00221	-0.01020	-0.00009	0.00002
Mean	**-0.00013**	**-0.00028**	**-0.00064**	**0.00047**	**-0.28101**	**0.00221**	**-0.01151**	**-0.00009**	**0.00012**
%RSD	116.23891	71.66862	1.61022	143.42520	1.43768	0.27052	16.03551	0.00000	120.98004

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.17260	-0.00047	-0.00168	0.00054	-0.00057	-0.00662	0.00133	0.00060	-0.00184
#2	-0.17528	-0.00018	0.00042	-0.00126	-0.00134	-0.00378	0.00186	0.00303	-0.00226
Mean	**-0.17394**	**-0.00033**	**-0.00063**	**-0.00036**	**-0.00095**	**-0.00520**	**0.00159**	**0.00182**	**-0.00205**
%RSD	1.09025	62.20195	237.15097	352.79310	57.04089	38.54706	23.55433	94.39334	14.39506

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00694	-0.00195	-0.00223	-0.00373	-0.00081	-0.00076	-0.01177	0.00001	-0.00071

20000400

#2	-0.00500	-0.00085	-0.00223	-0.00218	-0.00084	0.00245	0.00707	-0.00003	-0.00064
Mean	**-0.00597**	**-0.00140**	**-0.00223**	**-0.00296**	**-0.00082**	**0.00085**	**-0.00235**	**-0.00001**	**-0.00068**
%RSD	23.06229	55.28339	0.00000	37.05797	2.21129	267.72132	567.47825	275.11909	7.17352

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00038	-0.00020	-0.00103
#2	0.00014	-0.00131	-0.00050
Mean	**0.00026**	**-0.00076**	**-0.00076**
%RSD	65.31085	103.89925	48.88724

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:48
SampleId1 : CRI **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/5/2010 11:18:51
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD3

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02064	0.44999	0.01118	0.42827	0.43373	0.01049	0.04760	5.32038	0.01038
#2	0.02104	0.44544	0.01054	0.42612	0.43015	0.01040	0.05380	5.28670	0.01056
Mean	**0.02084**	**0.44771**	**0.01086**	**0.42719**	**0.43194**	**0.01044**	**0.05070**	**5.30354**	**0.01047**
%RSD	1.34077	0.71841	4.15557	0.35552	0.58601	0.55804	8.64860	0.44908	1.21417

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10625	0.02052	0.05290	0.21759	3.83268	0.01847	5.39718	0.03136	0.02110
#2	0.10561	0.02152	0.05318	0.21648	3.77127	0.01827	5.34837	0.03110	0.01977
Mean	**0.10593**	**0.02102**	**0.05304**	**0.21704**	**3.80198**	**0.01837**	**5.37278**	**0.03123**	**0.02044**
%RSD	0.42694	3.35675	0.37322	0.36257	1.14231	0.73804	0.64228	0.58934	4.59916

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.39218	0.08508	0.21830	0.00617	0.00467	0.21587	0.12602	0.01557	0.01002
#2	4.32779	0.08508	0.21449	0.00862	0.00459	0.21445	0.12808	0.00856	0.00883
Mean	**4.35998**	**0.08508**	**0.21639**	**0.00739**	**0.00463**	**0.21516**	**0.12705**	**0.01206**	**0.00942**
%RSD	1.04422	0.00000	1.24617	23.47935	1.21170	0.46578	1.15030	41.08315	8.87926

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10610	0.10982	0.01931	0.09501	0.02012	0.02099	0.21909	0.10706	0.03997
#2	0.10561	0.10666	0.01921	0.09215	0.02001	0.02092	0.22653	0.10633	0.04024
Mean	**0.10586**	**0.10824**	**0.01926**	**0.09358**	**0.02007**	**0.02096**	**0.22281**	**0.10669**	**0.04010**
%RSD	0.32972	2.06677	0.39408	2.16066	0.38064	0.23306	2.36011	0.48584	0.48473

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.05336	0.00517	0.01186
#2	0.05353	0.00593	0.00874

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Mean	**0.05344**	**0.00555**	**0.01030CH**
%RSD	0.23213	9.73860	21.43570

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:48
SampleId1 : ICSA **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/5/2010 11:20:42
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD4

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00028	275.91011	-0.00065	0.00123	-0.00024	0.00040	0.01106	276.77218	0.00009
#2	-0.00019	278.91710	0.00059	0.00076	-0.00026	0.00041	0.00909	279.08061	-0.00033
Mean	**0.00005**	**277.41360**	**-0.00003**	**0.00099**	**-0.00025**	**0.00041**	**0.01007**	**277.92640**	**-0.00012**
%RSD	700.76650	0.76646	3289.21156	33.87982	8.02661	1.61413	13.80247	0.58732	255.90334

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00167	-0.00066	-0.00454	114.00213	-0.45791	0.00365	284.75719	-0.00095	-0.00113
#2	0.00140	-0.00059	-0.00433	114.90077	-0.46315	0.00367	287.04577	-0.00076	-0.00053
Mean	**0.00154**	**-0.00063**	**-0.00444**	**114.45145**	**-0.46053**	**0.00366**	**285.90148**	**-0.00085**	**-0.00083**
%RSD	12.18468	7.11354	3.40393	0.55520	0.80441	0.27274	0.56602	15.41881	51.10399

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.17801	0.00067	0.00744	-0.00024	0.00026	0.00897	0.00709	0.00310	-0.00164
#2	-0.17821	0.00170	0.00905	0.00426	-0.00098	0.00755	0.00638	0.01139	-0.00363
Mean	**-0.17811**	**0.00118**	**0.00825**	**0.00201**	**-0.00036**	**0.00826**	**0.00673**	**0.00725**	**-0.00264**
%RSD	0.07887	61.45269	13.75745	158.46672	241.20773	12.12630	7.44946	80.96278	53.24756

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00814	0.00109	0.01099	-0.01032	-0.00154	-0.00168	0.05486	-0.00121	-0.00030
#2	-0.00814	0.00158	0.01115	-0.00721	-0.00123	0.00453	0.05574	-0.00108	-0.00037
Mean	**-0.00814**	**0.00134**	**0.01107**	**-0.00877**	**-0.00138**	**0.00142**	**0.05530**	**-0.00115**	**-0.00033**
%RSD	0.00726	25.70919	1.00516	25.12178	15.80801	308.06540	1.11919	8.43518	14.55804

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00294	0.00009	-0.00007
#2	0.00281	0.00076	0.00137
Mean	**0.00288**	**0.00043**	**0.00065**
%RSD	3.26503	111.75343	155.56323

20000402

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:49
SampleId1 : ICSAB **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/5/2010 11:22:34
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD5

Final concentrations:**34** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.21563	281.49051	0.11607	1.05749	0.53461	0.50729	0.55404	280.02335	1.06299
#2	0.21510	281.68626	0.11656	1.05781	0.53572	0.50754	0.55276	280.13812	1.06258
Mean	**0.21536**	**281.58839**	**0.11632**	**1.05765**	**0.53516**	**0.50742**	**0.55340**	**280.08073**	**1.06279**
%RSD	0.17552	0.04916	0.29721	0.02134	0.14655	0.03413	0.16265	0.02897	0.02725

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49254	0.49408	0.53442	115.62464	-0.46625	1.11477	289.16542	0.49042	1.04408
#2	0.49283	0.49400	0.53390	115.70072	-0.46292	1.11592	289.18674	0.49079	1.04505
Mean	**0.49269**	**0.49404**	**0.53416**	**115.66268**	**-0.46458**	**1.11535**	**289.17608**	**0.49060**	**1.04457**
%RSD	0.04187	0.01106	0.06888	0.04651	0.50744	0.07257	0.00521	0.05396	0.06584

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.18626	0.99098	1.05251	0.05346	0.05877	1.06382	0.64191	0.05656	0.05447
#2	-0.18671	0.99603	1.05291	0.05520	0.05923	1.06808	0.64070	0.06768	0.05792
Mean	**-0.18648**	**0.99351**	**1.05271**	**0.05433**	**0.05900**	**1.06595**	**0.64130**	**0.06212**	**0.05619**
%RSD	0.16948	0.35967	0.02706	2.26885	0.54126	0.28234	0.13242	12.65099	4.35013

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.99784	1.06516	1.05541	-0.02403	0.98985	0.10310	10.61548	0.50450	0.93824
#2	0.99556	1.06112	1.05766	-0.02628	0.99083	0.11425	10.64127	0.50433	0.93990
Mean	**0.99670**	**1.06314**	**1.05654**	**-0.02515**	**0.99034**	**0.10868**	**10.62837**	**0.50441**	**0.93907**
%RSD	0.16233	0.26866	0.15089	6.31376	0.06974	7.25236	0.17154	0.02435	0.12556

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.52280	0.05700	0.05516
#2	0.52407	0.05789	0.06117
Mean	**0.52344**	**0.05744**	**0.05817**
%RSD	0.17232	1.08536	7.30208

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:49
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 11:24:26
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

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	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19964	50.63852	0.51313	0.98984	0.99361	0.50476	0.50137	49.39465	0.50002
#2	0.19995	50.60563	0.51518	0.99295	0.99658	0.50493	0.51506	49.40932	0.49913
Mean	**0.19980**	**50.62207**	**0.51416**	**0.99140**	**0.99510**	**0.50484**	**0.50822**	**49.40199**	**0.49958**
%RSD	0.10937	0.04593	0.28074	0.22187	0.21113	0.02313	1.90551	0.02100	0.12619

ted: 3/5/2010 16:43:34 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50094	0.99869	0.98046	20.54425	49.92090	0.51497	50.72728	0.98900	0.99733
#2	0.50137	0.99798	0.98173	20.54592	49.94432	0.51522	50.70735	0.98930	0.99830
Mean	**0.50115**	**0.99833**	**0.98110**	**20.54509**	**49.93261**	**0.51509**	**50.71732**	**0.98915**	**0.99781**
%RSD	0.06049	0.05028	0.09169	0.00572	0.03316	0.03397	0.02779	0.02156	0.06889

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.20660	1.01557	4.92130	0.97399	0.97714	4.94455	0.48955	1.01293	1.01970
#2	49.12677	1.01900	4.90757	0.97503	0.96656	4.93172	0.49523	1.01861	1.01200
Mean	**49.16669**	**1.01729**	**4.91443**	**0.97451**	**0.97185**	**4.93813**	**0.49239**	**1.01577**	**1.01585**
%RSD	0.11481	0.23890	0.19746	0.07602	0.77050	0.18369	0.81581	0.39560	0.53564

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.80400	1.00801	0.49843	0.13772	0.47463	0.51158	4.90213	0.48632	1.02638
#2	4.80301	1.00618	0.49980	0.13727	0.47491	0.50672	4.92148	0.48777	1.02756
Mean	**4.80350**	**1.00710**	**0.49912**	**0.13750**	**0.47477**	**0.50915**	**4.91181**	**0.48704**	**1.02697**
%RSD	0.01453	0.12886	0.19311	0.22823	0.04213	0.67550	0.27859	0.21071	0.08141

	Zr	Pb	Se
	ppm	calc	calc
#1	0.98025	0.97609	1.01744
#2	0.98187	0.96938	1.01420
Mean	**0.98106**	**0.97274**	**1.01582**
%RSD	0.11650	0.48809	0.22556

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:49
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/5/2010 11:26:17
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00061	0.06597	-0.00035	0.00171	0.00019	0.00039	-0.00134	0.01149	-0.00010
#2	-0.00087	0.06956	-0.00211	0.00147	0.00013	0.00036	0.00033	0.00887	-0.00029
Mean	**-0.00074**	**0.06777**	**-0.00123**	**0.00159**	**0.00016**	**0.00038**	**-0.00051**	**0.01018**	**-0.00020**
%RSD	24.70606	3.73757	101.60319	10.59465	24.85231	5.05074	232.79769	18.17182	68.69764

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00002	-0.00034	-0.00078	0.01259	-0.31743	0.00225	0.01567	0.00032	-0.00014
#2	0.00000	-0.00009	-0.00107	0.01227	-0.33886	0.00223	0.01241	0.00036	0.00007
Mean	**-0.00001**	**-0.00022**	**-0.00092**	**0.01243**	**-0.32815**	**0.00224**	**0.01404**	**0.00034**	**-0.00003**
%RSD	193.49642	81.59882	22.02386	1.80642	4.61727	0.71185	16.42286	7.79601	427.20962

20000404

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.15432	-0.00003	-0.00278	-0.00314	0.00070	0.00189	-0.00111	-0.00357	-0.00118
#2	-0.15845	-0.00053	0.00032	-0.00105	0.00211	-0.00236	0.00001	0.00114	0.00101
Mean	**-0.15638**	**-0.00028**	**-0.00123**	**-0.00210**	**0.00140**	**-0.00024**	**-0.00055**	**-0.00121**	**-0.00009**
%RSD	1.86395	124.89634	178.77333	70.48534	71.41192	1256.81746	145.13009	274.92953	1817.01806

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00613	-0.00329	-0.00199	0.00038	-0.00053	-0.00447	-0.00830	-0.00003	-0.00009
#2	-0.00620	-0.00195	-0.00203	-0.00257	-0.00049	-0.00369	-0.00533	-0.00016	-0.00064
Mean	**-0.00617**	**-0.00262**	**-0.00201**	**-0.00110**	**-0.00051**	**-0.00408**	**-0.00682**	**-0.00009**	**-0.00037**
%RSD	0.82338	36.15116	1.50968	189.94624	5.69182	13.41458	30.85419	101.20502	105.59445

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00032	-0.00058	-0.00198
#2	0.00043	0.00106	0.00106
Mean	**0.00038**	**0.00024**	**-0.00046**
%RSD	20.31031	488.19918	465.41395

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:50
SampleId1 : IP100304-2MB SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:28:09
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE1

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00003	0.03109	-0.00031	0.00171	-0.00057	-0.00013	0.00239	-0.02184	-0.00023
#2	0.00045	0.02381	0.00010	0.00151	-0.00055	-0.00016	-0.00016	-0.02252	-0.00071
Mean	**0.00021**	**0.02745**	**-0.00010**	**0.00161**	**-0.00056**	**-0.00015**	**0.00111**	**-0.02218**	**-0.00047**
%RSD	159.27954	18.76436	287.07183	8.71999	3.56952	12.59349	162.26472	2.17567	72.33363

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00005	-0.00078	-0.00157	-0.00318	-0.38767	0.00185	-0.02651	-0.00035	-0.00126
#2	0.00000	-0.00047	-0.00121	-0.00323	-0.40005	0.00185	-0.02825	-0.00035	-0.00162
Mean	**-0.00002**	**-0.00063**	**-0.00139**	**-0.00321**	**-0.39386**	**0.00185**	**-0.02738**	**-0.00035**	**-0.00144**
%RSD	159.97311	34.35852	18.12151	1.16634	2.22293	0.10777	4.49256	0.00000	17.89352

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.18765	-0.00125	0.00093	-0.00090	-0.00177	-0.00095	0.00197	0.00280	-0.00129
#2	-0.18849	-0.00051	0.00373	0.00212	-0.00054	-0.01370	0.00090	-0.00180	0.00073
Mean	**-0.18807**	**-0.00088**	**0.00233**	**0.00061**	**-0.00115**	**-0.00732**	**0.00143**	**0.00050**	**-0.00028**
%RSD	0.31743	59.47463	85.19948	348.20040	75.71536	123.12278	53.07877	647.71735	511.33673

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

20000405

	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00771	-0.00219	-0.00239	-0.00177	-0.00086	-0.00215	-0.00532	-0.00029	0.00204
#2	-0.00635	-0.00256	-0.00240	-0.00233	-0.00071	0.00219	-0.00433	-0.00033	0.00162
Mean	**-0.00703**	**-0.00237**	**-0.00239**	**-0.00205**	**-0.00079**	**0.00002**	**-0.00482**	**-0.00031**	**0.00183**
%RSD	13.68040	10.87689	0.21137	19.21481	13.41271	16621.02271	14.53491	8.54508	15.92430

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00008	-0.00148	0.00007
#2	0.00014	0.00035	-0.00011
Mean	**0.00011**	**-0.00056**	**-0.00002**
%RSD	41.90085	229.16141	703.85020

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:50
SampleId1 : IP100304-2RVS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:29:55
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00153	0.11717	0.00454	0.00703	0.00423	0.00093	0.00783	0.47831	0.00197
#2	0.00174	0.12420	0.00303	0.00727	0.00435	0.00092	0.00617	0.47706	0.00157
Mean	**0.00164**	**0.12069**	**0.00378**	**0.00715**	**0.00429**	**0.00093**	**0.00700**	**0.47769**	**0.00177**
%RSD	8.68466	4.11924	28.06310	2.35647	1.86464	0.76968	16.81088	0.18532	16.20628

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00145	0.00377	0.00376	0.10137	0.33449	0.00520	0.47734	0.00448	0.00888
#2	0.00169	0.00452	0.00410	0.10163	0.34305	0.00521	0.47581	0.00448	0.00935
Mean	**0.00157**	**0.00414**	**0.00393**	**0.10150**	**0.33877**	**0.00520**	**0.47658**	**0.00448**	**0.00911**
%RSD	10.69074	12.76268	6.08492	0.18445	1.78671	0.15339	0.22587	0.00000	3.64006

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.59789	0.00468	0.10502	0.00326	0.00504	0.10249	0.01028	0.00529	0.00506
#2	0.59669	0.00508	0.10221	0.00389	0.00358	0.09824	0.01039	0.00617	0.00346
Mean	**0.59729**	**0.00488**	**0.10362**	**0.00358**	**0.00431**	**0.10037**	**0.01034**	**0.00573**	**0.00426**
%RSD	0.14132	5.81163	1.91665	12.47568	23.89618	2.99508	0.78812	10.80948	26.57701

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02362	0.00924	0.00252	-0.00178	0.00395	0.00767	0.02881	0.00407	0.00554
#2	0.02454	0.00972	0.00255	-0.00125	0.00409	0.01030	0.05310	0.00467	0.00588
Mean	**0.02408**	**0.00948**	**0.00254**	**-0.00152**	**0.00402**	**0.00899**	**0.04096**	**0.00437**	**0.00571**
%RSD	2.69877	3.62779	0.79682	24.93694	2.44418	20.66427	41.93364	9.73211	4.25251

	Zr	**Pb**	**Se**
	ppm	calc	calc

20000406

#1	0.00485	0.00444	0.00514	**CH**
#2	0.00508	0.00368	0.00436	
Mean	**0.00496**	**0.00406**	**0.00475**	
%RSD	3.27953	13.23793	11.55200	

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:50
SampleId1 : IP100304-2LCS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:31:41
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE3

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10020	2.09440	2.06341	0.98769	2.00063	0.04780	0.00042	39.52278	0.05038
#2	0.10064	2.10694	2.07158	0.99706	2.01555	0.04800	0.00102	39.58171	0.05073
Mean	**0.10042**	**2.10067**	**2.06750**	**0.99237**	**2.00809**	**0.04790**	**0.00072**	**39.55225**	**0.05055**
%RSD	0.30510	0.42214	0.27954	0.66779	0.52529	0.29890	58.61596	0.10536	0.49077

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.48143	0.19269	0.25026	1.00860	38.31182	0.51732	40.42536	0.47878	0.99843
#2	0.48293	0.19285	0.25190	1.01174	38.47310	0.51943	40.52884	0.48113	1.00379
Mean	**0.48218**	**0.19277**	**0.25108**	**1.01017**	**38.39246**	**0.51837**	**40.47710**	**0.47995**	**1.00111**
%RSD	0.22078	0.05943	0.46161	0.21994	0.29704	0.28703	0.18079	0.34743	0.37860

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	38.28104	0.48706	0.00604	0.46851	0.47176	-0.00095	0.49676	2.06085	2.05651
#2	38.37034	0.48959	0.00514	0.47259	0.46807	-0.00095	0.50126	2.07250	2.05942
Mean	**38.32569**	**0.48832**	**0.00559**	**0.47055**	**0.46991**	**-0.00095**	**0.49901**	**2.06668**	**2.05796**
%RSD	0.16476	0.36638	11.41768	0.61370	0.55668	0.00000	0.63816	0.39869	0.10000

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.94825	0.50511	0.49663	-0.01256	0.47956	2.05989	-0.01592	0.49337	0.46492
#2	1.96275	0.50109	0.49995	-0.01723	0.48101	2.08123	-0.01047	0.49416	0.46443
Mean	**1.95550**	**0.50310**	**0.49829**	**-0.01489**	**0.48029**	**2.07056**	**-0.01320**	**0.49376**	**0.46468**
%RSD	0.52442	0.56595	0.47062	22.20645	0.21427	0.72894	29.20547	0.11344	0.07359

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00015	0.47068	2.05795
#2	0.00005	0.46957	2.06378
Mean	**-0.00005**	**0.47013**	**2.06087**
%RSD	299.20138	0.16659	0.19974

20000407

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:50
SampleId1 : 1002192-1 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:33:26

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE4

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00044	0.01820	0.00131	0.00409	0.00033	-0.00019	-0.00085	-0.01206	-0.00042
#2	0.00008	0.01516	0.00048	0.00310	-0.00012	-0.00021	0.00092	-0.01945	-0.00036
Mean	**0.00026**	**0.01668**	**0.00089**	**0.00359**	**0.00010**	**-0.00020**	**0.00003**	**-0.01575**	**-0.00039**
%RSD	96.41017	12.87863	65.38919	19.52373	306.56448	6.02656	3872.22343	33.18490	11.16770

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00024	-0.00045	-0.00136	-0.00493	-0.38100	0.00200	-0.01194	-0.00028	-0.00084
#2	0.00003	-0.00050	-0.00135	-0.00519	-0.39457	0.00191	-0.02064	-0.00035	-0.00087
Mean	**0.00014**	**-0.00047**	**-0.00136**	**-0.00506**	**-0.38779**	**0.00196**	**-0.01629**	**-0.00031**	**-0.00086**
%RSD	110.13674	7.05403	0.26095	3.69720	2.47480	3.36643	37.75482	16.77620	2.15422

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.17359	-0.00053	0.00865	0.00074	-0.00152	-0.00378	0.00060	0.00056	-0.00098
#2	-0.17881	-0.00109	0.00353	-0.00013	-0.00026	-0.01512	-0.00058	0.00114	-0.00021
Mean	**-0.17620**	**-0.00081**	**0.00609**	**0.00031**	**-0.00089**	**-0.00945**	**0.00001**	**0.00085**	**-0.00059**
%RSD	2.09273	48.12753	59.37398	200.77104	99.55594	84.82552	7987.41215	48.44945	91.35646

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00921	-0.00158	-0.00216	-0.00399	-0.00089	0.00013	0.00013	0.00010	0.00087
#2	-0.00907	-0.00304	-0.00228	-0.00320	-0.00075	-0.00083	-0.00631	-0.00022	0.00066
Mean	**-0.00914**	**-0.00231**	**-0.00222**	**-0.00360**	**-0.00082**	**-0.00035**	**-0.00309**	**-0.00006**	**0.00077**
%RSD	1.12773	44.63609	3.87104	15.61370	11.53478	194.55350	147.60363	391.15609	19.03758

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00028	-0.00077	-0.00046
#2	-0.00010	-0.00022	0.00024
Mean	**-0.00019**	**-0.00049**	**-0.00011**
%RSD	69.19819	78.66589	447.01552

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:51
SampleId1 : 1002192-2 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:35:11
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE5

20000408

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00038	0.02147	0.00386	0.11122	0.03887	-0.00011	-0.00155	140.84401	-0.00018
#2	0.00037	0.01948	0.00172	0.11058	0.03901	-0.00011	-0.00164	141.89467	-0.00029

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Mean	**0.00000**	**0.02048**	**0.00279**	**0.11090**	**0.03894**	**-0.00011**	**-0.00159**	**141.36934**	**-0.00023**
%RSD	18977.34566	6.88346	54.25419	0.40517	0.25696	2.14187	4.10652	0.52553	34.72031

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00001	0.00495	-0.00120	0.00751	5.10369	0.02975	69.86246	0.00006	0.01344
#2	0.00011	0.00517	-0.00093	0.00788	5.13857	0.02990	70.28924	0.00010	0.01393
Mean	**0.00006**	**0.00506**	**-0.00107**	**0.00769**	**5.12113**	**0.02982**	**70.07585**	**0.00008**	**0.01369**
%RSD	125.08340	3.04389	17.90374	3.40491	0.48158	0.37405	0.43065	34.15748	2.55834

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	68.83646	0.17848	0.00694	0.00029	-0.00209	160.78836	-0.00094	0.01040	0.00498
#2	69.26680	0.18055	0.00193	0.00223	-0.00242	161.91450	0.00020	0.00726	0.00567
Mean	**69.05163**	**0.17952**	**0.00444**	**0.00126**	**-0.00226**	**161.35143**	**-0.00037**	**0.00883**	**0.00532**
%RSD	0.44068	0.81632	79.92043	108.96119	10.36082	0.49352	216.73272	25.18027	9.23857

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	12.68015	0.00012	5.83300	-0.02080	-0.00144	-0.00197	-0.01673	0.00179	0.03289
#2	12.77277	-0.00146	5.89287	-0.02194	-0.00146	-0.00086	0.00310	0.00206	0.03351
Mean	**12.72646**	**-0.00067**	**5.86294**	**-0.02137**	**-0.00145**	**-0.00142**	**-0.00681**	**0.00193**	**0.03320**
%RSD	0.51462	166.95538	0.72203	3.76082	1.25424	55.65002	205.77471	9.65529	1.31747

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00116	-0.00130	0.00678
#2	-0.00097	-0.00087	0.00620
Mean	**-0.00106**	**-0.00109**	**0.00649**
%RSD	12.47894	27.70948	6.34775

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:51
SampleId1 : 1002192-3 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 11:36:57
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00010	0.01848	0.00348	0.10911	0.03878	-0.00016	-0.00528	139.47801	-0.00055
#2	0.00059	0.01914	0.00187	0.11014	0.03853	-0.00015	-0.00232	139.55470	-0.00002
Mean	**0.00025**	**0.01881**	**0.00268**	**0.10963**	**0.03865**	**-0.00016**	**-0.00380**	**139.51636**	**-0.00029**
%RSD	197.98930	2.46631	42.65095	0.66604	0.46591	1.68726	54.93047	0.03887	129.65538

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00026	0.00458	-0.00015	0.00947	5.08130	0.02982	69.41457	0.00006	0.01315
#2	0.00024	0.00506	0.00014	0.00978	5.07800	0.02972	69.41078	0.00010	0.01313
Mean	**-0.00001**	**0.00482**	**0.00000**	**0.00963**	**5.07965**	**0.02977**	**69.41267**	**0.00008**	**0.01314**

20000409

%RSD	5516.35997	7.05552	7413.35449	2.33280	0.04593	0.23419	0.00386	34.15748	0.14026

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	69.11147	0.17709	0.00514	-0.00188	0.00007	160.50449	-0.00141	0.01261	0.00487
#2	68.91168	0.17837	0.00584	0.00506	-0.00157	160.14224	0.00144	0.01207	0.00494
Mean	**69.01158**	**0.17773**	**0.00549**	**0.00159**	**-0.00075**	**160.32336**	**0.00002**	**0.01234**	**0.00491**
%RSD	0.20472	0.50971	9.04265	308.14525	153.96516	0.15977	13379.91711	3.06370	1.00326

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	12.69875	-0.00097	5.87014	-0.02265	-0.00159	-0.00160	0.00112	0.00159	0.00588
#2	12.66817	-0.00170	5.84127	-0.02309	-0.00144	0.00319	0.00211	0.00221	0.00588
Mean	**12.68346**	**-0.00134**	**5.85571**	**-0.02287**	**-0.00151**	**0.00080**	**0.00161**	**0.00190**	**0.00588**
%RSD	0.17049	38.56002	0.34856	1.33401	6.72553	425.00894	43.47469	23.08813	0.00000

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00130	-0.00058	0.00745
#2	-0.00077	0.00064	0.00732
Mean	**-0.00103**	**0.00003**	**0.00738**
%RSD	36.45887	2929.93473	1.26061

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:51
SampleId1 : 1002192-4 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 11:38:42
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE7

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00066	0.08492	0.00183	0.07436	0.02627	-0.00010	-0.00163	145.37867	-0.00067
#2	-0.00157	0.08344	-0.00189	0.07484	0.02647	-0.00011	-0.00301	145.99351	-0.00059
Mean	**-0.00112**	**0.08418**	**-0.00003**	**0.07460**	**0.02637**	**-0.00011**	**-0.00232**	**145.68609**	**-0.00063**
%RSD	57.32612	1.23906	9875.09291	0.45165	0.53105	3.31903	42.03753	0.29842	9.08201

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00017	0.00418	0.00309	0.19454	3.12807	0.02572	69.59782	0.04185	0.00841
#2	-0.00052	0.00447	0.00288	0.19576	3.14297	0.02591	70.01007	0.04219	0.00739
Mean	**-0.00034**	**0.00433**	**0.00298**	**0.19515**	**3.13552**	**0.02582**	**69.80394**	**0.04202**	**0.00790**
%RSD	70.42970	4.83243	4.94131	0.44157	0.33604	0.50172	0.41760	0.56332	9.09639

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	38.40276	0.02597	0.00423	-0.00348	0.00235	135.80566	-0.00145	0.00097	0.00233
#2	38.65103	0.02548	-0.00078	-0.00313	0.00194	137.03783	-0.00092	0.00064	0.00201
Mean	**38.52690**	**0.02573**	**0.00173**	**-0.00330**	**0.00214**	**136.42174**	**-0.00118**	**0.00080**	**0.00217**
%RSD	0.45566	1.34479	205.09471	7.58203	13.39844	0.63866	31.26755	28.75066	10.19702

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ted: 3/5/2010 16:43:34 User: ROY FRENCH

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	10.71538	-0.00098	3.48440	-0.02056	0.00022	-0.00020	-0.02330	0.00029	0.03433
#2	10.81087	-0.00256	3.52511	-0.02334	0.00001	-0.00208	-0.03074	0.00016	0.03419
Mean	**10.76312**	**-0.00177**	**3.50475**	**-0.02195**	**0.00012**	**-0.00114**	**-0.02702**	**0.00023**	**0.03426**
%RSD	0.62738	63.29474	0.82125	8.96416	131.32574	116.15923	19.46285	41.19772	0.28367

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00128	0.00041	0.00187
#2	-0.00121	0.00025	0.00156
Mean	**-0.00124**	**0.00033**	**0.00172**
%RSD	4.09453	32.79819	13.09642

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:52
SampleId1 : 1002192-4D SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:40:27
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE8

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00013	0.08188	0.00164	0.07444	0.02630	-0.00007	0.00201	146.46896	-0.00065
#2	-0.00028	0.08100	-0.00023	0.07452	0.02675	-0.00007	0.00172	147.58213	-0.00051
Mean	**-0.00021**	**0.08144**	**0.00071**	**0.07448**	**0.02653**	**-0.00007**	**0.00187**	**147.02554**	**-0.00058**
%RSD	50.29161	0.76466	188.15465	0.07540	1.20671	1.65743	11.25037	0.53537	17.35077

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00020	0.00497	0.00372	0.17706	3.11411	0.02559	70.05890	0.04092	0.00838
#2	0.00004	0.00423	0.00286	0.17759	3.16047	0.02589	70.73795	0.04133	0.00901
Mean	**0.00012**	**0.00460**	**0.00329**	**0.17732**	**3.13729**	**0.02574**	**70.39842**	**0.04113**	**0.00870**
%RSD	94.65873	11.32760	18.47328	0.21126	1.04485	0.82827	0.68206	0.70344	5.08613

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	38.08671	0.02509	0.00022	0.00077	-0.00038	135.57866	-0.00116	-0.00186	0.00097
#2	38.56919	0.02526	0.00383	0.00094	0.00047	137.38616	-0.00001	-0.00153	0.00083
Mean	**38.32795**	**0.02518**	**0.00203**	**0.00085**	**0.00004**	**136.48241**	**-0.00059**	**-0.00169**	**0.00090**
%RSD	0.89011	0.45809	125.77961	13.63101	1361.52811	0.93646	138.06219	13.49405	10.97465

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	10.68860	-0.00304	3.45792	-0.02248	0.00050	-0.00042	-0.00643	0.00117	0.02986
#2	10.83426	-0.00037	3.50172	-0.02432	0.00039	-0.00513	-0.00395	0.00070	0.02993
Mean	**10.76143**	**-0.00171**	**3.47982**	**-0.02340**	**0.00045**	**-0.00277**	**-0.00519**	**0.00094**	**0.02990**
%RSD	0.95707	110.93194	0.89010	5.56072	16.32770	120.03167	33.73719	35.48327	0.16253

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	-0.00058	0.00000	0.00003
#2	-0.00090	0.00063	0.00004
Mean	**-0.00074**	**0.00031**	**0.00003**
%RSD	30.73009	140.09399	30.90645

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:52
SampleId1 : 1002192-4L 5X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:42:12
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE9

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00082	0.03168	0.00123	0.01366	0.00466	-0.00018	0.00180	28.41740	-0.00051
#2	-0.00097	0.02857	-0.00185	0.01370	0.00463	-0.00019	-0.00095	28.44705	-0.00040
Mean	**-0.00090**	**0.03012**	**-0.00031**	**0.01368**	**0.00464**	**-0.00018**	**0.00042**	**28.43223**	**-0.00045**
%RSD	12.30858	7.29910	706.32328	0.20524	0.43067	3.70403	457.70970	0.07373	17.73478

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00036	-0.00016	-0.00134	0.03350	0.15898	0.00569	13.80330	0.00820	0.00077
#2	-0.00044	0.00008	-0.00064	0.03392	0.14803	0.00568	13.83630	0.00824	0.00017
Mean	**-0.00040**	**-0.00004**	**-0.00099**	**0.03371**	**0.15351**	**0.00568**	**13.81980**	**0.00822**	**0.00047**
%RSD	14.02085	452.42222	50.11141	0.88832	5.04009	0.14051	0.16885	0.31988	89.47844

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	7.06922	0.00431	-0.00058	-0.00247	0.00030	26.73553	-0.00194	-0.00181	-0.00107
#2	7.08996	0.00525	-0.00619	-0.00244	0.00066	26.84665	-0.00028	0.00195	-0.00180
Mean	**7.07959**	**0.00478**	**-0.00338**	**-0.00245**	**0.00048**	**26.79109**	**-0.00111**	**0.00007**	**-0.00144**
%RSD	0.20721	13.92501	117.28700	0.86450	52.31947	0.29328	105.33917	3861.50660	35.91168

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.15409	-0.00037	0.70000	-0.01182	-0.00074	0.00171	-0.01823	-0.00040	0.00623
#2	2.16227	-0.00207	0.70296	-0.01119	-0.00082	-0.00041	-0.00435	-0.00021	0.00595
Mean	**2.15818**	**-0.00122**	**0.70148**	**-0.01150**	**-0.00078**	**0.00065**	**-0.01129**	**-0.00030**	**0.00609**
%RSD	0.26806	98.86842	0.29910	3.82857	7.47344	231.70766	86.90888	43.73923	3.19093

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00025	-0.00062	-0.00132
#2	-0.00012	-0.00037	-0.00055
Mean	**-0.00018**	**-0.00050**	**-0.00094**
%RSD	48.92578	35.25027	57.68284

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Method : Paragon File : 100305A Printed : 3/5/2010 16:42:52

SampleId1 : 1002192-4MS **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 11:43:58
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE10

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09678	2.14111	2.00973	1.04552	1.97770	0.04557	-0.00237	181.03775	0.04909
#2	0.09775	2.14215	2.02117	1.05011	1.97513	0.04557	0.00186	181.23106	0.04941
Mean	**0.09727**	**2.14163**	**2.01545**	**1.04781**	**1.97641**	**0.04557**	**-0.00025**	**181.13441**	**0.04925**
%RSD	0.70879	0.03418	0.40147	0.30958	0.09185	0.00359	1184.88548	0.07546	0.45830

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.45548	0.18734	0.24948	1.11488	45.40647	0.57817	107.98674	0.49622	0.97106
#2	0.45577	0.18738	0.24825	1.11493	45.26735	0.57658	108.07305	0.49641	0.97029
Mean	**0.45563**	**0.18736**	**0.24887**	**1.11490**	**45.33691**	**0.57737**	**108.02989**	**0.49631**	**0.97068**
%RSD	0.04468	0.01636	0.34818	0.00338	0.21697	0.19428	0.05649	0.02667	0.05549

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	75.60053	0.48137	0.00363	0.44789	0.44680	131.53485	0.48875	2.00330	1.97589
#2	75.44975	0.48226	0.00514	0.44937	0.44333	131.48604	0.48645	2.00038	1.96738
Mean	**75.52514**	**0.48181**	**0.00439**	**0.44863**	**0.44507**	**131.51044**	**0.48760**	**2.00184**	**1.97164**
%RSD	0.14116	0.13116	24.25028	0.23435	0.55153	0.02624	0.33301	0.10333	0.30522

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	12.26156	0.48940	3.85595	-0.02320	0.46158	1.99165	-0.01897	0.47503	0.46305
#2	12.24563	0.49269	3.85137	-0.02233	0.46188	1.98408	-0.00509	0.47445	0.46319
Mean	**12.25359**	**0.49105**	**3.85366**	**-0.02276**	**0.46173**	**1.98787**	**-0.01203**	**0.47474**	**0.46312**
%RSD	0.09192	0.47414	0.08399	2.70693	0.04489	0.26941	81.59132	0.08700	0.02110

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00114	0.44716	1.98502
#2	-0.00099	0.44534	1.97837
Mean	**-0.00106**	**0.44625**	**1.98170**
%RSD	9.67653	0.28844	0.23731

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:52
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 11:45:44
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

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Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	0.19946	49.94745	0.50720	0.97433	0.97887	0.49794	0.49866	48.76689	0.49362
#2	0.19823	49.65629	0.50070	0.96631	0.97353	0.49513	0.50375	48.47753	0.49164
Mean	**0.19884**	**49.80187**	**0.50395**	**0.97032**	**0.97620**	**0.49654**	**0.50121**	**48.62221**	**0.49263**
%RSD	0.43769	0.41339	0.91219	0.58410	0.38691	0.40063	0.71876	0.42081	0.28435

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49506	0.98576	0.96833	20.21511	49.60979	0.50952	50.00851	0.97429	0.97812
#2	0.49189	0.98014	0.96479	20.09791	49.41908	0.50700	49.69789	0.96864	0.97303
Mean	**0.49348**	**0.98295**	**0.96656**	**20.15651**	**49.51443**	**0.50826**	**49.85320**	**0.97147**	**0.97557**
%RSD	0.45336	0.40373	0.25917	0.41113	0.27235	0.35011	0.44057	0.41159	0.36939

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	48.79828	0.99576	4.87910	0.96342	0.95401	4.88754	0.48742	0.98381	0.98191
#2	48.58119	0.99020	4.86149	0.95812	0.94790	4.87043	0.48773	0.99397	0.98053
Mean	**48.68974**	**0.99298**	**4.87030**	**0.96077**	**0.95096**	**4.87898**	**0.48757**	**0.98889**	**0.98122**
%RSD	0.31527	0.39585	0.25570	0.38974	0.45463	0.24787	0.04585	0.72591	0.09995

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.73065	0.99505	0.49033	0.13751	0.46874	0.50596	4.86812	0.48201	1.00746
#2	4.70571	0.99114	0.48781	0.13739	0.46621	0.50384	4.82602	0.47937	0.99905
Mean	**4.71818**	**0.99310**	**0.48907**	**0.13745**	**0.46747**	**0.50490**	**4.84707**	**0.48069**	**1.00325**
%RSD	0.37382	0.27849	0.36450	0.06255	0.38273	0.29620	0.61415	0.38864	0.59296

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.96720	0.95714	0.98255
#2	0.96244	0.95130	0.98500
Mean	**0.96482**	**0.95422**	**0.98377**
%RSD	0.34872	0.43287	0.17649

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:53
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 11:47:36
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00017	0.06880	0.00056	0.00091	0.00019	0.00034	-0.00617	0.01854	-0.00036
#2	-0.00111	0.06170	-0.00170	0.00072	-0.00012	0.00022	-0.00292	0.00227	-0.00034
Mean	**-0.00064**	**0.06525**	**-0.00057**	**0.00082**	**0.00003**	**0.00028**	**-0.00455**	**0.01041**	**-0.00035**
%RSD	103.57625	7.69139	278.94990	17.20852	653.36488	28.28172	50.41360	110.51129	3.12819

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00013	-0.00015	-0.00092	0.01264	-0.37648	0.00216	0.02220	0.00043	0.00010

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#2	-0.00042	-0.00051	-0.00134	0.00730	-0.39910	0.00206	0.00306	0.00013	-0.00121
Mean	**-0.00027**	**-0.00033**	**-0.00113**	**0.00997**	**-0.38779**	**0.00211**	**0.01263**	**0.00028**	**-0.00056**
%RSD	75.08525	76.30603	26.05417	37.91381	4.12466	3.59388	107.12910	74.72601	165.79973

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.15249	-0.00060	-0.00318	-0.00246	0.00154	0.00472	-0.00022	-0.00346	-0.00188
#2	-0.16614	-0.00105	-0.00409	-0.00309	0.00172	0.00755	-0.00088	0.00102	-0.00310
Mean	**-0.15932**	**-0.00082**	**-0.00364**	**-0.00277**	**0.00163**	**0.00614**	**-0.00055**	**-0.00122**	**-0.00249**
%RSD	6.06211	38.77723	17.55003	16.29148	7.93916	32.65179	84.53086	259.73383	34.65005

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00899	-0.00085	-0.00176	-0.00240	-0.00060	-0.00002	-0.00979	-0.00014	-0.00051
#2	-0.01081	-0.00073	-0.00204	-0.00369	-0.00095	0.00247	-0.02515	-0.00063	-0.00112
Mean	**-0.00990**	**-0.00079**	**-0.00190**	**-0.00305**	**-0.00078**	**0.00123**	**-0.01747**	**-0.00038**	**-0.00081**
%RSD	13.00903	10.89389	10.38578	30.03272	31.39873	143.50620	62.17359	90.23078	53.67172

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00054	0.00021	-0.00241
#2	0.00030	0.00012	-0.00172
Mean	**0.00042**	**0.00016**	**-0.00206**
%RSD	40.14221	40.00885	23.31278

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:53
SampleId1 : 1002192-4MSD SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:49:27
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE11

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09977	2.22518	2.09295	1.08960	2.02955	0.04716	-0.00243	187.47645	0.05025
#2	0.10034	2.22430	2.10394	1.08928	2.02932	0.04725	0.00397	188.16586	0.05095
Mean	**0.10006**	**2.22474**	**2.09844**	**1.08944**	**2.02943**	**0.04720**	**0.00077**	**187.82115**	**0.05060**
%RSD	0.40455	0.02800	0.37040	0.02072	0.00804	0.13618	585.36780	0.25955	0.98022

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47157	0.19328	0.25634	1.21397	46.15816	0.58937	111.67110	0.51026	1.00540
#2	0.47325	0.19422	0.25647	1.21568	46.19146	0.58915	111.95138	0.51086	1.00650
Mean	**0.47241**	**0.19375**	**0.25640**	**1.21483**	**46.17481**	**0.58926**	**111.81124**	**0.51056**	**1.00595**
%RSD	0.25035	0.34449	0.03633	0.09932	0.05100	0.02597	0.17725	0.08298	0.07758

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	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	76.51850	0.50155	0.00794	0.46617	0.46102	136.12909	0.50296	2.10279	2.04909
#2	76.57114	0.50458	0.00995	0.46905	0.45550	136.28921	0.50519	2.09131	2.03905

Mean	**76.54482**	**0.50306**	**0.00895**	**0.46761**	**0.45826**	**136.20915**	**0.50408**	**2.09705**	**2.04407**
%RSD	0.04863	0.42647	15.84789	0.43583	0.85182	0.08312	0.31279	0.38696	0.34738

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	12.60745	0.51037	3.97400	-0.02386	0.47311	2.05735	-0.01953	0.48868	0.48143
#2	12.61230	0.51537	3.97635	-0.02308	0.47339	2.06618	-0.00516	0.48917	0.48378
Mean	**12.60987**	**0.51287**	**3.97518**	**-0.02347**	**0.47325**	**2.06177**	**-0.01234**	**0.48892**	**0.48260**
%RSD	0.02718	0.68947	0.04181	2.34665	0.04073	0.30278	82.33644	0.07091	0.34422

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00104	0.46273	2.06697
#2	-0.00069	0.46001	2.05645
Mean	**-0.00086**	**0.46137**	**2.06171**
%RSD	28.88964	0.41723	0.36078

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:53
SampleId1 : 1002192-5 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 11:51:13
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE12

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00065	0.04231	0.00615	0.06753	0.02234	0.00006	0.00151	118.42667	-0.00024
#2	-0.00012	0.03656	-0.00083	0.06638	0.02226	0.00007	-0.00174	118.56174	-0.00048
Mean	**-0.00039**	**0.03943**	**0.00266**	**0.06696**	**0.02230**	**0.00006**	**-0.00011**	**118.49420**	**-0.00036**
%RSD	96.14412	10.31673	185.78790	1.21606	0.26917	8.81698	2010.19067	0.08060	47.19696

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00017	0.00067	-0.00130	0.00047	3.09495	0.02244	64.09335	-0.00009	0.00575
#2	-0.00047	0.00010	-0.00071	-0.00032	3.09448	0.02251	64.22976	-0.00020	0.00565
Mean	**-0.00015**	**0.00039**	**-0.00100**	**0.00007**	**3.09472**	**0.02247**	**64.16155**	**-0.00015**	**0.00570**
%RSD	301.00209	104.23476	41.67957	771.80091	0.01081	0.20399	0.15033	53.97947	1.29346

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	35.88408	0.00029	0.00133	-0.00130	-0.00074	114.17330	0.00267	0.00025	0.00230
#2	36.10659	0.00005	0.00213	-0.00221	0.00003	114.66805	0.00048	0.00462	0.00362
Mean	**35.99534**	**0.00017**	**0.00173**	**-0.00175**	**-0.00035**	**114.42067**	**0.00157**	**0.00243**	**0.00296**
%RSD	0.43711	96.97719	32.81541	36.48326	154.62698	0.30575	98.64254	127.02927	31.62099

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	13.72631	-0.00134	2.36627	-0.02012	-0.00112	-0.00159	0.01104	0.00153	0.01798
#2	13.81190	-0.00280	2.38047	-0.02178	-0.00122	0.00332	-0.01276	0.00155	0.01804
Mean	**13.76910**	**-0.00207**	**2.37337**	**-0.02095**	**-0.00117**	**0.00087**	**-0.00086**	**0.00154**	**0.01801**

20000416

%RSD	0.43955	49.88446	0.42319	5.62037	5.89552	401.22590	1956.66879	0.85548	0.26977

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00160	-0.00093	0.00161
#2	-0.00161	-0.00071	0.00395
Mean	**-0.00161**	**-0.00082**	**0.00278**
%RSD	0.54314	18.51413	59.40096

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:54
SampleId1 : 1002192-5D SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:53:00
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE13

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00038	0.04220	-0.00035	0.06344	0.02146	0.00008	-0.00253	119.57094	-0.00041
#2	-0.00005	0.03927	-0.00035	0.06618	0.02169	0.00006	0.00279	120.13689	-0.00027
Mean	**-0.00022**	**0.04073**	**-0.00035**	**0.06481**	**0.02158**	**0.00007**	**0.00013**	**119.85391**	**-0.00034**
%RSD	106.07428	5.09548	0.00000	2.98906	0.74178	26.45962	2884.98552	0.33390	29.09769

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00055	-0.00009	-0.00086	-0.00138	3.08809	0.02221	64.48344	-0.00039	0.00627
#2	-0.00041	0.00016	-0.00107	-0.00165	3.11506	0.02233	64.86001	-0.00035	0.00599
Mean	**-0.00048**	**0.00003**	**-0.00096**	**-0.00151**	**3.10158**	**0.02227**	**64.67172**	**-0.00037**	**0.00613**
%RSD	19.51592	521.75982	15.61863	12.35083	0.61476	0.39378	0.41173	7.12099	3.30747

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	35.82695	0.00000	-0.00028	-0.00201	-0.00117	114.35900	-0.00088	0.00538	-0.00024
#2	36.08409	-0.00059	-0.00298	0.00023	-0.00067	115.35852	-0.00059	0.00452	-0.00097
Mean	**35.95552**	**-0.00029**	**-0.00163**	**-0.00089**	**-0.00092**	**114.85876**	**-0.00074**	**0.00495**	**-0.00061**
%RSD	0.50569	143.58310	117.40508	177.54190	38.45583	0.61534	27.99296	12.27677	84.79027

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	13.75717	-0.00207	2.37139	-0.02051	-0.00131	-0.00075	-0.00433	0.00125	0.01695
#2	13.86912	-0.00110	2.38667	-0.02104	-0.00132	-0.00054	-0.00681	0.00166	0.01653
Mean	**13.81314**	**-0.00158**	**2.37903**	**-0.02078**	**-0.00132**	**-0.00065**	**-0.00557**	**0.00145**	**0.01674**
%RSD	0.57308	43.49121	0.45421	1.80118	0.82901	24.00228	31.47377	20.07993	1.74151

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00173	-0.00145	0.00163
#2	-0.00172	-0.00037	0.00085
Mean	**-0.00172**	**-0.00091**	**0.00124**
%RSD	0.53552	83.82405	44.07880

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ted: 3/5/2010 16:43:34 User: ROY FRENCH
Method : Paragon File : 100305A Printed : 3/5/2010 16:42:54
SampleId1 : 1002192-5L 5X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:54:46
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE14

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00161	0.03634	-0.00136	0.01191	0.00367	-0.00008	-0.00194	23.16499	-0.00091
#2	-0.00078	0.04067	-0.00354	0.01259	0.00367	-0.00007	0.00052	23.11325	-0.00053
Mean	**-0.00120**	**0.03851**	**-0.00245**	**0.01225**	**0.00367**	**-0.00007**	**-0.00071**	**23.13912**	**-0.00072**
%RSD	49.00266	7.95996	62.89217	3.89608	0.00000	2.73357	244.48563	0.15809	36.87118

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00097	-0.00140	-0.00270	-0.00773	0.07453	0.00502	12.64616	-0.00061	0.00041
#2	-0.00047	-0.00068	-0.00185	-0.00731	0.06882	0.00500	12.62562	-0.00057	-0.00035
Mean	**-0.00072**	**-0.00104**	**-0.00227**	**-0.00752**	**0.07168**	**0.00501**	**12.63589**	**-0.00059**	**0.00003**
%RSD	49.52472	48.74400	26.48691	3.98008	5.63266	0.23890	0.11491	4.43886	1743.89234

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	6.66909	-0.00076	-0.00699	-0.00571	0.00218	22.61501	-0.00223	-0.00106	0.00243
#2	6.68790	-0.00003	-0.00559	-0.00030	0.00120	22.53498	-0.00058	0.00360	-0.00167
Mean	**6.67849**	**-0.00040**	**-0.00629**	**-0.00300**	**0.00169**	**22.57500**	**-0.00140**	**0.00127**	**0.00038**
%RSD	0.19915	129.59595	15.77297	127.44452	41.32138	0.25067	83.20336	260.10913	760.81683

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.75874	-0.00474	0.48260	-0.00866	-0.00107	-0.00569	-0.02217	-0.00069	0.00259
#2	2.76174	-0.00158	0.48173	-0.00927	-0.00110	-0.00006	-0.01473	0.00006	0.00238
Mean	**2.76024**	**-0.00316**	**0.48216**	**-0.00896**	**-0.00109**	**-0.00288**	**-0.01845**	**-0.00031**	**0.00248**
%RSD	0.07678	70.68580	0.12819	4.79030	2.00706	138.37312	28.49268	170.41564	5.86935

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00108	-0.00045	0.00127
#2	-0.00045	0.00070	0.00008
Mean	**-0.00077**	**0.00013**	**0.00068**
%RSD	58.36709	640.50737	123.86569

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:54
SampleId1 : 1002192-5MS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 11:56:32
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE15

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10054	2.15360	2.13152	1.09427	2.05290	0.04790	-0.00213	159.56760	0.05099
#2	0.10137	2.15551	2.13137	1.09699	2.05414	0.04784	-0.00035	159.56242	0.05091
Mean	**0.10095**	**2.15455**	**2.13144**	**1.09563**	**2.05352**	**0.04787**	**-0.00124**	**159.56501**	**0.05095**
%RSD	0.58194	0.06257	0.00512	0.17511	0.04274	0.08752	101.09217	0.00230	0.11403

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47819	0.19188	0.25526	0.99374	45.94803	0.58511	105.84874	0.47604	1.02597
#2	0.47875	0.19240	0.25568	0.99374	45.94400	0.58484	105.88486	0.47634	1.02474
Mean	**0.47847**	**0.19214**	**0.25547**	**0.99374**	**45.94601**	**0.58497**	**105.86680**	**0.47619**	**1.02535**
%RSD	0.08272	0.19387	0.11621	0.00000	0.00619	0.03271	0.02413	0.04446	0.08518

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	74.14235	0.49212	0.00524	0.47024	0.47089	113.24847	0.50707	2.12994	2.11121
#2	74.14746	0.49169	0.00935	0.47092	0.46308	113.09814	0.50627	2.13151	2.09079
Mean	**74.14491**	**0.49190**	**0.00729**	**0.47058**	**0.46698**	**113.17330**	**0.50667**	**2.13073**	**2.10100**
%RSD	0.00488	0.06153	39.85760	0.10253	1.18277	0.09393	0.11159	0.05190	0.68705

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	15.46764	0.51719	2.85269	-0.02120	0.47503	2.09217	-0.01195	0.49568	0.47335
#2	15.48485	0.51549	2.85014	-0.01971	0.47495	2.09431	-0.00055	0.49638	0.47390
Mean	**15.47624**	**0.51634**	**2.85141**	**-0.02046**	**0.47499**	**2.09324**	**-0.00625**	**0.49603**	**0.47362**
%RSD	0.07866	0.23385	0.06316	5.12684	0.01148	0.07219	129.07974	0.09940	0.08252

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00282	0.47067	2.11745
#2	-0.00269	0.46569	2.10435
Mean	**-0.00276**	**0.46818**	**2.11090**
%RSD	3.32786	0.75258	0.43867

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:54
SampleId1 : 1002192-5MSD **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 11:58:27
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE16

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09872	2.13002	2.07424	1.07512	2.03442	0.04668	0.00041	155.21630	0.05023
#2	0.09911	2.12132	2.06900	1.07049	2.01968	0.04648	-0.00186	154.61113	0.04987
Mean	**0.09891**	**2.12567**	**2.07162**	**1.07281**	**2.02705**	**0.04658**	**-0.00073**	**154.91371**	**0.05005**
%RSD	0.27751	0.28925	0.17898	0.30503	0.51443	0.29710	220.84966	0.27623	0.51101

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.46697	0.18805	0.25370	0.97404	45.77409	0.58339	103.03898	0.46616	0.99975
#2	0.46568	0.18774	0.25175	0.96909	45.52544	0.57967	102.61770	0.46410	0.99580
Mean	**0.46633**	**0.18789**	**0.25272**	**0.97157**	**45.64976**	**0.58153**	**102.82834**	**0.46513**	**0.99778**
%RSD	0.19600	0.11807	0.54353	0.36037	0.38515	0.45248	0.28969	0.31291	0.27931

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	73.83818	0.47994	0.00203	0.45705	0.45385	110.70218	0.50357	2.08797	2.04309
#2	73.54271	0.47772	-0.00118	0.46026	0.45394	109.91431	0.49920	2.06929	2.04327
Mean	**73.69044**	**0.47883**	**0.00042**	**0.45865**	**0.45389**	**110.30825**	**0.50138**	**2.07863**	**2.04318**
%RSD	0.28352	0.32901	533.85152	0.49491	0.01455	0.50505	0.61626	0.63553	0.00611

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	15.18683	0.50415	2.82342	-0.02249	0.46687	2.05330	-0.01986	0.48690	0.45614
#2	15.12540	0.50269	2.80118	-0.02013	0.46547	2.03728	-0.00251	0.48384	0.45683
Mean	**15.15612**	**0.50342**	**2.81230**	**-0.02131**	**0.46617**	**2.04529**	**-0.01119**	**0.48537**	**0.45649**
%RSD	0.28660	0.20535	0.55911	7.82638	0.21219	0.55386	109.67898	0.44490	0.10700

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00281	0.45491	2.05804
#2	-0.00253	0.45604	2.05193
Mean	**-0.00267**	**0.45548**	**2.05498**
%RSD	7.39383	0.17562	0.21002

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:55
SampleId1 : 1002192-6 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 12:00:14
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE17

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00027	0.03641	-0.00012	0.22086	0.02093	-0.00004	0.00102	57.62195	-0.00045
#2	-0.00096	0.03867	0.00138	0.21979	0.02076	-0.00006	0.00161	57.55302	-0.00078
Mean	**-0.00062**	**0.03754**	**0.00063**	**0.22033**	**0.02084**	**-0.00005**	**0.00131**	**57.58748**	**-0.00062**
%RSD	79.74997	4.25745	168.45365	0.34433	0.57597	23.03322	31.79015	0.08464	37.23904

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00052	0.00305	-0.00093	-0.00292	3.94086	0.03845	33.17777	-0.00009	0.00987
#2	-0.00057	0.00290	-0.00100	-0.00271	3.94346	0.03844	33.14212	0.00002	0.01096
Mean	**-0.00055**	**0.00297**	**-0.00097**	**-0.00281**	**3.94216**	**0.03844**	**33.15994**	**-0.00003**	**0.01042**
%RSD	6.81750	3.63773	5.31281	5.32398	0.04660	0.02589	0.07603	228.13305	7.43096

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	79.74596	0.00024	-0.00098	0.00015	0.00102	92.43647	-0.00041	0.00265	0.00557
#2	79.76300	0.00019	-0.00599	-0.00062	0.00015	92.45057	0.00008	0.00399	0.00038
Mean	**79.75448**	**0.00022**	**-0.00349**	**-0.00023**	**0.00059**	**92.44352**	**-0.00017**	**0.00332**	**0.00297**
%RSD	0.01511	16.29861	101.70786	235.26353	104.55960	0.01079	205.62542	28.55506	123.25750

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	24.93774	-0.00377	1.90318	-0.01436	-0.00095	-0.00164	-0.00036	0.01433	0.00520
#2	24.94645	-0.00414	1.90410	-0.01581	-0.00109	-0.00436	0.00112	0.01460	0.00492
Mean	**24.94209**	**-0.00395**	**1.90364**	**-0.01508**	**-0.00102**	**-0.00300**	**0.00038**	**0.01447**	**0.00506**
%RSD	0.02469	6.52229	0.03388	6.81793	9.26719	64.05261	275.70840	1.28517	3.84085

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00418	0.00073	0.00459
#2	-0.00395	-0.00010	0.00158
Mean	**-0.00407**	**0.00031**	**0.00309**
%RSD	4.01455	187.99132	68.95536

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:55
SampleId1 : 1002192-7 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:02:00
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE18

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00007	0.03363	0.00157	0.06198	0.01892	0.00003	0.00299	112.53953	-0.00056
#2	-0.00028	0.03542	-0.00065	0.06265	0.01892	0.00005	0.00535	113.18992	-0.00042
Mean	**-0.00017**	**0.03453**	**0.00046**	**0.06231**	**0.01892**	**0.00004**	**0.00417**	**112.86473**	**-0.00049**
%RSD	87.65064	3.67396	339.43839	0.76599	0.00000	29.05443	40.05993	0.40748	19.51841

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00031	0.00085	-0.00086	0.00507	3.25507	0.02360	70.91794	-0.00035	0.00583
#2	-0.00026	0.00094	-0.00050	0.00523	3.26925	0.02375	71.36540	-0.00039	0.00552
Mean	**-0.00029**	**0.00090**	**-0.00068**	**0.00515**	**3.26216**	**0.02367**	**71.14167**	**-0.00037**	**0.00567**
%RSD	13.11123	7.16225	37.21896	2.17856	0.30754	0.44618	0.44475	7.12099	3.89822

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	35.07182	0.00184	0.00303	0.00074	-0.00084	116.78897	-0.00018	0.00560	0.00080
#2	35.37770	0.00140	-0.00148	0.00062	-0.00021	117.84701	-0.00120	0.00876	0.00306
Mean	**35.22476**	**0.00162**	**0.00078**	**0.00068**	**-0.00052**	**117.31799**	**-0.00069**	**0.00718**	**0.00193**
%RSD	0.61402	19.20694	411.18463	12.45421	84.84473	0.63771	103.72977	31.09429	82.80115

20000421

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	13.25321	-0.00085	2.28217	-0.02029	-0.00131	0.00216	0.00756	0.00140	0.02876

#2	13.37488	-0.00219	2.30561	-0.02035	-0.00135	-0.00531	0.00360	0.00170	0.02918
Mean	**13.31405**	**-0.00152**	**2.29389**	**-0.02032**	**-0.00133**	**-0.00158**	**0.00558**	**0.00155**	**0.02897**
%RSD	0.64622	62.18836	0.72256	0.19572	2.18931	335.29727	50.24706	13.70979	1.00639

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00141	-0.00031	0.00240
#2	-0.00145	0.00007	0.00496
Mean	**-0.00143**	**-0.00012**	**0.00368**
%RSD	2.39074	218.55340	49.20475

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:55
SampleId1 : 1002192-8 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 12:03:45
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE19

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00003	0.03363	0.00059	0.11344	0.02146	-0.00006	-0.00391	74.56719	-0.00041
#2	-0.00053	0.03290	0.00044	0.11273	0.02146	-0.00006	-0.00007	74.34942	-0.00038
Mean	**-0.00025**	**0.03326**	**0.00052**	**0.11308**	**0.02146**	**-0.00006**	**-0.00199**	**74.45831**	**-0.00040**
%RSD	155.83518	1.54498	20.51003	0.44702	0.00000	1.69270	136.65414	0.20681	5.10557

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00041	0.00082	-0.00178	-0.00329	3.06397	0.03541	53.41757	-0.00031	0.00625
#2	-0.00047	0.00112	-0.00136	-0.00308	3.04741	0.03528	53.24622	-0.00035	0.00453
Mean	**-0.00044**	**0.00097**	**-0.00157**	**-0.00318**	**3.05569**	**0.03535**	**53.33190**	**-0.00033**	**0.00539**
%RSD	8.47431	21.77887	19.06790	4.70414	0.38319	0.27043	0.22719	7.91843	22.58129

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	57.35772	-0.00061	0.00323	-0.00105	-0.00063	100.07017	-0.00381	-0.00079	-0.00038
#2	57.10479	-0.00040	-0.00890	0.00003	-0.00060	100.15071	0.00016	0.00152	0.00063
Mean	**57.23126**	**-0.00050**	**-0.00283**	**-0.00051**	**-0.00062**	**100.11044**	**-0.00182**	**0.00037**	**0.00012**
%RSD	0.31250	29.94255	302.75020	148.57520	3.88495	0.05689	153.71409	446.16089	589.03029

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	17.96429	-0.00316	3.02947	-0.01783	-0.00113	-0.00260	-0.01226	0.00806	0.00300
#2	17.92168	-0.00487	3.02687	-0.01873	-0.00113	-0.00212	-0.00433	0.00812	0.00320
Mean	**17.94299**	**-0.00401**	**3.02817**	**-0.01828**	**-0.00113**	**-0.00236**	**-0.00829**	**0.00809**	**0.00310**
%RSD	0.16793	29.98999	0.06073	3.48819	0.32158	14.45617	67.62336	0.49262	4.69922

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00270	-0.00077	-0.00052
#2	-0.00244	-0.00039	0.00092

20000422

Mean	**-0.00257**	**-0.00058**	**0.00020CH**
%RSD	7.06571	46.15928	503.12311

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:56
SampleId1 : 1002192-9 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 12:05:31
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE20

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00028	0.03555	0.00232	0.06023	0.01835	-0.00004	0.00328	108.46122	-0.00024
#2	0.00037	0.03446	0.00270	0.05979	0.01832	-0.00006	-0.00056	108.60227	-0.00043
Mean	**0.00005**	**0.03501**	**0.00251**	**0.06001**	**0.01834**	**-0.00005**	**0.00136**	**108.53174**	**-0.00033**
%RSD	944.42593	2.19960	10.58711	0.51466	0.10910	26.61848	199.31927	0.09190	39.75471

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00021	0.03381	-0.00100	0.27325	2.88321	0.02196	67.22782	0.00181	0.00520
#2	0.00035	0.03354	-0.00122	0.27378	2.87564	0.02196	67.35323	0.00177	0.00526
Mean	**0.00007**	**0.03368**	**-0.00111**	**0.27351**	**2.87942**	**0.02196**	**67.29052**	**0.00179**	**0.00523**
%RSD	555.01727	0.56633	13.98517	0.13705	0.18595	0.00000	0.13179	1.47101	0.70474

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	34.25659	0.01187	-0.00068	0.00129	-0.00102	106.91500	0.00131	-0.00035	0.00004
#2	34.24362	0.01144	-0.00048	-0.00050	-0.00013	107.40316	0.00221	0.00308	0.00098
Mean	**34.25011**	**0.01166**	**-0.00058**	**0.00039**	**-0.00058**	**107.15908**	**0.00176**	**0.00136**	**0.00051**
%RSD	0.02677	2.58703	24.54577	321.46399	109.21683	0.32212	35.96309	178.18232	130.04719

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	13.47648	-0.00255	2.37138	-0.01987	-0.00144	-0.00357	-0.00303	0.00218	0.01427
#2	13.48509	-0.00219	2.37806	-0.02368	-0.00147	-0.00029	0.00342	0.00198	0.01399
Mean	**13.48078**	**-0.00237**	**2.37472**	**-0.02177**	**-0.00146**	**-0.00193**	**0.00019**	**0.00208**	**0.01413**
%RSD	0.04521	10.87637	0.19896	12.37965	1.49713	120.00263	2358.23770	7.01646	1.37553

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00154	-0.00025	-0.00009
#2	-0.00150	-0.00025	0.00168
Mean	**-0.00152**	**-0.00025**	**0.00079**
%RSD	1.68415	0.64325	157.53311

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Method : Paragon File : 100305A Printed : 3/5/2010 16:42:56
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 12:07:17
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations:**34** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19914	50.05394	0.50694	0.97030	0.98053	0.49313	0.50329	48.50212	0.49493
#2	0.20084	50.12451	0.50792	0.97552	0.98296	0.49420	0.50399	48.60228	0.49652
Mean	**0.19999**	**50.08922**	**0.50743**	**0.97291**	**0.98174**	**0.49366**	**0.50364**	**48.55220**	**0.49573**
%RSD	0.59993	0.09962	0.13695	0.37967	0.17488	0.15296	0.09856	0.14587	0.22673

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49241	0.97830	0.97485	20.09400	49.81007	0.51201	49.64564	0.96532	0.97875
#2	0.49382	0.98063	0.97741	20.14273	49.81163	0.51184	49.79574	0.96762	0.98033
Mean	**0.49312**	**0.97947**	**0.97613**	**20.11837**	**49.81085**	**0.51193**	**49.72069**	**0.96647**	**0.97954**
%RSD	0.20229	0.16821	0.18539	0.17127	0.00222	0.02292	0.21346	0.16823	0.11379

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.00714	0.99953	4.90767	0.95319	0.94774	4.88184	0.49063	0.99218	0.98376
#2	48.97889	1.00566	4.92232	0.96159	0.93626	4.88754	0.49122	0.98964	0.97850
Mean	**48.99301**	**1.00260**	**4.91500**	**0.95739**	**0.94200**	**4.88469**	**0.49093**	**0.99091**	**0.98113**
%RSD	0.04076	0.43217	0.21070	0.62004	0.86147	0.08253	0.08526	0.18159	0.37922

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.70179	0.98931	0.49174	0.13218	0.46483	0.50854	4.84686	0.47907	0.99224
#2	4.71495	0.99995	0.49206	0.13465	0.46525	0.51026	4.86618	0.48162	0.99502
Mean	**4.70837**	**0.99463**	**0.49190**	**0.13341**	**0.46504**	**0.50940**	**4.85652**	**0.48035**	**0.99363**
%RSD	0.19760	0.75652	0.04714	1.30459	0.06334	0.23851	0.28129	0.37587	0.19790

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.96746	0.94956	0.98656
#2	0.96924	0.94470	0.98221
Mean	**0.96835**	**0.94713**	**0.98439**
%RSD	0.12951	0.36278	0.31297

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:56
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 12:09:09
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00014	0.06301	0.00010	0.00179	-0.00007	0.00015	0.00210	-0.00125	-0.00039
#2	-0.00047	0.05890	0.00033	0.00080	-0.00035	0.00011	0.00299	-0.00830	-0.00022
Mean	**-0.00031**	**0.06096**	**0.00022**	**0.00129**	**-0.00021**	**0.00013**	**0.00254**	**-0.00478**	**-0.00030**
%RSD	75.86212	4.76884	73.26897	54.31727	96.73767	21.44687	24.61177	104.37939	40.51417

20000424

ted: 3/5/2010 16:43:34 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00024	0.00042	-0.00079	0.00576	-0.38172	0.00207	0.00850	0.00013	-0.00126
#2	-0.00016	-0.00016	-0.00093	0.00349	-0.39457	0.00199	-0.00390	-0.00002	-0.00082
Mean	**0.00004**	**0.00013**	**-0.00086**	**0.00462**	**-0.38814**	**0.00203**	**0.00230**	**0.00006**	**-0.00104**
%RSD	647.61846	310.05565	11.79807	34.79973	2.34239	2.55466	380.79053	180.13864	30.18462

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.16659	0.00000	-0.00218	0.00094	-0.00061	0.00330	-0.00036	-0.00035	-0.00184
#2	-0.17255	-0.00056	-0.00599	0.00068	0.00100	0.00755	-0.00106	0.00077	-0.00132
Mean	**-0.16957**	**-0.00028**	**-0.00409**	**0.00081**	**0.00020**	**0.00543**	**-0.00071**	**0.00021**	**-0.00158**
%RSD	2.48524	143.68071	65.91967	22.60329	577.33532	55.36957	70.00272	375.46241	23.30116

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00935	-0.00243	-0.00198	-0.00212	-0.00079	-0.00171	-0.00037	0.00042	-0.00064
#2	-0.01024	-0.00049	-0.00210	-0.00368	-0.00078	-0.00270	0.00013	-0.00037	-0.00099
Mean	**-0.00979**	**-0.00146**	**-0.00204**	**-0.00290**	**-0.00079**	**-0.00220**	**-0.00012**	**0.00003**	**-0.00081**
%RSD	6.38855	94.18499	3.96931	38.18330	0.92200	31.86905	294.46812	1946.80696	29.81761

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00064	-0.00009	-0.00135
#2	0.00042	0.00089	-0.00062
Mean	**0.00053**	**0.00040**	**-0.00099**
%RSD	29.67315	174.18182	51.85251

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:57
SampleId1 : 1002192-9D SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:11:01
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE21

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00005	0.04480	0.00059	0.05816	0.01818	0.00000	0.00210	106.63764	-0.00051
#2	-0.00017	0.03298	0.00022	0.05773	0.01829	-0.00004	0.00466	106.50245	-0.00054
Mean	**-0.00006**	**0.03889**	**0.00041**	**0.05794**	**0.01824**	**-0.00002**	**0.00338**	**106.57005**	**-0.00053**
%RSD	257.16647	21.49210	65.53059	0.53299	0.43877	161.13192	53.62499	0.08970	3.37546

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00011	0.03442	-0.00143	0.28316	2.82618	0.02179	66.09733	0.00207	0.00513
#2	0.00008	0.03459	-0.00058	0.28061	2.79991	0.02169	66.09800	0.00195	0.00531
Mean	**0.00010**	**0.03451**	**-0.00100**	**0.28189**	**2.81304**	**0.02174**	**66.09766**	**0.00201**	**0.00522**
%RSD	19.04467	0.35349	59.90298	0.63833	0.66033	0.31175	0.00071	3.92333	2.47275

20000425

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	33.86951	0.01134	0.00153	-0.00061	0.00013	105.78534	-0.00119	-0.00078	0.00157
#2	33.84538	0.01098	-0.00068	-0.00114	0.00066	106.01562	-0.00304	0.00131	0.00105
Mean	**33.85744**	**0.01116**	**0.00042**	**-0.00087**	**0.00040**	**105.90048**	**-0.00211**	**0.00027**	**0.00131**
%RSD	0.05038	2.30453	367.02551	42.96831	94.64045	0.15376	61.67457	557.38349	28.15084

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	13.29489	-0.00377	2.34111	-0.01741	-0.00115	-0.00011	-0.00254	0.00151	0.01296
#2	13.30517	-0.00487	2.33894	-0.01966	-0.00128	0.00012	0.00688	0.00149	0.01248
Mean	**13.30003**	**-0.00432**	**2.34002**	**-0.01854**	**-0.00122**	**0.00000**	**0.00217**	**0.00150**	**0.01272**
%RSD	0.05467	17.91982	0.06558	8.56660	7.77745	5302.02655	306.91323	0.90837	2.67368

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00150	-0.00012	0.00079
#2	-0.00163	0.00006	0.00114
Mean	**-0.00156**	**-0.00003**	**0.00096**
%RSD	6.21943	471.13457	25.63147

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:57
SampleId1 : 1002192-9L 5X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 12:12:47
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE22

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00036	0.03477	0.00037	0.01183	0.00302	-0.00014	-0.00439	21.18937	-0.00053
#2	-0.00053	0.03658	0.00202	0.01147	0.00307	-0.00015	-0.00164	21.27456	-0.00054
Mean	**-0.00044**	**0.03568**	**0.00119**	**0.01165**	**0.00305**	**-0.00015**	**-0.00302**	**21.23197**	**-0.00054**
%RSD	27.43855	3.58518	97.86829	2.16803	1.31324	3.88700	64.44343	0.28372	1.49207

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00089	0.00595	-0.00165	0.04980	0.09998	0.00505	13.17398	-0.00005	0.00002
#2	-0.00004	0.00619	-0.00142	0.05038	0.09142	0.00503	13.22227	-0.00005	0.00004
Mean	**-0.00047**	**0.00607**	**-0.00153**	**0.05009**	**0.09570**	**0.00504**	**13.19812**	**-0.00005**	**0.00003**
%RSD	128.06320	2.75106	10.41933	0.82202	6.32750	0.35644	0.25870	0.00000	60.13538

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	6.24750	0.00187	-0.00579	-0.00277	0.00007	21.09134	-0.00201	0.00035	-0.00191
#2	6.27853	0.00221	-0.00449	-0.00168	-0.00084	21.15235	-0.00142	-0.00036	0.00018
Mean	**6.26302**	**0.00204**	**-0.00514**	**-0.00223**	**-0.00038**	**21.12185**	**-0.00171**	**-0.00001**	**-0.00086**
%RSD	0.35034	11.72341	17.93213	34.85471	167.57748	0.20425	24.42963	6962.94258	171.18013

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

20000426

	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.68370	0.00024	0.47639	-0.00774	-0.00114	-0.00085	0.00158	-0.00013	0.00252
#2	2.69741	0.00024	0.47951	-0.00704	-0.00102	-0.00255	-0.01329	-0.00011	0.00224
Mean	**2.69055**	**0.00024**	**0.47795**	**-0.00739**	**-0.00108**	**-0.00170**	**-0.00585**	**-0.00012**	**0.00238**
%RSD	0.36028	0.04370	0.46118	6.68302	8.42253	70.69833	179.72699	10.93663	8.16465

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00058	-0.00088	-0.00116
#2	-0.00060	-0.00112	0.00000
Mean	**-0.00059**	**-0.00100**	**-0.00058**
%RSD	2.14679	17.11751	141.61080

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:57
SampleId1 : 1002192-9MS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:14:33
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE23

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09743	2.08845	2.06052	1.05478	1.99307	0.04675	-0.00641	147.93942	0.04966
#2	0.09926	2.11314	2.07625	1.05992	2.01102	0.04686	-0.00058	148.56606	0.05027
Mean	**0.09834**	**2.10080**	**2.06838**	**1.05735**	**2.00205**	**0.04681**	**-0.00349**	**148.25274**	**0.04996**
%RSD	1.31473	0.83104	0.53776	0.34415	0.63384	0.16711	117.91240	0.29888	0.86821

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.46670	0.22071	0.24822	1.25424	44.86828	0.57030	107.74095	0.46691	0.99223
#2	0.46856	0.22291	0.25076	1.26010	45.15999	0.57381	108.16342	0.46889	0.99696
Mean	**0.46763**	**0.22181**	**0.24949**	**1.25717**	**45.01413**	**0.57205**	**107.95219**	**0.46790**	**0.99460**
%RSD	0.28045	0.70071	0.71974	0.32999	0.45824	0.43317	0.27672	0.29976	0.33623

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	71.78922	0.48440	-0.00178	0.44964	0.47127	106.17447	0.48648	2.03204	2.04767
#2	72.15877	0.48985	0.00574	0.45800	0.45642	106.57645	0.49848	2.05159	2.01188
Mean	**71.97400**	**0.48713**	**0.00198**	**0.45382**	**0.46384**	**106.37546**	**0.49248**	**2.04182**	**2.02978**
%RSD	0.36306	0.79120	268.67536	1.30242	2.26357	0.26721	1.72418	0.67706	1.24707

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	15.08814	0.50281	2.81217	-0.02031	0.46577	2.04220	-0.05128	0.48373	0.45732
#2	15.17473	0.50598	2.83316	-0.02188	0.46725	2.04876	-0.00915	0.48633	0.45870
Mean	**15.13144**	**0.50440**	**2.82266**	**-0.02109**	**0.46651**	**2.04548**	**-0.03022**	**0.48503**	**0.45801**
%RSD	0.40466	0.44433	0.52597	5.25854	0.22372	0.22691	98.58418	0.37930	0.21330

	Zr	**Pb**	**Se**
	ppm	calc	calc

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#1	-0.00279	0.46406	2.04247**CH**
#2	-0.00198	0.45694	2.02510
Mean	**-0.00238**	**0.46050**	**2.03379**
%RSD	23.84240	1.09333	0.60381

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:57
SampleId1 : 1002192-9MSD SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:16:19
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE24

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09996	2.12582	2.12890	1.07859	2.02467	0.04802	0.00259	152.09954	0.05102
#2	0.09952	2.13025	2.11482	1.08083	2.02476	0.04781	-0.00233	151.60088	0.05124
Mean	**0.09974**	**2.12804**	**2.12186**	**1.07971**	**2.02471**	**0.04792**	**0.00013**	**151.85021**	**0.05113**
%RSD	0.30982	0.14721	0.46927	0.14632	0.00302	0.30685	2763.21515	0.23221	0.29967

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47908	0.22837	0.25312	1.27152	45.28771	0.57547	110.50729	0.47754	1.01806
#2	0.47807	0.22734	0.25312	1.26890	45.28100	0.57550	110.24207	0.47657	1.01543
Mean	**0.47858**	**0.22786**	**0.25312**	**1.27021**	**45.28435**	**0.57548**	**110.37468**	**0.47705**	**1.01675**
%RSD	0.14881	0.31871	0.00032	0.14550	0.01048	0.00432	0.16991	0.14425	0.18276

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	72.38191	0.49792	0.00474	0.46940	0.47062	108.40562	0.50415	2.08282	2.06134
#2	72.39548	0.49834	0.00073	0.46880	0.46702	108.16049	0.49920	2.09186	2.05282
Mean	**72.38870**	**0.49813**	**0.00273**	**0.46910**	**0.46882**	**108.28305**	**0.50167**	**2.08734**	**2.05708**
%RSD	0.01325	0.05897	103.83972	0.09057	0.54326	0.16008	0.69825	0.30635	0.29278

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	15.35783	0.52037	2.85836	-0.01985	0.47506	2.07993	-0.01610	0.49500	0.47390
#2	15.35525	0.51634	2.84932	-0.02103	0.47402	2.08796	-0.01759	0.49453	0.47293
Mean	**15.35654**	**0.51835**	**2.85384**	**-0.02044**	**0.47454**	**2.08395**	**-0.01684**	**0.49477**	**0.47341**
%RSD	0.01192	0.54895	0.22421	4.09883	0.15403	0.27263	6.23550	0.06741	0.14447

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00284	0.47022	2.06849
#2	-0.00280	0.46761	2.06582
Mean	**-0.00282**	**0.46891**	**2.06716**
%RSD	0.98810	0.39245	0.09132

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Method : Paragon File : 100305A Printed : 3/5/2010 16:42:58
SampleId1 : IP100304-4MB SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:18:06

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE25

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00099	0.05177	-0.00196	0.00123	-0.00038	-0.00009	-0.00283	0.02161	-0.00091
#2	0.00079	0.05371	0.00142	0.00107	-0.00024	-0.00010	0.00004	0.01695	-0.00061
Mean	**-0.00010**	**0.05274**	**-0.00027**	**0.00115**	**-0.00031**	**-0.00009**	**-0.00139**	**0.01928**	**-0.00076**
%RSD	1257.03819	2.60341	882.77908	9.73801	32.70753	4.04678	145.57119	17.10440	27.84671

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00082	-0.00056	-0.00177	0.03821	-0.40005	0.00189	-0.01216	-0.00005	-0.00110
#2	0.00011	0.00019	-0.00052	0.03905	-0.38172	0.00189	-0.00520	0.00006	-0.00058
Mean	**-0.00035**	**-0.00019**	**-0.00114**	**0.03863**	**-0.39088**	**0.00189**	**-0.00868**	**0.00000**	**-0.00084**
%RSD	185.01312	281.28046	77.40330	1.55028	3.31669	0.00000	56.68830	3024.44272	43.75086

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.18149	-0.00150	0.01938	-0.00139	0.00158	0.01322	-0.00100	-0.00059	0.00101
#2	-0.18427	-0.00033	0.01757	0.00231	-0.00192	0.01606	0.00114	0.00256	-0.00299
Mean	**-0.18288**	**-0.00092**	**0.01847**	**0.00046**	**-0.00017**	**0.01464**	**0.00007**	**0.00098**	**-0.00099**
%RSD	1.07534	89.90325	6.90868	565.24614	1448.13509	13.68887	2250.62285	225.70533	286.99081

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01277	-0.00024	-0.00182	-0.00111	-0.00062	-0.00208	-0.02765	-0.00058	0.00025
#2	0.01406	0.00000	-0.00182	-0.00414	-0.00061	-0.00331	0.01944	0.00030	-0.00023
Mean	**0.01342**	**-0.00012**	**-0.00182**	**-0.00263**	**-0.00062**	**-0.00270**	**-0.00411**	**-0.00014**	**0.00001**
%RSD	6.81982	139.49745	0.00000	81.43260	0.58982	32.10391	810.55219	436.07325	3464.76848

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00056	0.00059	0.00048
#2	0.00078	-0.00051	-0.00114
Mean	**0.00011**	**0.00004**	**-0.00033**
%RSD	862.13581	1931.98315	347.93947

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:58
SampleId1 : IP100304-4RVS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:19:52
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE26

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Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00175	0.13662	0.00326	0.00441	0.00421	0.00083	0.00744	0.49129	0.00137
#2	0.00073	0.13480	0.00386	0.00536	0.00426	0.00082	0.00606	0.49209	0.00164

Mean	**0.00124**	**0.13571**	**0.00356**	**0.00488**	**0.00423**	**0.00083**	**0.00675**	**0.49169**	**0.00151**
%RSD	57.96760	0.94909	11.93576	13.79228	0.94478	0.60314	14.44767	0.11458	12.80921

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00180	0.00466	0.00347	0.12663	0.26695	0.00478	0.45581	0.00444	0.00893
#2	0.00159	0.00443	0.00326	0.12695	0.26457	0.00477	0.45102	0.00448	0.00846
Mean	**0.00169**	**0.00454**	**0.00336**	**0.12679**	**0.26576**	**0.00478**	**0.45341**	**0.00446**	**0.00870**
%RSD	8.83917	3.67878	4.36940	0.17723	0.63273	0.16717	0.74614	0.58893	3.81459

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.57993	0.00447	0.12348	0.00538	0.00448	0.09541	0.00843	0.00407	0.00423
#2	0.57913	0.00394	0.12699	0.00271	0.00591	0.09257	0.00729	0.00332	0.00423
Mean	**0.57953**	**0.00421**	**0.12524**	**0.00404**	**0.00520**	**0.09399**	**0.00786**	**0.00370**	**0.00423**
%RSD	0.09710	8.85600	1.98245	46.74013	19.41984	2.13217	10.18011	14.47374	0.00293

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02653	0.00997	0.00250	-0.00104	0.00350	0.00684	0.04218	0.00454	0.00877
#2	0.02648	0.00948	0.00248	-0.00378	0.00358	0.00522	0.03375	0.00431	0.00849
Mean	**0.02650**	**0.00972**	**0.00249**	**-0.00241**	**0.00354**	**0.00603**	**0.03797**	**0.00443**	**0.00863**
%RSD	0.15317	3.53874	0.60876	80.48238	1.74692	19.04612	15.69522	3.59778	2.25128

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00461	0.00478	0.00418
#2	0.00461	0.00484	0.00393
Mean	**0.00461**	**0.00481**	**0.00405**
%RSD	0.01461	0.91832	4.39462

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:58
SampleId1 : IP100304-4LCS **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 12:21:38
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE27

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09881	2.10179	1.95681	0.92381	1.95543	0.04528	0.00137	38.37293	0.04908
#2	0.09691	2.09801	1.95076	0.92002	1.95719	0.04521	-0.00060	38.33573	0.04890
Mean	**0.09786**	**2.09990**	**1.95379**	**0.92192**	**1.95631**	**0.04525**	**0.00038**	**38.35433**	**0.04899**
%RSD	1.37144	0.12732	0.21876	0.29049	0.06359	0.10930	361.38125	0.06857	0.26052

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.46665	0.18718	0.24569	1.00695	37.85553	0.48290	38.86137	0.46220	0.97179
#2	0.46769	0.18764	0.24604	1.00530	37.87668	0.48306	38.83756	0.46223	0.97192
Mean	**0.46717**	**0.18741**	**0.24586**	**1.00613**	**37.86610**	**0.48298**	**38.84947**	**0.46221**	**0.97186**

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%RSD	0.15726	0.17213	0.10252	0.11602	0.03950	0.02274	0.04335	0.00572	0.00956

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	36.48388	0.47906	0.02088	0.45345	0.44382	0.00330	0.47551	1.84461	1.81674
#2	36.45395	0.47720	0.02168	0.45226	0.44408	-0.00095	0.47466	1.85262	1.82021
Mean	**36.46891**	**0.47813**	**0.02128**	**0.45285**	**0.44395**	**0.00118**	**0.47508**	**1.84861**	**1.81848**
%RSD	0.05802	0.27550	2.66545	0.18566	0.04059	255.20738	0.12604	0.30656	0.13492

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.63961	0.49635	0.48697	-0.01681	0.46488	2.00213	-0.01096	0.48014	0.44509
#2	1.63681	0.49415	0.48785	-0.01737	0.46456	1.99540	-0.00997	0.47919	0.44440
Mean	**1.63821**	**0.49525**	**0.48741**	**-0.01709**	**0.46472**	**1.99876**	**-0.01047**	**0.47967**	**0.44475**
%RSD	0.12093	0.31339	0.12790	2.30280	0.04852	0.23784	6.70477	0.13894	0.10981

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00001	0.44703	1.82602
#2	-0.00003	0.44680	1.83100
Mean	**-0.00001**	**0.44691**	**1.82851**
%RSD	234.67292	0.03575	0.19270

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:59
SampleId1 : 1003045-2 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 12:23:24
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE28

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00179	54.45854	0.04522	0.03168	0.66503	0.00469	0.01177	127.91181	0.00045
#2	-0.00204	54.47235	0.04431	0.03120	0.66671	0.00467	0.00980	127.76420	0.00027
Mean	**-0.00191**	**54.46544**	**0.04476**	**0.03144**	**0.66587**	**0.00468**	**0.01078**	**127.83801**	**0.00036**
%RSD	9.11944	0.01793	1.42437	1.07139	0.17842	0.22441	12.91442	0.08165	35.43086

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04334	0.05701	0.07899	148.90282	11.46651	0.07855	34.92618	1.32475	0.00377
#2	0.04302	0.05680	0.07893	148.74919	11.45835	0.07846	34.84867	1.32399	0.00356
Mean	**0.04318**	**0.05691**	**0.07896**	**148.82600**	**11.46243**	**0.07851**	**34.88743**	**1.32437**	**0.00367**
%RSD	0.51762	0.26074	0.05646	0.07299	0.05032	0.07585	0.15711	0.04046	4.02126

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.03404	0.08439	2.69295	0.08029	0.08075	4.42731	0.00576	-0.00123	0.00659
#2	2.03039	0.08522	2.69528	0.07841	0.07978	4.44298	0.00368	-0.00070	0.00681
Mean	**2.03221**	**0.08480**	**2.69412**	**0.07935**	**0.08026**	**4.43514**	**0.00472**	**-0.00096**	**0.00670**
%RSD	0.12671	0.69075	0.06124	1.67350	0.85043	0.24982	31.19142	38.70112	2.32518

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ted: 3/5/2010 16:43:34 User: ROY FRENCH

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	9.84622	0.00692	0.67009	0.04500	0.84422	-0.00459	0.01623	0.13689	0.29694
#2	9.84083	0.00595	0.67138	0.04762	0.84482	-0.00003	0.00543	0.13714	0.29563
Mean	**9.84353**	**0.00643**	**0.67073**	**0.04631**	**0.84452**	**-0.00231**	**0.01083**	**0.13702**	**0.29628**
%RSD	0.03866	10.70087	0.13534	3.99354	0.05037	139.72111	70.54616	0.13010	0.31263

	Zr	Pb	Se
	ppm	calc	calc
#1	0.05589	0.08059	0.00399
#2	0.05567	0.07932	0.00431
Mean	**0.05578**	**0.07996**	**0.00415**
%RSD	0.27579	1.12243	5.49703

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:59
SampleId1 : 1003045-4 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:25:11
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE29

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00057	25.46029	0.01490	0.01945	0.71251	0.00172	0.00415	57.37258	-0.00014
#2	-0.00135	25.56932	0.01347	0.01890	0.71619	0.00171	0.00199	57.43660	-0.00008
Mean	**-0.00096**	**25.51481**	**0.01419**	**0.01918**	**0.71435**	**0.00171**	**0.00307**	**57.40459**	**-0.00011**
%RSD	56.96197	0.30217	7.11308	2.04949	0.36380	0.02550	49.79121	0.07886	42.53715

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01464	0.02462	0.02200	46.86754	5.36758	0.03113	11.54082	0.69648	-0.00030
#2	0.01451	0.02418	0.02185	47.00115	5.37818	0.03121	11.56702	0.69847	0.00049
Mean	**0.01458**	**0.02440**	**0.02192**	**46.93435**	**5.37288**	**0.03117**	**11.55392**	**0.69747**	**0.00010**
%RSD	0.62821	1.26305	0.48288	0.20130	0.13950	0.18531	0.16037	0.20176	577.09165

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.43756	0.02937	1.09119	0.02795	0.02777	1.70533	0.00267	0.00103	-0.00091
#2	1.44508	0.02952	1.10801	0.02546	0.02730	1.71811	0.00131	-0.00202	0.00325
Mean	**1.44132**	**0.02945**	**1.09960**	**0.02671**	**0.02753**	**1.71172**	**0.00199**	**-0.00050**	**0.00117**
%RSD	0.36910	0.36152	1.08194	6.57957	1.19982	0.52787	48.17792	433.48098	251.76646

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	7.39897	0.01008	0.26902	0.01527	0.53576	-0.00398	-0.00055	0.06378	0.09284
#2	7.43557	0.01141	0.27046	0.01203	0.53696	-0.00729	0.00828	0.06367	0.09332
Mean	**7.41727**	**0.01074**	**0.26974**	**0.01365**	**0.53636**	**-0.00564**	**0.00386**	**0.06373**	**0.09308**
%RSD	0.34887	8.79488	0.37883	16.79117	0.15865	41.59767	161.58679	0.11716	0.36573

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	0.02715	0.02783	-0.00027
#2	0.02740	0.02669	0.00149
Mean	**0.02728**	**0.02726**	**0.00061**
%RSD	0.63338	2.95506	202.80768

Method : Paragon File : 100305A Printed : 3/5/2010 16:42:59
SampleId1 : 1003045-4D **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 12:26:57
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE30

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00046	21.05780	0.01306	0.01596	0.70434	0.00145	0.00003	54.79275	-0.00019
#2	0.00052	21.01491	0.01208	0.01711	0.70328	0.00145	0.00456	54.72356	-0.00008
Mean	**0.00003**	**21.03635**	**0.01257**	**0.01654**	**0.70381**	**0.00145**	**0.00229**	**54.75815**	**-0.00014**
%RSD	2190.80709	0.14416	5.49188	4.92309	0.10590	0.21084	139.79161	0.08934	55.13743

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01322	0.02259	0.01664	38.32563	4.29594	0.02564	9.18049	0.60953	0.00007
#2	0.01296	0.02285	0.01720	38.25863	4.28579	0.02561	9.17918	0.60871	0.00043
Mean	**0.01309**	**0.02272**	**0.01692**	**38.29213**	**4.29087**	**0.02562**	**9.17983**	**0.60912**	**0.00025**
%RSD	1.45247	0.81321	2.35773	0.12372	0.16724	0.08555	0.01008	0.09578	102.31134

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.20648	0.02260	0.92039	0.02338	0.02207	1.51368	0.00174	0.00311	0.00253
#2	1.20190	0.02240	0.92069	0.02550	0.02041	1.52220	0.00632	0.00499	-0.00281
Mean	**1.20419**	**0.02250**	**0.92054**	**0.02444**	**0.02124**	**1.51794**	**0.00403**	**0.00405**	**-0.00014**
%RSD	0.26904	0.63092	0.02320	6.15726	5.52069	0.39675	80.31755	32.85847	2709.41396

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	6.84420	0.00878	0.23333	0.00646	0.60061	0.00130	0.00774	0.05752	0.07475
#2	6.83813	0.00878	0.23300	0.01055	0.60213	-0.00345	0.01721	0.05826	0.07503
Mean	**6.84116**	**0.00878**	**0.23317**	**0.00851**	**0.60137**	**-0.00107**	**0.01248**	**0.05789**	**0.07489**
%RSD	0.06280	0.01420	0.09847	34.03323	0.17837	312.74222	53.64123	0.90184	0.25969

	Zr	Pb	Se
	ppm	calc	calc
#1	0.02409	0.02251	0.00272
#2	0.02407	0.02211	-0.00021
Mean	**0.02408**	**0.02231**	**0.00126**
%RSD	0.07461	1.26023	165.02304

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Method : Paragon File : 100305A Printed : 3/5/2010 16:42:59

SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 12:28:47
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20285	50.31544	0.51336	0.98876	0.98664	0.50103	0.51417	49.55579	0.50573
#2	0.20339	50.61723	0.51710	0.99215	0.99193	0.50162	0.52178	49.64310	0.50766
Mean	**0.20312**	**50.46633**	**0.51523**	**0.99046**	**0.98928**	**0.50133**	**0.51797**	**49.59944**	**0.50669**
%RSD	0.18890	0.42285	0.51361	0.24201	0.37776	0.08281	1.03952	0.12447	0.27006

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50126	0.99421	0.98829	20.37783	49.85244	0.51096	50.51845	0.97573	0.99851
#2	0.50201	0.99593	0.99512	20.41578	50.06518	0.51371	50.62608	0.97803	0.99898
Mean	**0.50164**	**0.99507**	**0.99170**	**20.39681**	**49.95881**	**0.51234**	**50.57226**	**0.97688**	**0.99875**
%RSD	0.10537	0.12224	0.48715	0.13155	0.30111	0.37988	0.15048	0.16646	0.03348

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	48.90824	1.02940	4.95182	0.97264	0.95635	4.90606	0.50203	1.00554	0.98622
#2	49.15439	1.03035	4.96565	0.97163	0.95531	4.90892	0.49972	1.00236	0.98862
Mean	**49.03131**	**1.02988**	**4.95873**	**0.97214**	**0.95583**	**4.90749**	**0.50087**	**1.00395**	**0.98742**
%RSD	0.35498	0.06507	0.19719	0.07354	0.07744	0.04107	0.32534	0.22401	0.17142

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.73130	1.01340	0.49607	0.13597	0.46759	0.51887	4.86056	0.48670	1.00843
#2	4.75492	1.01756	0.49854	0.13739	0.46943	0.52275	4.90271	0.48722	1.00843
Mean	**4.74311**	**1.01548**	**0.49730**	**0.13668**	**0.46851**	**0.52081**	**4.88164**	**0.48696**	**1.00843**
%RSD	0.35216	0.28948	0.35236	0.73694	0.27710	0.52589	0.61059	0.07495	0.00000

	Zr	Pb	Se
	ppm	calc	calc
#1	0.98087	0.96178	0.99266
#2	0.98409	0.96074	0.99319
Mean	**0.98248**	**0.96126**	**0.99293**
%RSD	0.23173	0.07612	0.03828

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:00
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 12:30:39
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

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Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	0.00000	0.08571	0.00179	-0.00051	-0.00004	0.00029	0.00220	-0.00193	-0.00022
#2	-0.00029	0.07646	-0.00181	-0.00103	-0.00018	0.00025	0.00033	-0.00876	-0.00053
Mean	**-0.00014**	**0.08109**	**-0.00001**	**-0.00077**	**-0.00011**	**0.00027**	**0.00126**	**-0.00535**	**-0.00038**
%RSD	142.84227	8.06519	32491.03116	47.25012	92.80772	12.73787	104.61727	90.26653	59.63222

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00051	-0.00016	-0.00165	0.00936	-0.35743	0.00211	0.00350	0.00017	0.00046
#2	-0.00026	-0.00029	-0.00136	0.00666	-0.37933	0.00205	-0.00672	0.00006	-0.00061
Mean	**0.00012**	**-0.00022**	**-0.00150**	**0.00801**	**-0.36838**	**0.00208**	**-0.00161**	**0.00011**	**-0.00007**
%RSD	441.99744	39.81149	13.48651	23.82395	4.20467	1.82502	448.17409	69.09531	1026.57158

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.17022	0.00063	-0.00048	0.00254	-0.00092	0.00189	0.00020	0.00083	0.00028
#2	-0.17508	0.00026	-0.00308	-0.00157	0.00179	-0.00520	-0.00076	0.00078	0.00167
Mean	**-0.17265**	**0.00044**	**-0.00178**	**0.00049**	**0.00044**	**-0.00166**	**-0.00028**	**0.00080**	**0.00098**
%RSD	1.99340	60.00268	103.50878	595.32685	438.14536	302.49709	239.87677	4.81589	100.89877

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00758	0.00012	-0.00210	0.00242	-0.00049	-0.00067	0.00409	0.00042	-0.00057
#2	-0.01092	-0.00073	-0.00221	-0.00149	-0.00087	-0.00612	0.00261	-0.00042	-0.00105
Mean	**-0.00925**	**-0.00031**	**-0.00215**	**0.00046**	**-0.00068**	**-0.00340**	**0.00335**	**0.00000**	**-0.00081**
%RSD	25.53880	196.84765	3.75832	596.43512	39.82621	113.38594	31.36738	51925.21531	41.74466

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00057	0.00023	0.00046
#2	0.00005	0.00067	0.00137
Mean	**0.00031**	**0.00045**	**0.00092**
%RSD	117.89755	68.54218	70.08429

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:00
SampleId1 : 1003045-4L 5X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:32:31
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE31

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00026	5.29804	0.00213	0.00262	0.14725	0.00052	0.00104	12.03067	-0.00023
#2	-0.00070	5.28141	0.00517	0.00246	0.14711	0.00049	-0.00093	12.03206	-0.00016
Mean	**-0.00048**	**5.28972**	**0.00365**	**0.00254**	**0.14718**	**0.00051**	**0.00005**	**12.03137**	**-0.00019**
%RSD	65.04378	0.22227	58.87191	4.41632	0.06805	3.50621	2537.19666	0.00815	26.17428

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00285	0.00462	0.00301	9.47351	0.64018	0.00702	2.44686	0.14745	-0.00048

#2	0.00254	0.00464	0.00293	9.47267	0.64754	0.00700	2.44251	0.14749	-0.00144
Mean	**0.00270**	**0.00463**	**0.00297**	**9.47309**	**0.64386**	**0.00701**	**2.44468**	**0.14747**	**-0.00096**
%RSD	8.29421	0.30674	1.88342	0.00627	0.80903	0.22780	0.12590	0.01786	71.04815

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10853	0.00564	0.23436	0.00611	0.00558	0.35477	-0.00182	0.00232	-0.00142
#2	0.10610	0.00628	0.23075	0.00546	0.00486	0.36186	0.00043	-0.00008	-0.00170
Mean	**0.10731**	**0.00596**	**0.23255**	**0.00578**	**0.00522**	**0.35831**	**-0.00070**	**0.00112**	**-0.00156**
%RSD	1.60441	7.59459	1.09863	7.95354	9.77984	1.39868	228.30359	151.47754	12.63607

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.54834	0.00108	0.05419	-0.00046	0.11160	-0.00349	-0.01524	0.01332	0.01908
#2	1.54928	0.00133	0.05409	0.00011	0.11108	-0.00102	-0.00533	0.01358	0.01914
Mean	**1.54881**	**0.00121**	**0.05414**	**-0.00018**	**0.11134**	**-0.00225**	**-0.01028**	**0.01345**	**0.01911**
%RSD	0.04282	14.29831	0.12167	228.09628	0.32997	77.52875	68.16930	1.38132	0.25425

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00576	0.00576	-0.00017
#2	0.00557	0.00506	-0.00116
Mean	**0.00567**	**0.00541**	**-0.00067**
%RSD	2.37827	9.12975	104.52164

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:00
SampleId1 : 1003045-4MS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:34:18
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE32

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09996	50.22021	2.05158	0.94634	2.60874	0.04951	-0.00188	103.63978	0.05011
#2	0.09935	49.93438	2.04776	0.94251	2.59481	0.04939	0.00115	103.31381	0.05035
Mean	**0.09966**	**50.07729**	**2.04967**	**0.94442**	**2.60177**	**0.04945**	**-0.00036**	**103.47680**	**0.05023**
%RSD	0.43260	0.40361	0.13165	0.28659	0.37857	0.16342	589.77153	0.22275	0.33622

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49733	0.22591	0.28047	52.55875	47.34126	0.56740	54.66432	1.16153	0.98974
#2	0.49495	0.22503	0.27826	52.37315	47.09332	0.56420	54.51596	1.15805	0.98230
Mean	**0.49614**	**0.22547**	**0.27937**	**52.46595**	**47.21729**	**0.56580**	**54.59014**	**1.15979**	**0.98602**
%RSD	0.33843	0.27634	0.55804	0.25014	0.37130	0.39955	0.19217	0.21202	0.53319

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	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	40.35388	0.53472	1.14066	0.49654	0.47698	1.73231	0.32097	1.93446	1.85978
#2	40.11100	0.53162	1.12948	0.49554	0.48111	1.71527	0.31420	1.92261	1.87558

Mean	**40.23244**	**0.53317**	**1.13507**	**0.49604**	**0.47904**	**1.72379**	**0.31759**	**1.92854**	**1.86768**
%RSD	0.42687	0.41082	0.69677	0.14306	0.61020	0.69891	1.50751	0.43459	0.59841

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	11.60734	0.52556	0.78478	0.00407	1.04339	2.06918	0.00846	0.56419	0.55125
#2	11.55156	0.51812	0.78073	0.00220	1.03883	2.06451	-0.00480	0.56227	0.55187
Mean	**11.57945**	**0.52184**	**0.78276**	**0.00314**	**1.04111**	**2.06685**	**0.00183**	**0.56323**	**0.55156**
%RSD	0.34068	1.00755	0.36667	42.33672	0.31006	0.16004	511.35203	0.24123	0.07979

	Zr	Pb	Se
	ppm	calc	calc
#1	0.03884	0.48349	1.88465
#2	0.03848	0.48592	1.89124
Mean	**0.03866**	**0.48470**	**1.88794**
%RSD	0.66182	0.35350	0.24702

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:01
SampleId1 : 1003045-4MSD **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 12:36:04
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE33

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10050	44.97135	2.06387	0.95427	2.78839	0.04974	-0.00190	95.38076	0.05100
#2	0.10086	45.03099	2.06110	0.95252	2.78167	0.04964	0.00144	95.24950	0.05047
Mean	**0.10068**	**45.00117**	**2.06249**	**0.95339**	**2.78503**	**0.04969**	**-0.00023**	**95.31513**	**0.05074**
%RSD	0.25246	0.09373	0.09516	0.13012	0.17050	0.13808	1048.52339	0.09738	0.74675

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50134	0.22881	0.27719	49.27158	46.14497	0.55973	53.23514	1.10047	1.00161
#2	0.49953	0.22873	0.27619	49.17418	46.17984	0.56002	53.22184	1.09825	1.00035
Mean	**0.50043**	**0.22877**	**0.27669**	**49.22288**	**46.16240**	**0.55988**	**53.22849**	**1.09936**	**1.00098**
%RSD	0.25596	0.02485	0.25723	0.13993	0.05341	0.03594	0.01767	0.14332	0.08909

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	39.70845	0.53610	1.00749	0.49595	0.47855	1.92117	0.33292	1.94067	1.88936
#2	39.84278	0.53451	1.00608	0.49695	0.47872	1.91549	0.33393	1.93469	1.90050
Mean	**39.77562**	**0.53530**	**1.00678**	**0.49645**	**0.47863**	**1.91833**	**0.33343**	**1.93768**	**1.89493**
%RSD	0.23881	0.20959	0.09902	0.14341	0.02513	0.20939	0.21421	0.21789	0.41592

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	12.04190	0.52843	0.76104	0.00504	1.19960	2.08770	-0.00566	0.57266	0.55180
#2	12.06570	0.53087	0.75852	0.00284	1.19735	2.07393	0.00234	0.57241	0.55035
Mean	**12.05380**	**0.52965**	**0.75978**	**0.00394**	**1.19848**	**2.08082**	**-0.00166**	**0.57254**	**0.55107**

20000437

%RSD	0.13962	0.32607	0.23496	39.58037	0.13284	0.46789	340.85347	0.03028	0.18635

	Zr	Pb	Se
	ppm	calc	calc
#1	0.03422	0.48434	1.90644
#2	0.03419	0.48479	1.91189
Mean	**0.03421**	**0.48457**	**1.90916**
%RSD	0.06690	0.06548	0.20171

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:01
SampleId1 : 1003045-5 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:37:50
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE34

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00092	40.23035	0.01685	0.03776	0.74175	0.00297	0.00089	102.01068	0.00020
#2	-0.00042	39.89392	0.01637	0.03835	0.73485	0.00295	0.00393	101.42548	0.00000
Mean	**-0.00067**	**40.06214**	**0.01661**	**0.03805**	**0.73830**	**0.00296**	**0.00241**	**101.71808**	**0.00010**
%RSD	52.35426	0.59382	2.07859	1.10663	0.66049	0.52077	89.35730	0.40681	146.15321

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02139	0.03110	0.03565	62.92231	9.10742	0.05956	19.63074	1.21337	0.00041
#2	0.02149	0.03141	0.03477	62.51672	9.04869	0.05921	19.53132	1.20622	0.00038
Mean	**0.02144**	**0.03125**	**0.03521**	**62.71952**	**9.07806**	**0.05939**	**19.58103**	**1.20980**	**0.00040**
%RSD	0.33916	0.69598	1.74895	0.45727	0.45751	0.42509	0.35905	0.41785	4.65943

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.04646	0.03805	1.61101	0.03950	0.04123	1.96804	0.00047	-0.00307	0.00096
#2	2.03059	0.03844	1.57881	0.04326	0.04051	1.94816	0.00147	-0.00193	0.00292
Mean	**2.03853**	**0.03825**	**1.59491**	**0.04138**	**0.04087**	**1.95810**	**0.00097**	**-0.00250**	**0.00194**
%RSD	0.55028	0.71907	1.42795	6.41359	1.23161	0.71803	73.35303	32.25383	71.34593

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	10.67143	0.00676	0.50056	0.02071	0.56172	-0.00875	-0.00355	0.08554	0.13487
#2	10.56361	0.00640	0.49646	0.01749	0.55848	-0.00595	0.01407	0.08475	0.13501
Mean	**10.61752**	**0.00658**	**0.49851**	**0.01910**	**0.56010**	**-0.00735**	**0.00526**	**0.08515**	**0.13494**
%RSD	0.71808	3.87910	0.58105	11.93857	0.40836	26.93358	236.87896	0.65812	0.07212

20000438

	Zr	Pb	Se
	ppm	calc	calc
#1	0.04204	0.04065	-0.00038
#2	0.04223	0.04143	0.00130
Mean	**0.04214**	**0.04104**	**0.00046**
%RSD	0.30553	1.33532	258.61379

ted: 3/5/2010 16:43:35 User: ROY FRENCH
Method : Paragon File : 100305A Printed : 3/5/2010 16:43:01
SampleId1 : 1003045-8 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:39:37
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE35

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00243	73.01444	0.03289	0.02894	0.89096	0.00510	0.00490	94.81942	0.00041
#2	-0.00206	72.86489	0.03800	0.03033	0.89341	0.00508	0.00313	94.88291	0.00036
Mean	**-0.00225**	**72.93966**	**0.03545**	**0.02964**	**0.89219**	**0.00509**	**0.00402**	**94.85116**	**0.00038**
%RSD	11.65947	0.14498	10.19175	3.31533	0.19453	0.32026	31.10788	0.04733	9.86826

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03923	0.06060	0.06819	132.51721	14.56064	0.08088	27.27449	0.93777	0.00197
#2	0.03912	0.06090	0.06884	132.69420	14.51519	0.08080	27.28437	0.93947	0.00278
Mean	**0.03917**	**0.06075**	**0.06851**	**132.60570**	**14.53791**	**0.08084**	**27.27943**	**0.93862**	**0.00238**
%RSD	0.19199	0.34606	0.67200	0.09438	0.22107	0.07120	0.02562	0.12774	24.04202

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.57664	0.08085	2.26706	0.07512	0.07678	2.71401	0.00374	0.00241	0.00812
#2	1.56837	0.08112	2.24843	0.07881	0.07465	2.71828	0.00060	0.00256	0.00567
Mean	**1.57251**	**0.08099**	**2.25775**	**0.07697**	**0.07571**	**2.71614**	**0.00217**	**0.00248**	**0.00689**
%RSD	0.37202	0.24109	0.58351	3.38415	1.98591	0.11102	102.60678	4.31036	25.06124

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	10.59501	0.00696	0.63651	0.04435	0.49935	-0.00388	0.03978	0.14416	0.25972
#2	10.59953	0.00975	0.63822	0.04288	0.50129	-0.00510	0.02925	0.14459	0.25772
Mean	**10.59727**	**0.00835**	**0.63737**	**0.04362**	**0.50032**	**-0.00449**	**0.03451**	**0.14438**	**0.25872**
%RSD	0.03016	23.65643	0.19021	2.37281	0.27402	19.23406	21.57610	0.21008	0.54621

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.05803	0.07623	0.00621
#2	0.05829	0.07603	0.00463
Mean	**0.05816**	**0.07613**	**0.00542**
%RSD	0.31805	0.17802	20.58708

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:02
SampleId1 : 1003045-9 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:41:23
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE36

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00102	40.46893	0.01291	0.01517	1.12984	0.00248	0.00290	80.93499	0.00020
#2	-0.00015	40.27203	0.01265	0.01425	1.12483	0.00245	0.00280	80.48302	-0.00002
Mean	**-0.00058**	**40.37048**	**0.01278**	**0.01471**	**1.12733**	**0.00247**	**0.00285**	**80.70900**	**0.00009**
%RSD	104.74779	0.34487	1.45469	4.38921	0.31401	0.77537	2.47948	0.39598	180.78614

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01789	0.03558	0.02372	58.89253	7.01095	0.03453	14.19168	0.68837	-0.00048
#2	0.01802	0.03608	0.02378	58.54473	6.97948	0.03441	14.11911	0.68503	0.00038
Mean	**0.01795**	**0.03583**	**0.02375**	**58.71863**	**6.99522**	**0.03447**	**14.15540**	**0.68670**	**-0.00005**
%RSD	0.51868	0.98515	0.17772	0.41883	0.31813	0.24263	0.36248	0.34407	1279.22605

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.63843	0.04079	1.30416	0.02985	0.03260	1.62583	-0.00084	-0.00300	0.00296
#2	0.63370	0.04084	1.27865	0.03474	0.03243	1.63008	0.00166	0.00012	-0.00008
Mean	**0.63606**	**0.04082**	**1.29141**	**0.03230**	**0.03251**	**1.62795**	**0.00041**	**-0.00144**	**0.00144**
%RSD	0.52535	0.08695	1.39683	10.71013	0.36871	0.18499	426.26439	152.78581	149.72317

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	10.21164	0.00713	0.30745	0.01645	0.76436	-0.01054	-0.01072	0.10284	0.09985
#2	10.16067	0.00896	0.30595	0.01485	0.76123	-0.00173	0.00439	0.10290	0.09930
Mean	**10.18615**	**0.00805**	**0.30670**	**0.01565**	**0.76279**	**-0.00614**	**-0.00317**	**0.10287**	**0.09958**
%RSD	0.35384	16.05826	0.34700	7.19269	0.29028	101.46677	337.24708	0.04407	0.39073

	Zr	Pb	Se
	ppm	calc	calc
#1	0.03978	0.03168	0.00097
#2	0.03972	0.03320	-0.00002
Mean	**0.03975**	**0.03244**	**0.00048**
%RSD	0.10265	3.30431	146.64631

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:02
SampleId1 : 1003045-10 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:43:10
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE37

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00014	54.47444	0.01892	0.01552	0.87583	0.00288	0.00498	72.78270	-0.00005
#2	-0.00078	54.61019	0.01670	0.01501	0.87889	0.00286	0.00183	72.73409	-0.00040
Mean	**-0.00032**	**54.54231**	**0.01781**	**0.01527**	**0.87736**	**0.00287**	**0.00341**	**72.75840**	**-0.00023**
%RSD	204.98263	0.17600	8.79717	2.39054	0.24609	0.25542	65.46079	0.04724	111.04938

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02206	0.03254	0.01512	55.89832	7.84198	0.04010	15.29590	0.57643	0.00033
#2	0.02195	0.03204	0.01536	55.89198	7.84151	0.04011	15.29109	0.57703	-0.00079
Mean	**0.02201**	**0.03229**	**0.01524**	**55.89515**	**7.84174**	**0.04011**	**15.29350**	**0.57673**	**-0.00023**
%RSD	0.33140	1.10491	1.09772	0.00803	0.00423	0.01985	0.02224	0.07353	344.57442

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.24383	0.04097	0.57305	0.04054	0.03549	1.27950	0.00402	0.00255	-0.00017
#2	1.24667	0.04083	0.58863	0.03655	0.03903	1.27666	0.00164	-0.00309	0.00160
Mean	**1.24525**	**0.04090**	**0.58084**	**0.03855**	**0.03726**	**1.27808**	**0.00283**	**-0.00027**	**0.00071**
%RSD	0.16120	0.23864	1.89676	7.30911	6.71014	0.15702	59.57663	1483.65689	175.43878

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	6.22785	0.00511	0.28677	0.00969	0.41023	-0.00266	0.02304	0.08920	0.08864
#2	6.23594	0.00669	0.28764	0.00852	0.41104	-0.00110	-0.00570	0.08865	0.08899
Mean	**6.23190**	**0.00590**	**0.28721**	**0.00911**	**0.41063**	**-0.00188**	**0.00867**	**0.08892**	**0.08881**
%RSD	0.09178	18.92184	0.21362	9.08576	0.13993	58.84791	234.48017	0.43420	0.27377

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.03553	0.03717	0.00074
#2	0.03513	0.03820	0.00004
Mean	**0.03533**	**0.03769**	**0.00039**
%RSD	0.80911	1.93524	127.17628

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:02
SampleId1 : 1003045-11 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:44:57
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE38

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00006	19.30288	0.00427	0.02930	0.19086	0.00120	0.00310	151.11654	-0.00033
#2	0.00089	19.32639	0.00164	0.02930	0.19148	0.00118	0.00301	150.92352	-0.00032
Mean	**0.00048**	**19.31464**	**0.00296**	**0.02930**	**0.19117**	**0.00119**	**0.00306**	**151.02003**	**-0.00032**
%RSD	123.20314	0.08604	62.82260	0.00000	0.23063	1.18883	2.14108	0.09038	1.92510

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01701	0.00943	0.01750	29.59837	3.58106	0.02769	18.91206	4.03299	0.00137
#2	0.01738	0.00967	0.01770	29.59038	3.57775	0.02767	18.90134	4.03272	0.00215
Mean	**0.01720**	**0.00955**	**0.01760**	**29.59437**	**3.57940**	**0.02768**	**18.90670**	**4.03285**	**0.00176**
%RSD	1.51622	1.82661	0.82064	0.01909	0.06536	0.05039	0.04012	0.00483	31.34552

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

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#1	11.61895	0.02335	0.54932	0.03163	0.03269	42.94394	0.00129	0.00079	0.00142
#2	11.61440	0.02260	0.54651	0.03163	0.03099	43.04369	0.00225	0.00407	0.00455
Mean	**11.61668**	**0.02297**	**0.54792**	**0.03163**	**0.03184**	**42.99382**	**0.00177**	**0.00243**	**0.00298**
%RSD	0.02769	2.31686	0.36317	0.00791	3.77268	0.16406	38.12190	95.44563	74.24482

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.70625	0.00397	1.70332	0.00131	0.14179	-0.00188	-0.00069	0.04841	0.05585
#2	4.72175	0.00664	1.70414	-0.00219	0.14276	-0.00496	0.01220	0.04948	0.05585
Mean	**4.71400**	**0.00530**	**1.70373**	**-0.00044**	**0.14228**	**-0.00342**	**0.00576**	**0.04894**	**0.05585**
%RSD	0.23247	35.64915	0.03412	565.21003	0.48574	63.75200	158.35657	1.54440	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.01415	0.03234	0.00121
#2	0.01449	0.03120	0.00439
Mean	**0.01432**	**0.03177**	**0.00280**
%RSD	1.67275	2.52441	80.37242

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:02
SampleId1 : 1003045-12 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:46:44
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE39

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00120	48.70320	0.04946	0.01608	0.62976	0.00438	0.00789	115.88558	0.00033
#2	-0.00063	48.50275	0.04770	0.01747	0.62819	0.00439	0.00691	115.87226	0.00039
Mean	**-0.00092**	**48.60298**	**0.04858**	**0.01677**	**0.62897**	**0.00439**	**0.00740**	**115.87892**	**0.00036**
%RSD	44.10237	0.29162	2.57054	5.85729	0.17601	0.20158	9.39837	0.00813	11.36808

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04620	0.04953	0.05426	175.64687	9.06296	0.08750	29.35213	1.59921	0.00333
#2	0.04655	0.04974	0.05396	175.51913	9.03043	0.08716	29.35433	1.59806	0.00262
Mean	**0.04638**	**0.04964**	**0.05411**	**175.58300**	**9.04670**	**0.08733**	**29.35323**	**1.59864**	**0.00298**
%RSD	0.52502	0.29576	0.38855	0.05144	0.25425	0.27258	0.00529	0.05047	16.72167

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.03194	0.07667	3.54179	0.06697	0.06680	2.04758	0.00518	0.00567	0.00754
#2	2.01807	0.07653	3.49282	0.07216	0.06296	2.04616	0.00713	0.00643	0.00572
Mean	**2.02501**	**0.07660**	**3.51730**	**0.06956**	**0.06488**	**2.04687**	**0.00615**	**0.00605**	**0.00663**
%RSD	0.48426	0.12745	0.98446	5.27413	4.18681	0.04907	22.45378	8.91175	19.50360

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	5.90540	0.00574	0.42993	0.03414	2.17176	-0.00661	0.03123	0.16836	0.28487

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#2	5.89940	0.01049	0.42917	0.03436	2.17038	-0.00287	0.04619	0.16826	0.28549
Mean	**5.90240**	**0.00811**	**0.42955**	**0.03425**	**2.17107**	**-0.00474**	**0.03871**	**0.16831**	**0.28518**
%RSD	0.07197	41.35119	0.12566	0.46586	0.04484	55.71874	27.32504	0.04198	0.15383

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.06175	0.06686	0.00692
#2	0.06188	0.06602	0.00595
Mean	**0.06182**	**0.06644**	**0.00644**
%RSD	0.15290	0.88812	10.61046

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:03
SampleId1 : 1003045-13 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:48:31
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE40

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00185	47.58720	0.03481	0.02481	0.74346	0.00390	0.00526	119.49605	0.00021
#2	-0.00163	47.23345	0.03492	0.02398	0.73881	0.00386	0.00525	118.72905	0.00009
Mean	**-0.00174**	**47.41033**	**0.03487**	**0.02440**	**0.74113**	**0.00388**	**0.00526**	**119.11255**	**0.00015**
%RSD	8.90499	0.52761	0.22857	2.41644	0.44319	0.68092	0.13603	0.45533	56.32780

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03801	0.05017	0.05613	130.12169	10.78138	0.06510	30.22500	1.73062	0.00299
#2	0.03836	0.05026	0.05742	129.51894	10.69131	0.06469	30.06870	1.72365	0.00333
Mean	**0.03819**	**0.05022**	**0.05677**	**129.82032**	**10.73634**	**0.06490**	**30.14685**	**1.72713**	**0.00316**
%RSD	0.65197	0.12580	1.60248	0.32831	0.59322	0.45621	0.36662	0.28547	7.58609

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.82605	0.07359	2.84314	0.06547	0.06497	2.77941	0.00095	-0.00649	0.00518
#2	0.81714	0.07215	2.84172	0.06553	0.06344	2.77372	0.00458	0.00722	0.00331
Mean	**0.82159**	**0.07287**	**2.84243**	**0.06550**	**0.06420**	**2.77656**	**0.00276**	**0.00037**	**0.00425**
%RSD	0.76662	1.40050	0.03535	0.07308	1.68743	0.14482	92.96086	2651.62746	31.06806

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	8.34581	0.00956	0.46164	0.03616	1.60771	-0.00475	0.01662	0.14156	0.25751
#2	8.31958	0.00932	0.45913	0.03596	1.60059	-0.00818	0.01555	0.14104	0.25489
Mean	**8.33269**	**0.00944**	**0.46039**	**0.03606**	**1.60415**	**-0.00646**	**0.01608**	**0.14130**	**0.25620**
%RSD	0.22254	1.75963	0.38567	0.39421	0.31374	37.53303	4.73375	0.25595	0.72273

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.06076	0.06513	0.00129
#2	0.06096	0.06413	0.00461

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Mean	**0.06086**	**0.06463**	**0.00295CH**
%RSD	0.23417	1.09332	79.49712

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:03
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 12:50:18
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20241	50.08995	0.51650	0.98350	0.97964	0.49895	0.51532	49.59205	0.50690
#2	0.20357	50.26614	0.51555	0.98605	0.98410	0.50077	0.52687	49.77008	0.50903
Mean	**0.20299**	**50.17804**	**0.51603**	**0.98478**	**0.98187**	**0.49986**	**0.52109**	**49.68106**	**0.50797**
%RSD	0.40662	0.24828	0.12950	0.18326	0.32092	0.25718	1.56721	0.25340	0.29726

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49961	0.99145	0.98266	20.27435	49.67826	0.50865	50.41637	0.97169	0.99549
#2	0.50217	0.99657	0.98871	20.34808	49.78308	0.51041	50.61567	0.97539	0.99919
Mean	**0.50089**	**0.99401**	**0.98569**	**20.31121**	**49.73067**	**0.50953**	**50.51602**	**0.97354**	**0.99734**
%RSD	0.36057	0.36413	0.43394	0.25666	0.14904	0.24388	0.27898	0.26834	0.26266

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	48.93435	1.03033	4.95448	0.97195	0.94870	4.84906	0.49594	0.99702	0.97862
#2	49.05974	1.03520	4.96636	0.97526	0.95092	4.83765	0.49616	1.00064	0.98032
Mean	**48.99704**	**1.03277**	**4.96042**	**0.97360**	**0.94981**	**4.84335**	**0.49605**	**0.99883**	**0.97947**
%RSD	0.18096	0.33398	0.16938	0.24020	0.16570	0.16646	0.03130	0.25666	0.12248

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.69660	1.02136	0.49307	0.13391	0.46431	0.51348	4.82838	0.48585	1.00739
#2	4.71688	1.01744	0.49558	0.13374	0.46573	0.51927	4.86604	0.48764	1.01066
Mean	**4.70674**	**1.01940**	**0.49432**	**0.13383**	**0.46502**	**0.51638**	**4.84721**	**0.48674**	**1.00903**
%RSD	0.30463	0.27167	0.35861	0.09337	0.21584	0.79386	0.54941	0.25941	0.22902

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.97726	0.95644	0.98475
#2	0.98038	0.95903	0.98709
Mean	**0.97882**	**0.95773**	**0.98592**
%RSD	0.22516	0.19092	0.16775

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Method : Paragon File : 100305A Printed : 3/5/2010 16:43:03
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 12:52:10
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations:**35** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00043	0.08184	-0.00113	-0.00071	-0.00024	0.00020	-0.00430	-0.00330	-0.00047
#2	-0.00042	0.08220	-0.00046	-0.00155	-0.00029	0.00019	-0.00341	-0.00478	-0.00014
Mean	**-0.00043**	**0.08202**	**-0.00080**	**-0.00113**	**-0.00026**	**0.00020**	**-0.00385**	**-0.00404**	**-0.00030**
%RSD	1.44275	0.31377	60.01024	52.18542	15.19102	2.02120	16.18707	25.89314	76.95678

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00037	-0.00043	-0.00165	0.01169	-0.40600	0.00201	-0.00411	0.00013	-0.00097
#2	-0.00074	-0.00037	-0.00178	0.01047	-0.42148	0.00196	-0.00933	0.00002	-0.00188
Mean	**-0.00055**	**-0.00040**	**-0.00171**	**0.01108**	**-0.41374**	**0.00198**	**-0.00672**	**0.00008**	**-0.00143**
%RSD	47.42265	9.95653	5.57865	7.76792	2.64523	1.71199	54.89342	102.47241	45.14180

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.17613	-0.00095	-0.00248	-0.00175	0.00029	0.00189	0.00084	-0.00062	0.00094
#2	-0.17856	-0.00112	-0.00268	-0.00119	0.00109	-0.00236	-0.00160	-0.00410	0.00143
Mean	**-0.17734**	**-0.00104**	**-0.00258**	**-0.00147**	**0.00069**	**-0.00024**	**-0.00038**	**-0.00236**	**0.00118**
%RSD	0.97032	11.97812	5.48960	26.95195	82.20810	1256.81746	453.27104	104.47747	29.07931

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01112	-0.00097	-0.00217	-0.00156	-0.00063	-0.00207	0.00161	-0.00040	-0.00085
#2	-0.01193	-0.00292	-0.00220	0.00012	-0.00068	-0.00101	-0.00830	-0.00061	-0.00085
Mean	**-0.01153**	**-0.00195**	**-0.00218**	**-0.00072**	**-0.00066**	**-0.00154**	**-0.00335**	**-0.00051**	**-0.00085**
%RSD	4.94643	70.64937	0.92726	163.98111	4.97629	48.67654	209.50346	28.94056	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00021	-0.00039	0.00042
#2	-0.00026	0.00033	-0.00041
Mean	**-0.00002**	**-0.00003**	**0.00000**
%RSD	1469.36088	1729.87619	15029.04752

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:04
SampleId1 : 1003045-16 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 12:54:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE41

Final concentrations

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	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00118	60.17133	0.03098	0.04315	0.89555	0.00498	0.00722	152.58583	-0.00003
#2	-0.00064	59.58103	0.03229	0.04327	0.88568	0.00494	0.00691	151.55334	0.00047
Mean	**-0.00091**	**59.87618**	**0.03163**	**0.04321**	**0.89062**	**0.00496**	**0.00706**	**152.06959**	**0.00022**
%RSD	41.71596	0.69712	2.93887	0.19490	0.78402	0.62155	3.02143	0.48010	160.36470

ted: 3/5/2010 16:43:35 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03686	0.04657	0.06671	107.89586	13.73807	0.09413	30.30744	2.21637	0.00163
#2	0.03717	0.04682	0.06599	107.03742	13.62451	0.09328	30.11464	2.19888	0.00234
Mean	**0.03702**	**0.04669**	**0.06635**	**107.46664**	**13.68129**	**0.09371**	**30.21104**	**2.20763**	**0.00199**
%RSD	0.59684	0.37402	0.77160	0.56484	0.58688	0.64112	0.45127	0.56024	25.06311

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	3.07009	0.06208	2.51072	0.07084	0.06945	3.05667	0.00424	-0.00184	0.00439
#2	3.04000	0.06069	2.47200	0.07265	0.06869	3.01543	0.00270	0.00181	0.00210
Mean	**3.05504**	**0.06139**	**2.49136**	**0.07174**	**0.06907**	**3.03605**	**0.00347**	**-0.00001**	**0.00325**
%RSD	0.69664	1.60451	1.09894	1.77699	0.78436	0.96051	31.42758	19172.19086	49.80823

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	10.63896	0.00570	0.81666	0.03010	0.53361	-0.00656	0.00201	0.11600	0.24056
#2	10.50823	0.00595	0.80833	0.03010	0.52927	-0.00337	0.01449	0.11583	0.23904
Mean	**10.57359**	**0.00582**	**0.81250**	**0.03010**	**0.53144**	**-0.00496**	**0.00825**	**0.11591**	**0.23980**
%RSD	0.87428	3.01387	0.72461	0.01125	0.57682	45.37542	106.93232	0.10149	0.44695

	Zr	Pb	Se
	ppm	calc	calc
#1	0.07070	0.06992	0.00232
#2	0.07063	0.07000	0.00201
Mean	**0.07066**	**0.06996**	**0.00216**
%RSD	0.07149	0.09032	10.08910

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:04
SampleId1 : 1003045-17 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:55:50
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE42

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00026	24.60256	0.01269	0.02366	1.67811	0.00192	0.00586	79.32133	0.00040
#2	-0.00034	24.70390	0.01377	0.02497	1.68110	0.00195	0.00587	79.47491	0.00014
Mean	**-0.00030**	**24.65323**	**0.01323**	**0.02432**	**1.67961**	**0.00193**	**0.00587**	**79.39812**	**0.00027**
%RSD	17.50705	0.29067	5.82130	3.80965	0.12593	0.99497	0.05112	0.13677	66.70859

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01913	0.04352	0.02591	66.27448	6.83760	0.03006	11.90485	1.00559	0.00075
#2	0.01958	0.04401	0.02605	66.42118	6.86955	0.03013	11.92996	1.00733	0.00124
Mean	**0.01936**	**0.04377**	**0.02598**	**66.34783**	**6.85357**	**0.03010**	**11.91740**	**1.00646**	**0.00099**
%RSD	1.64169	0.77739	0.38592	0.15634	0.32964	0.15224	0.14902	0.12189	35.19261

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	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.23312	0.03262	1.72878	0.03741	0.03255	1.95100	0.00385	0.00438	0.00265
#2	0.23576	0.03320	1.74424	0.03626	0.03218	1.94673	0.00427	0.00652	0.00173
Mean	**0.23444**	**0.03291**	**1.73651**	**0.03683**	**0.03236**	**1.94887**	**0.00406**	**0.00545**	**0.00219**
%RSD	0.79455	1.24005	0.62942	2.21951	0.82185	0.15459	7.24028	27.79408	29.59063

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	6.13618	0.00926	0.32511	0.01362	1.34056	-0.00648	0.02589	0.11776	0.11891
#2	6.17884	0.00865	0.32575	0.01650	1.34243	-0.00251	0.02728	0.11824	0.12028
Mean	**6.15751**	**0.00896**	**0.32543**	**0.01506**	**1.34150**	**-0.00449**	**0.02659**	**0.11800**	**0.11960**
%RSD	0.48985	4.81783	0.14003	13.51650	0.09862	62.38640	3.68980	0.28729	0.81352

	Zr	Pb	Se
	ppm	calc	calc
#1	0.03608	0.03417	0.00323
#2	0.03609	0.03353	0.00333
Mean	**0.03609**	**0.03385**	**0.00328**
%RSD	0.01273	1.32827	2.19186

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:04
SampleId1 : 1003045-18 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:57:37
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE43

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00024	5.44919	0.00262	0.00346	0.46413	0.00038	-0.00311	35.01341	-0.00056
#2	0.00012	5.43468	0.00446	0.00469	0.46564	0.00038	-0.00173	35.10024	-0.00005
Mean	**-0.00006**	**5.44193**	**0.00354**	**0.00407**	**0.46489**	**0.00038**	**-0.00242**	**35.05682**	**-0.00030**
%RSD	441.16364	0.18864	36.74705	21.37642	0.22910	1.33227	40.27097	0.17514	117.65654

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00358	0.00637	0.00236	11.83355	0.75423	0.00844	2.67103	0.26366	-0.00116
#2	0.00406	0.00667	0.00250	11.87603	0.75566	0.00848	2.68496	0.26429	-0.00022
Mean	**0.00382**	**0.00652**	**0.00243**	**11.85479**	**0.75494**	**0.00846**	**2.67800**	**0.26398**	**-0.00069**
%RSD	8.84546	3.26446	4.02865	0.25336	0.13352	0.35367	0.36781	0.16992	96.70137

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.65594	0.00719	0.34589	0.00582	0.00895	0.72340	0.00130	-0.00410	0.00332
#2	0.65106	0.00756	0.34449	0.01109	0.00625	0.71489	0.00167	-0.00265	0.00037
Mean	**0.65350**	**0.00737**	**0.34519**	**0.00845**	**0.00760**	**0.71915**	**0.00149**	**-0.00338**	**0.00185**
%RSD	0.52750	3.48839	0.28797	44.10795	25.05064	0.83663	17.21310	30.34226	113.07532

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	3.48267	0.00444	0.11402	0.00351	0.36517	-0.00736	-0.00247	0.02001	0.02553
#2	3.49753	0.00723	0.11448	0.00431	0.36501	-0.00345	0.00345	0.02056	0.02553
Mean	**3.49010**	**0.00584**	**0.11425**	**0.00391**	**0.36509**	**-0.00540**	**0.00049**	**0.02029**	**0.02553**
%RSD	0.30114	33.89329	0.28450	14.52464	0.03088	51.16076	860.13319	1.92694	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00680	0.00790	0.00085
#2	0.00719	0.00786	-0.00064
Mean	**0.00699**	**0.00788**	**0.00011**
%RSD	3.98474	0.35854	994.13326

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:04
SampleId1 : 1003045-19 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 12:59:24
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE44

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00097	5.51751	0.00743	0.00369	0.60815	0.00040	-0.00430	36.17585	-0.00051
#2	-0.00002	5.50652	0.00803	0.00401	0.60636	0.00037	0.00052	36.15521	-0.00055
Mean	**-0.00049**	**5.51201**	**0.00773**	**0.00385**	**0.60726**	**0.00039**	**-0.00189**	**36.16553**	**-0.00053**
%RSD	135.35472	0.14101	5.49796	5.82914	0.20878	5.55821	180.33847	0.04034	5.52081

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00583	0.00927	0.00343	14.72395	0.78108	0.00853	2.83776	0.33388	-0.00084
#2	0.00607	0.00980	0.00357	14.68399	0.79010	0.00853	2.82905	0.33340	-0.00037
Mean	**0.00595**	**0.00953**	**0.00350**	**14.70397**	**0.78559**	**0.00853**	**2.83340**	**0.33364**	**-0.00061**
%RSD	2.83139	3.92537	2.78289	0.19218	0.81258	0.02338	0.21728	0.10291	54.56962

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47295	0.00827	0.38345	0.00806	0.01089	0.87232	-0.00045	0.00214	-0.00271
#2	0.46987	0.00925	0.39229	0.01081	0.00895	0.86097	0.00134	0.00413	-0.00046
Mean	**0.47141**	**0.00876**	**0.38787**	**0.00944**	**0.00992**	**0.86665**	**0.00044**	**0.00313**	**-0.00159**
%RSD	0.46246	7.89801	1.61125	20.61035	13.81919	0.92582	283.71101	44.81417	100.59019

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	3.52452	0.01107	0.12848	0.00202	0.30714	-0.00089	-0.00791	0.02921	0.02210
#2	3.50862	0.00925	0.12799	0.00479	0.30565	-0.00156	-0.00144	0.02971	0.02224
Mean	**3.51657**	**0.01016**	**0.12824**	**0.00341**	**0.30639**	**-0.00123**	**-0.00468**	**0.02946**	**0.02217**
%RSD	0.31978	12.68331	0.26946	57.38622	0.34305	38.46949	97.87181	1.19855	0.43838

	Zr	**Pb**	**Se**
	ppm	calc	calc

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#1	0.00772	0.00995	-0.00110**CH**
#2	0.00736	0.00957	0.00107
Mean	**0.00754**	**0.00976**	**-0.00001**
%RSD	3.34872	2.73163	11140.59537

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:05
SampleId1 : 1003045-21 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:01:12
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE45

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00144	69.60655	0.04845	0.03506	0.80324	0.00555	0.01417	166.44853	0.00029
#2	-0.00177	70.20554	0.05006	0.03446	0.81105	0.00555	0.00857	166.99336	0.00045
Mean	**-0.00161**	**69.90605**	**0.04925**	**0.03476**	**0.80714**	**0.00555**	**0.01137**	**166.72094**	**0.00037**
%RSD	14.49718	0.60589	2.31950	1.21153	0.68451	0.04785	34.79230	0.23108	29.51751

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04540	0.06049	0.08426	147.35582	15.52940	0.09806	41.46658	1.57947	0.00395
#2	0.04543	0.06057	0.08497	147.98888	15.67246	0.09893	41.64693	1.58704	0.00424
Mean	**0.04541**	**0.06053**	**0.08461**	**147.67235**	**15.60093**	**0.09850**	**41.55676**	**1.58325**	**0.00410**
%RSD	0.04164	0.10243	0.59565	0.30313	0.64845	0.62582	0.30687	0.33796	4.94879

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.88479	0.08957	2.79777	0.10017	0.09503	5.01012	0.00549	0.00651	0.01015
#2	2.91497	0.08908	2.79513	0.09870	0.09237	5.02152	0.00251	0.01004	0.01126
Mean	**2.89988**	**0.08933**	**2.79645**	**0.09943**	**0.09370**	**5.01582**	**0.00400**	**0.00828**	**0.01070**
%RSD	0.73611	0.38751	0.06672	1.04496	2.01067	0.16076	52.53689	30.18525	7.29774

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	7.32609	0.00776	0.90315	0.04977	0.43395	-0.00221	0.03959	0.13920	0.31197
#2	7.40191	0.00776	0.91109	0.04978	0.43900	-0.00727	0.04164	0.13979	0.31238
Mean	**7.36400**	**0.00776**	**0.90712**	**0.04978**	**0.43647**	**-0.00474**	**0.04061**	**0.13950**	**0.31217**
%RSD	0.72804	0.05353	0.61955	0.01142	0.81819	75.46070	3.56510	0.30032	0.09372

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.05667	0.09674	0.00894
#2	0.05682	0.09447	0.01085
Mean	**0.05675**	**0.09561**	**0.00990**
%RSD	0.18306	1.67622	13.67185

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Method : Paragon File : 100305A Printed : 3/5/2010 16:43:05
SampleId1 : 1003045-23 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:02:58

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE46

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00079	16.60361	0.01223	0.01489	0.58891	0.00124	-0.00299	55.54172	-0.00016
#2	-0.00082	16.57643	0.00938	0.01497	0.58840	0.00123	0.00360	55.49701	-0.00045
Mean	**-0.00081**	**16.59002**	**0.01081**	**0.01493**	**0.58866**	**0.00123**	**0.00030**	**55.51936**	**-0.00031**
%RSD	2.75031	0.11585	18.67464	0.37609	0.06152	0.57523	1540.03158	0.05693	67.85029

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00977	0.01205	0.01243	29.44182	3.51299	0.02407	8.94705	0.66412	-0.00071
#2	0.00993	0.01239	0.01244	29.40876	3.49692	0.02400	8.93637	0.66378	-0.00011
Mean	**0.00985**	**0.01222**	**0.01243**	**29.42529**	**3.50495**	**0.02403**	**8.94171**	**0.66395**	**-0.00041**
%RSD	1.12717	1.93032	0.03274	0.07943	0.32425	0.19902	0.08453	0.03597	102.77614

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.04067	0.01855	0.80234	0.01885	0.01973	1.15888	0.00083	-0.00184	-0.00275
#2	1.03708	0.01858	0.79278	0.01891	0.02035	1.15746	0.00280	0.00035	-0.00021
Mean	**1.03888**	**0.01856**	**0.79756**	**0.01888**	**0.02004**	**1.15817**	**0.00182**	**-0.00074**	**-0.00148**
%RSD	0.24397	0.14336	0.84744	0.22513	2.17432	0.08663	76.49591	208.52124	121.07781

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	7.00445	0.00389	0.27294	0.00462	0.51964	-0.00358	-0.00504	0.04017	0.05935
#2	7.01087	0.00316	0.27283	0.00743	0.52001	-0.00528	-0.01246	0.04000	0.05976
Mean	**7.00766**	**0.00353**	**0.27289**	**0.00602**	**0.51983**	**-0.00443**	**-0.00875**	**0.04008**	**0.05956**
%RSD	0.06479	14.63445	0.02622	32.97444	0.05037	27.16968	59.90154	0.30946	0.48973

	Zr	Pb	Se
	ppm	calc	calc
#1	0.01901	0.01944	-0.00244
#2	0.01906	0.01987	-0.00002
Mean	**0.01904**	**0.01965**	**-0.00123**
%RSD	0.17469	1.55087	138.58639

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:05
SampleId1 : 1002254-1 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:04:45
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE47

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Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00021	0.07435	0.00067	0.15797	0.00112	0.00005	-0.00076	18.15142	-0.00034
#2	-0.00057	0.07100	0.00134	0.16007	0.00107	0.00003	-0.00420	18.17019	-0.00045

	Mean	%RSD
Ag	-0.00039	65.46665
Al	0.07268	3.26285
As	0.00101	47.50935
B	0.15902	0.93620
Ba	0.00109	3.65522
Be	0.00004	36.81122
Bi	-0.00248	98.22504
Ca	18.16080	0.07306
Cd	-0.00039	19.15636

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00044	-0.00065	-0.00221	0.00555	39.89567	2.65964	8.64449	0.05699	-0.00066
#2	-0.00031	-0.00091	-0.00192	0.00200	40.06772	2.66926	8.66303	0.05703	-0.00147
Mean	**-0.00038**	**-0.00078**	**-0.00207**	**0.00378**	**39.98170**	**2.66445**	**8.65376**	**0.05701**	**-0.00106**
%RSD	24.82697	23.75945	9.94511	66.37770	0.30429	0.25536	0.15150	0.04614	53.69428

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	619.34182	-0.00052	-0.00539	0.00011	-0.00185	17.20707	0.00091	0.00666	-0.00383
#2	619.13244	-0.00114	-0.00308	-0.00040	-0.00152	17.33144	0.00025	-0.00073	-0.00129
Mean	**619.23713**	**-0.00083**	**-0.00424**	**-0.00014**	**-0.00168**	**17.26925**	**0.00058**	**0.00296**	**-0.00256**
%RSD	0.02391	52.38116	38.48255	250.55085	13.91572	0.50926	80.68810	176.43725	70.22730

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.34154	-0.00219	1.47776	-0.00461	-0.00085	-0.00126	-0.00433	-0.00001	-0.00119
#2	0.34203	-0.00012	1.48815	-0.00565	-0.00105	0.00124	-0.01078	-0.00031	-0.00140
Mean	**0.34178**	**-0.00116**	**1.48295**	**-0.00513**	**-0.00095**	**-0.00001**	**-0.00755**	**-0.00016**	**-0.00130**
%RSD	0.10011	126.40851	0.49531	14.46108	15.33974	20432.51734	60.29599	133.68339	11.24934

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00010	-0.00120	-0.00033
#2	-0.00014	-0.00114	-0.00110
Mean	**-0.00012**	**-0.00117**	**-0.00072**
%RSD	21.37318	3.19185	75.59233

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:06
SampleId1 : 1002254-2 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:06:32
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE48

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00033	0.07027	0.00221	0.13906	0.00143	0.00007	-0.00095	22.45568	-0.00029
#2	0.00105	0.07123	0.00071	0.14204	0.00149	0.00007	0.00495	22.70877	-0.00027
Mean	**0.00069**	**0.07075**	**0.00146**	**0.14055**	**0.00146**	**0.00007**	**0.00200**	**22.58222**	**-0.00028**
%RSD	73.25855	0.96288	72.91596	1.49880	2.73595	5.55217	208.76882	0.79249	7.27069

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00038	-0.00054	-0.00207	-0.00297	67.57235	3.85756	9.91517	0.04356	0.01253
#2	0.00035	-0.00006	-0.00158	-0.00387	68.33324	3.90306	10.04917	0.04393	0.01331
Mean	**0.00036**	**-0.00030**	**-0.00183**	**-0.00342**	**67.95280**	**3.88031**	**9.98217**	**0.04375**	**0.01292**

20000451

%RSD	5.09996	111.77092	18.99549	18.60047	0.79177	0.82922	0.94919	0.60118	4.27988

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	725.89750	-0.00003	-0.01642	0.00197	-0.00233	24.40524	0.00244	0.00093	-0.00282
#2	730.55769	-0.00008	-0.01772	0.00453	-0.00342	24.67358	0.00423	0.00619	-0.00383
Mean	**728.22759**	**-0.00006**	**-0.01707**	**0.00325**	**-0.00287**	**24.53941**	**0.00334**	**0.00356**	**-0.00332**
%RSD	0.45250	60.87624	5.39878	55.75194	26.83567	0.77323	37.84233	104.34170	21.47292

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.07166	-0.00292	1.36147	-0.00678	-0.00080	0.00040	-0.00086	0.00029	-0.00044
#2	0.07512	-0.00158	1.38230	-0.00766	-0.00089	-0.00004	0.01104	0.00053	-0.00044
Mean	**0.07339**	**-0.00225**	**1.37188**	**-0.00722**	**-0.00085**	**0.00018**	**0.00509**	**0.00041**	**-0.00044**
%RSD	3.33445	42.02065	1.07362	8.60237	6.88242	172.15245	165.24980	41.86171	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00021	-0.00090	-0.00157
#2	0.00073	-0.00077	-0.00049
Mean	**0.00047**	**-0.00083**	**-0.00103**
%RSD	77.61485	10.70629	73.91195

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:06
SampleId1 : 1002254-3 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 13:08:19
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE49

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00003	0.07651	-0.00020	0.14951	0.00160	0.00010	0.00564	24.60906	-0.00055
#2	-0.00007	0.07251	0.00176	0.14585	0.00160	0.00010	0.00210	24.35876	-0.00045
Mean	**-0.00005**	**0.07451**	**0.00078**	**0.14768**	**0.00160**	**0.00010**	**0.00387**	**24.48391**	**-0.00050**
%RSD	61.81634	3.79990	176.85690	1.74982	0.00000	0.59050	64.73534	0.72289	13.87100

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00043	-0.00076	-0.00228	-0.00683	72.68170	4.13326	11.14452	0.04252	0.01555
#2	0.00030	-0.00049	-0.00193	-0.00699	71.95861	4.09494	11.03951	0.04211	0.01469
Mean	**0.00036**	**-0.00063**	**-0.00211**	**-0.00691**	**72.32016**	**4.11410**	**11.09201**	**0.04232**	**0.01512**
%RSD	25.59407	31.22155	11.87164	1.62393	0.70700	0.65867	0.66946	0.68367	4.02223

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	776.25618	-0.00046	-0.01732	0.00157	-0.00285	25.75506	0.00301	0.00372	-0.00310
#2	764.95274	-0.00059	-0.01552	0.00254	-0.00190	25.60173	0.00258	0.00345	-0.00237
Mean	**770.60446**	**-0.00052**	**-0.01642**	**0.00206**	**-0.00237**	**25.67840**	**0.00279**	**0.00358**	**-0.00273**
%RSD	1.03720	16.97887	7.77195	33.39691	28.21148	0.42222	10.79256	5.21224	18.90454

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	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.07079	-0.00049	1.58498	-0.00413	-0.00092	-0.00244	-0.00482	-0.00009	-0.00112
#2	0.07119	-0.00122	1.56905	-0.00538	-0.00118	0.00084	-0.00036	-0.00022	-0.00133
Mean	**0.07099**	**-0.00085**	**1.57702**	**-0.00475**	**-0.00105**	**-0.00080**	**-0.00259**	**-0.00015**	**-0.00123**
%RSD	0.39731	60.50042	0.71438	18.55198	17.68759	289.12500	121.80045	61.17689	11.87930

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00020	-0.00137	-0.00083
#2	-0.00007	-0.00042	-0.00043
Mean	**-0.00014**	**-0.00090**	**-0.00063**
%RSD	64.04685	75.25382	44.85430

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:06
SampleId1 : 1002254-4 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:10:06
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE50

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00021	0.07646	-0.00271	0.14061	0.00121	0.00015	0.00042	21.85160	-0.00079
#2	-0.00021	0.07469	0.00029	0.14144	0.00112	0.00015	0.00121	21.97610	-0.00039
Mean	**-0.00021**	**0.07558**	**-0.00121**	**0.14103**	**0.00117**	**0.00015**	**0.00082**	**21.91385**	**-0.00059**
%RSD	1.75496	1.65534	175.62768	0.41825	5.15006	0.72692	68.23000	0.40174	47.39584

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00003	-0.00057	-0.00192	-0.00747	60.30589	3.57821	9.95467	0.04568	0.01138
#2	-0.00018	-0.00068	-0.00193	-0.00699	60.67679	3.59871	10.00858	0.04602	0.01104
Mean	**-0.00007**	**-0.00063**	**-0.00193**	**-0.00723**	**60.49134**	**3.58846**	**9.98162**	**0.04585**	**0.01121**
%RSD	204.31686	11.77172	0.14132	4.65785	0.43356	0.40379	0.38186	0.51628	2.13699

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	693.77560	-0.00047	-0.00980	-0.00085	-0.00147	22.46078	0.00000	0.00184	-0.00505
#2	695.51369	-0.00005	-0.01632	0.00015	-0.00278	22.56990	0.00208	0.00029	0.00010
Mean	**694.64464**	**-0.00026**	**-0.01306**	**-0.00035**	**-0.00212**	**22.51534**	**0.00104**	**0.00106**	**-0.00247**
%RSD	0.17693	116.44580	35.28340	204.24513	43.66289	0.34271	141.90000	102.85046	147.31789

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09416	-0.00134	1.45448	-0.00553	-0.00101	0.00050	-0.00730	-0.00050	-0.00112
#2	0.09578	-0.00268	1.46445	-0.00630	-0.00101	0.00157	-0.00234	-0.00039	-0.00078
Mean	**0.09497**	**-0.00201**	**1.45946**	**-0.00592**	**-0.00101**	**0.00104**	**-0.00482**	**-0.00044**	**-0.00095**
%RSD	1.21123	47.11179	0.48312	9.23402	0.36098	72.91432	72.70843	17.99501	25.51401

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	-0.00036	-0.00126	-0.00275
#2	0.00008	-0.00180	0.00017
Mean	**-0.00014**	**-0.00153**	**-0.00129**
%RSD	226.82609	24.98249	159.50131

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:06
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 13:11:54
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20332	50.32929	0.51593	0.99359	0.98773	0.49404	0.52492	49.27730	0.51162
#2	0.20382	50.50791	0.51903	0.99654	0.99344	0.49555	0.53124	49.39465	0.51229
Mean	**0.20357**	**50.41860**	**0.51748**	**0.99506**	**0.99058**	**0.49479**	**0.52808**	**49.33598**	**0.51195**
%RSD	0.17533	0.25050	0.42358	0.20972	0.40786	0.21595	0.84745	0.16819	0.09251

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49820	0.98372	0.99937	20.09211	49.97532	0.51173	50.02733	0.96039	0.99376
#2	0.50011	0.98698	1.00391	20.17051	50.17645	0.51404	50.15818	0.96378	0.99977
Mean	**0.49915**	**0.98535**	**1.00164**	**20.13131**	**50.07588**	**0.51289**	**50.09275**	**0.96208**	**0.99676**
%RSD	0.27156	0.23388	0.32078	0.27536	0.28401	0.31909	0.18471	0.24933	0.42684

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	48.27395	1.04577	4.90798	0.96292	0.92714	4.87328	0.50234	1.00669	0.97575
#2	48.48036	1.04597	4.91730	0.96714	0.93561	4.88326	0.50476	1.02203	0.98405
Mean	**48.37715**	**1.04587**	**4.91264**	**0.96503**	**0.93138**	**4.87827**	**0.50355**	**1.01436**	**0.97990**
%RSD	0.30171	0.01367	0.13414	0.30929	0.64306	0.14461	0.34107	1.06973	0.59900

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.66655	1.01415	0.49733	0.13299	0.46005	0.51889	4.86224	0.48380	0.98202
#2	4.69541	1.01953	0.49994	0.13635	0.46203	0.52484	4.90437	0.48587	0.98424
Mean	**4.68098**	**1.01684**	**0.49864**	**0.13467**	**0.46104**	**0.52186**	**4.88331**	**0.48483**	**0.98313**
%RSD	0.43594	0.37416	0.37004	1.76658	0.30289	0.80602	0.60998	0.30179	0.15999

	Zr	Pb	Se
	ppm	calc	calc
#1	0.98111	0.93906	0.98605
#2	0.98467	0.94611	0.99670
Mean	**0.98289**	**0.94258**	**0.99138**
%RSD	0.25649	0.52927	0.75939

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SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 13:15:01
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00027	0.07864	0.00044	-0.00250	-0.00035	0.00026	-0.00332	-0.01581	0.00010
#2	0.00005	0.07719	-0.00046	-0.00345	-0.00046	0.00027	-0.00469	-0.01672	-0.00056
Mean	**0.00016**	**0.07791**	**-0.00001**	**-0.00298**	**-0.00040**	**0.00027**	**-0.00400**	**-0.01626**	**-0.00023**
%RSD	99.57549	1.31125	8102.15125	22.64093	19.76601	3.18963	24.28580	3.95577	200.13657

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00024	-0.00013	-0.00171	0.00327	-0.34100	0.00224	-0.01020	-0.00013	-0.00022
#2	-0.00015	-0.00013	-0.00128	0.00253	-0.35410	0.00219	-0.00824	-0.00013	-0.00087
Mean	**0.00004**	**-0.00013**	**-0.00150**	**0.00290**	**-0.34755**	**0.00222**	**-0.00922**	**-0.00013**	**-0.00054**
%RSD	646.87031	1.44812	20.08302	18.04049	2.66423	1.44185	15.00385	0.00000	84.89014

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.16053	-0.00023	-0.00489	0.00033	-0.00121	-0.00378	0.00037	0.00082	-0.00303
#2	-0.16192	-0.00035	-0.00369	-0.00172	-0.00024	-0.00378	0.00203	0.00388	0.00282
Mean	**-0.16123**	**-0.00029**	**-0.00429**	**-0.00069**	**-0.00072**	**-0.00378**	**0.00120**	**0.00235**	**-0.00010**
%RSD	0.60991	27.49461	19.84308	209.32291	93.74261	0.00000	97.87800	92.05746	3970.84879

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00872	-0.00134	-0.00225	-0.00226	-0.00093	-0.00131	-0.01028	0.00003	-0.00099
#2	-0.01070	-0.00280	-0.00227	-0.00137	-0.00093	-0.00145	-0.00532	-0.00029	-0.00085
Mean	**-0.00971**	**-0.00207**	**-0.00226**	**-0.00181**	**-0.00093**	**-0.00138**	**-0.00780**	**-0.00013**	**-0.00092**
%RSD	14.46212	49.88136	0.67230	34.99019	0.39091	7.38828	44.93296	172.01369	10.58763

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00024	-0.00069	-0.00175
#2	0.00004	-0.00073	0.00317
Mean	**0.00014**	**-0.00071**	**0.00071**
%RSD	97.65057	4.08853	488.11924

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:07
SampleId1 : 1002254-5 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 13:16:53
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE51

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Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00045	0.06025	0.00164	0.17374	0.00124	0.00007	-0.00519	19.57185	-0.00058
#2	-0.00017	0.05613	0.00240	0.17140	0.00126	0.00007	0.00662	19.21825	-0.00032
Mean	**-0.00031**	**0.05819**	**0.00202**	**0.17257**	**0.00125**	**0.00007**	**0.00072**	**19.39505**	**-0.00045**
%RSD	64.07947	4.99825	26.29147	0.96044	1.60014	5.16989	1166.72900	1.28917	39.84028

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00036	-0.00102	-0.00249	-0.00773	45.90264	3.12112	10.36782	0.07537	-0.00071

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:07
SampleId1 : 1002254-6 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:18:41
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE52

Final concentrations

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00043	0.07041	0.00161	0.17291	0.00141	0.00012	-0.00390	24.06930	-0.00009
#2	0.00006	0.06452	0.00007	0.16973	0.00135	0.00012	-0.00194	23.64542	-0.00079
Mean	**-0.00019**	**0.06747**	**0.00084**	**0.17132**	**0.00138**	**0.00012**	**-0.00292**	**23.85736**	**-0.00044**
%RSD	188.44795	6.17059	130.06166	1.31179	2.90452	4.37591	47.44262	1.25634	113.33278

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	750.54372	-0.00101	-0.01451	-0.00051	-0.00203	24.57440	-0.00073	-0.00099	-0.00446
#2	730.64688	-0.00018	-0.01973	-0.00003	-0.00022	24.27984	0.00111	-0.00342	0.00115
Mean	**740.59530**	**-0.00060**	**-0.01712**	**-0.00027**	**-0.00113**	**24.42712**	**0.00019**	**-0.00221**	**-0.00165**
%RSD	1.89971	97.94906	21.53190	127.08827	113.82637	0.85266	694.79863	77.96998	239.50166

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.16236	-0.00110	1.70493	-0.00337	-0.00089	-0.00041	0.00361	-0.00018	-0.00071
#2	0.15974	-0.00122	1.67625	-0.00203	-0.00104	-0.00116	-0.02514	-0.00033	-0.00126
Mean	**0.16105**	**-0.00116**	**1.69059**	**-0.00270**	**-0.00096**	**-0.00079**	**-0.01077**	**-0.00026**	**-0.00099**
%RSD	1.14970	7.42479	1.19991	35.13825	10.56591	67.75890	188.78972	41.58736	39.40075

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00012	-0.00153	-0.00330
#2	-0.00031	-0.00016	-0.00037
Mean	**-0.00021**	**-0.00084**	**-0.00184**
%RSD	63.01825	115.23076	112.60748

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#2	0.00019	-0.00073	-0.00171	-0.00752	45.20584	3.07474	10.17815	0.07396	-0.00024
Mean	**-0.00009**	**-0.00087**	**-0.00210**	**-0.00763**	**45.55424**	**3.09793**	**10.27299**	**0.07466**	**-0.00048**
%RSD	454.38843	24.08837	26.16038	1.96243	1.08159	1.05863	1.30551	1.33917	69.45975

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	713.01080	-0.00074	-0.01121	-0.00157	0.00029	19.69940	-0.00087	-0.00336	0.00017
#2	696.79555	-0.00131	-0.01090	-0.00016	-0.00132	19.43404	-0.00034	-0.00405	-0.00320
Mean	**704.90317**	**-0.00102**	**-0.01105**	**-0.00087**	**-0.00051**	**19.56672**	**-0.00061**	**-0.00371**	**-0.00151**
%RSD	1.62659	39.83872	1.92385	115.41377	221.97502	0.95897	62.49939	13.08250	157.55432

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.35847	-0.00353	1.64316	-0.00259	-0.00102	-0.00516	-0.02019	-0.00059	-0.00051
#2	0.35307	-0.00584	1.62049	-0.00362	-0.00096	-0.00177	-0.00779	-0.00003	-0.00085
Mean	**0.35577**	**-0.00468**	**1.63182**	**-0.00311**	**-0.00099**	**-0.00347**	**-0.01399**	**-0.00031**	**-0.00068**
%RSD	1.07387	34.88746	0.98227	23.40351	4.05355	69.11374	62.63255	127.79857	35.86759

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00056	-0.00033	-0.00101
#2	-0.00014	-0.00094	-0.00348
Mean	**-0.00035**	**-0.00063**	**-0.00224**
%RSD	86.22622	68.06995	78.10256

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:08
SampleId1 : 1002254-7 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 13:20:29
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE53

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00107	0.05424	0.00146	0.14820	0.00118	0.00005	0.00012	17.57204	-0.00061
#2	-0.00071	0.05415	-0.00098	0.14569	0.00115	0.00004	-0.00056	17.44756	-0.00054
Mean	**-0.00089**	**0.05420**	**0.00024**	**0.14694**	**0.00117**	**0.00005**	**-0.00022**	**17.50980**	**-0.00058**
%RSD	28.40782	0.12147	730.62653	1.20423	1.71669	12.26209	220.57605	0.50272	8.85347

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00063	-0.00074	-0.00256	-0.00853	42.10794	2.85969	9.53220	0.06023	-0.00043
#2	-0.00047	-0.00079	-0.00256	-0.00842	41.75297	2.83724	9.47024	0.05993	-0.00048
Mean	**-0.00055**	**-0.00077**	**-0.00256**	**-0.00847**	**41.93045**	**2.84847**	**9.50122**	**0.06008**	**-0.00045**
%RSD	20.45847	3.90329	0.17006	0.88317	0.59861	0.55728	0.46118	0.35030	8.16324

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	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	662.32502	-0.00130	-0.00980	-0.00040	-0.00042	17.79438	-0.00010	-0.00754	-0.00063
#2	654.75935	-0.00111	-0.01311	-0.00310	0.00006	17.64824	0.00008	-0.00089	-0.00240

Mean	**658.54218**	**-0.00121**	**-0.01146**	**-0.00175**	**-0.00018**	**17.72131**	**-0.00001**	**-0.00422**	**-0.00151**
%RSD	0.81236	11.03170	20.42152	109.36039	185.99488	0.58313	988.41984	111.42874	82.83193

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20475	-0.00231	1.51022	-0.00612	-0.00087	-0.00381	-0.01870	-0.00042	-0.00078
#2	0.20542	-0.00207	1.50301	-0.00652	-0.00103	-0.00115	-0.01077	-0.00063	-0.00099
Mean	**0.20508**	**-0.00219**	**1.50662**	**-0.00632**	**-0.00095**	**-0.00248**	**-0.01473**	**-0.00053**	**-0.00088**
%RSD	0.23087	7.85787	0.33818	4.47167	11.50481	75.67869	38.06356	27.66879	16.49907

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00034	-0.00041	-0.00293
#2	-0.00031	-0.00100	-0.00190
Mean	**-0.00032**	**-0.00070**	**-0.00241**
%RSD	7.17994	58.73521	30.13548

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:08
SampleId1 : 1002254-8 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:22:17
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE54

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00068	0.05918	0.00037	0.13604	0.00132	0.00002	0.00072	17.35476	-0.00068
#2	-0.00061	0.05386	-0.00110	0.13898	0.00129	0.00002	0.00042	17.57449	-0.00081
Mean	**-0.00064**	**0.05652**	**-0.00036**	**0.13751**	**0.00131**	**0.00002**	**0.00057**	**17.46462**	**-0.00074**
%RSD	7.81948	6.65124	284.02476	1.51147	1.53086	23.95002	36.43608	0.88964	12.23088

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00063	-0.00096	-0.00249	-0.00800	44.32003	2.98315	9.71768	0.04382	0.00103
#2	-0.00047	-0.00074	-0.00207	-0.00832	44.95419	3.02237	9.84447	0.04434	0.00002
Mean	**-0.00055**	**-0.00085**	**-0.00228**	**-0.00816**	**44.63711**	**3.00276**	**9.78107**	**0.04408**	**0.00053**
%RSD	20.38886	18.85476	13.22892	2.75264	1.00458	0.92368	0.91658	0.83527	136.68399

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	691.42306	-0.00072	-0.00709	-0.00151	0.00049	18.44727	0.00128	-0.00368	-0.00150
#2	694.88730	-0.00080	-0.01211	-0.00128	0.00035	18.74564	-0.00063	-0.00212	0.00094
Mean	**693.15518**	**-0.00076**	**-0.00960**	**-0.00139**	**0.00042**	**18.59645**	**0.00032**	**-0.00290**	**-0.00028**
%RSD	0.35340	6.99571	36.91946	11.64962	22.15891	1.13454	418.36257	37.88436	615.68190

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10673	-0.00170	1.53061	-0.00642	-0.00097	-0.00097	-0.01275	-0.00054	-0.00078
#2	0.10740	-0.00207	1.55172	-0.00544	-0.00085	-0.00001	-0.00978	-0.00074	-0.00112
Mean	**0.10707**	**-0.00189**	**1.54116**	**-0.00593**	**-0.00091**	**-0.00049**	**-0.01126**	**-0.00064**	**-0.00095**

%RSD	0.44434	13.68135	0.96870	11.69440	9.19434	137.37976	18.67220	22.81289	25.51401

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00029	-0.00018	-0.00222
#2	-0.00029	-0.00019	-0.00008
Mean	**-0.00029**	**-0.00018**	**-0.00115**
%RSD	0.98579	4.44038	131.37673

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:08
SampleId1 : 1002254-9 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:24:04
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE55

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00023	0.05994	-0.00016	0.14049	0.00175	0.00006	0.00278	16.49810	-0.00048
#2	-0.00075	0.05900	-0.00166	0.14387	0.00183	0.00005	0.00308	16.50752	-0.00033
Mean	**-0.00026**	**0.05947**	**-0.00091**	**0.14218**	**0.00179**	**0.00005**	**0.00293**	**16.50281**	**-0.00041**
%RSD	265.98131	1.11981	116.83110	1.67919	3.35706	20.51627	7.08735	0.04036	25.87685

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00014	-0.00038	-0.00135	-0.00747	47.41072	3.16689	9.93372	0.04352	0.00195
#2	0.00001	-0.00073	-0.00185	-0.00768	47.38905	3.17020	9.93459	0.04367	0.00228
Mean	**0.00007**	**-0.00055**	**-0.00160**	**-0.00757**	**47.39988**	**3.16855**	**9.93416**	**0.04360**	**0.00212**
%RSD	127.18750	43.73005	22.07618	1.97614	0.03232	0.07392	0.00621	0.24129	11.32414

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	741.63680	-0.00056	-0.00830	-0.00045	-0.00135	19.16731	0.00033	-0.00159	-0.00094
#2	735.83654	-0.00090	-0.01251	0.00030	-0.00115	19.18905	0.00057	0.00232	-0.00512
Mean	**738.73667**	**-0.00073**	**-0.01040**	**-0.00007**	**-0.00125**	**19.17818**	**0.00045**	**0.00037**	**-0.00303**
%RSD	0.55519	32.83420	28.62123	724.66723	11.23057	0.08016	38.14598	754.07873	97.48907

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.12513	-0.00170	1.49462	-0.00887	-0.00116	0.00069	-0.00779	-0.00033	-0.00085
#2	0.13147	-0.00110	1.49853	-0.00902	-0.00119	-0.00016	-0.00730	-0.00027	-0.00078
Mean	**0.12830**	**-0.00140**	**1.49658**	**-0.00895**	**-0.00118**	**0.00026**	**-0.00755**	**-0.00030**	**-0.00081**
%RSD	3.49373	30.72272	0.18463	1.24605	1.54467	227.63615	4.64599	13.16662	5.96352

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00001	-0.00105	-0.00116
#2	0.00012	-0.00067	-0.00264
Mean	**0.00007**	**-0.00086**	**-0.00190**
%RSD	112.76035	31.68814	55.26320

20000459

ted: 3/5/2010 16:43:35 User: ROY FRENCH
Method : Paragon File : 100305A Printed : 3/5/2010 16:43:09
SampleId1 : 1002254-10 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:25:52
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE56

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00103	0.05451	-0.00125	0.15991	0.00141	-0.00005	-0.00224	17.19317	-0.00059
#2	-0.00071	0.05091	-0.00181	0.15682	0.00141	-0.00007	-0.00125	16.92642	-0.00065
Mean	**-0.00087**	**0.05271**	**-0.00153**	**0.15837**	**0.00141**	**-0.00006**	**-0.00174**	**17.05980**	**-0.00062**
%RSD	26.13492	4.83818	26.05412	1.38351	0.00000	30.68982	39.92551	1.10564	6.88759

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00036	-0.00104	-0.00234	-0.00863	49.99851	3.39129	10.01752	0.06391	0.00242
#2	-0.00018	-0.00096	-0.00242	-0.00869	49.27162	3.34748	9.85429	0.06291	0.00166
Mean	**-0.00027**	**-0.00100**	**-0.00238**	**-0.00866**	**49.63507**	**3.36939**	**9.93590**	**0.06341**	**0.00204**
%RSD	48.29746	5.10233	2.29227	0.43214	1.03553	0.91954	1.16171	1.12023	26.23094

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	760.82683	-0.00038	-0.01121	-0.00075	-0.00168	20.36243	0.00117	-0.00513	0.00111
#2	751.13142	-0.00116	-0.01862	-0.00064	-0.00027	20.16942	-0.00133	-0.00207	-0.00219
Mean	**755.97912**	**-0.00077**	**-0.01491**	**-0.00069**	**-0.00097**	**20.26593**	**-0.00008**	**-0.00360**	**-0.00054**
%RSD	0.90686	71.11636	35.17326	11.35196	102.67540	0.67345	2259.28806	60.01468	432.31792

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.18779	-0.00195	1.50463	-0.00313	-0.00081	0.00006	-0.02019	-0.00069	-0.00064
#2	0.18614	-0.00414	1.48548	-0.00199	-0.00097	-0.00123	-0.01275	-0.00056	-0.00071
Mean	**0.18696**	**-0.00304**	**1.49505**	**-0.00256**	**-0.00089**	**-0.00058**	**-0.01647**	**-0.00062**	**-0.00068**
%RSD	0.62405	50.88426	0.90545	31.35161	12.67909	155.14480	31.92593	14.94784	7.17352

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00067	-0.00137	-0.00097
#2	-0.00058	-0.00039	-0.00215
Mean	**-0.00062**	**-0.00088**	**-0.00156**
%RSD	10.16463	78.73234	53.77970

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:09
SampleId1 : 1002254-11 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:27:40
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE57

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00025	0.05643	0.00059	0.17120	0.00149	-0.00003	0.00407	15.28134	-0.00024
#2	-0.00064	0.05219	-0.00136	0.17660	0.00138	-0.00003	-0.00017	15.52289	-0.00102
Mean	**-0.00020**	**0.05431**	**-0.00038**	**0.17390**	**0.00143**	**-0.00003**	**0.00195**	**15.40211**	**-0.00063**
%RSD	322.06783	5.51275	360.15559	2.19696	5.57984	3.42412	153.67293	1.10893	88.02014

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00032	0.00010	-0.00130	-0.00747	42.95918	3.15960	9.45649	0.08270	0.00072
#2	-0.00050	-0.00096	-0.00192	-0.00874	43.95605	3.22663	9.61905	0.08426	-0.00011
Mean	**-0.00009**	**-0.00043**	**-0.00161**	**-0.00810**	**43.45761**	**3.19311**	**9.53777**	**0.08348**	**0.00030**
%RSD	674.30575	174.14314	27.32970	11.08248	1.62203	1.48447	1.20517	1.32394	193.79639

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	758.81743	-0.00028	-0.00870	0.00357	-0.00425	19.26443	0.00150	0.00373	-0.00421
#2	758.79703	-0.00095	-0.01201	0.00050	-0.00010	19.66750	0.00008	-0.00261	-0.00101
Mean	**758.80723**	**-0.00062**	**-0.01035**	**0.00204**	**-0.00218**	**19.46596**	**0.00079**	**0.00056**	**-0.00261**
%RSD	0.00190	76.25535	22.59700	106.52075	135.06043	1.46416	126.91173	799.05244	86.69205

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.29025	-0.00085	1.38413	-0.00701	-0.00102	-0.00231	0.01451	0.00050	-0.00085
#2	0.29213	-0.00365	1.41728	-0.00765	-0.00114	-0.00211	-0.01226	-0.00031	-0.00105
Mean	**0.29119**	**-0.00225**	**1.40070**	**-0.00733**	**-0.00108**	**-0.00221**	**0.00113**	**0.00009**	**-0.00095**
%RSD	0.45599	87.86116	1.67360	6.15192	8.42253	6.58414	1677.14419	621.34887	15.30841

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00045	-0.00165	-0.00157
#2	-0.00004	0.00010	-0.00154
Mean	**0.00021**	**-0.00077**	**-0.00155**
%RSD	166.43427	160.05562	1.10200

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:09
SampleId1 : 1002254-12 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:29:27
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE58

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00060	0.05242	-0.00031	0.17624	0.00132	-0.00008	0.00012	15.68516	-0.00044
#2	-0.00093	0.05648	-0.00207	0.17418	0.00138	-0.00008	0.00179	15.63196	-0.00074
Mean	**-0.00076**	**0.05445**	**-0.00119**	**0.17521**	**0.00135**	**-0.00008**	**0.00096**	**15.65856**	**-0.00059**
%RSD	30.40658	5.27837	104.80742	0.83373	2.96542	4.90583	123.14864	0.24026	35.93580

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00028	-0.00108	-0.00249	-0.00826	45.27921	3.31493	9.84818	0.08475	-0.00048
#2	-0.00036	-0.00097	-0.00263	-0.00879	45.17006	3.30781	9.82766	0.08441	0.00056
Mean	**-0.00032**	**-0.00102**	**-0.00256**	**-0.00853**	**45.22463**	**3.31137**	**9.83792**	**0.08458**	**0.00004**
%RSD	16.97831	7.09260	3.89317	4.38842	0.17066	0.15219	0.14744	0.28002	1687.70509

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	769.14138	-0.00105	-0.00970	-0.00065	0.00032	19.89376	0.00014	0.00076	-0.00268
#2	760.72715	-0.00055	-0.01161	-0.00145	0.00011	19.88071	-0.00253	-0.00336	-0.00205
Mean	**764.93427**	**-0.00080**	**-0.01065**	**-0.00105**	**0.00021**	**19.88723**	**-0.00120**	**-0.00130**	**-0.00237**
%RSD	0.77781	44.43973	12.64307	53.95626	70.02010	0.04642	157.85629	224.20615	18.70546

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.28422	0.00024	1.45982	-0.00488	-0.00104	-0.00126	-0.01573	-0.00029	-0.00133
#2	0.28648	-0.00328	1.45847	-0.01565	-0.00181	-0.00255	-0.01820	-0.00059	-0.00209
Mean	**0.28535**	**-0.00152**	**1.45914**	**-0.01027**	**-0.00142**	**-0.00191**	**-0.01696**	**-0.00044**	**-0.00171**
%RSD	0.55962	163.92832	0.06548	74.24931	38.05144	47.82273	10.32941	47.93659	31.29119

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00043	0.00000	-0.00153
#2	0.00025	-0.00041	-0.00249
Mean	**-0.00009**	**-0.00021**	**-0.00201**
%RSD	536.83985	138.31335	33.58566

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:09
SampleId1 : 1002254-13 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 13:31:15
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE59

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00026	0.05922	0.00116	0.17561	0.00132	-0.00003	0.00377	15.41941	-0.00036
#2	-0.00133	0.05841	0.00202	0.17692	0.00129	-0.00004	-0.00243	15.43729	-0.00060
Mean	**-0.00053**	**0.05881**	**0.00159**	**0.17626**	**0.00131**	**-0.00003**	**0.00067**	**15.42835**	**-0.00048**
%RSD	210.54275	0.97774	38.45689	0.52594	1.53086	24.73484	657.05781	0.08197	34.94307

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00009	-0.00029	-0.00193	-0.00763	43.86247	3.21772	9.56712	0.08099	0.00260
#2	-0.00034	-0.00085	-0.00256	-0.00763	44.21035	3.24570	9.58108	0.08147	0.00296
Mean	**-0.00013**	**-0.00057**	**-0.00225**	**-0.00763**	**44.03641**	**3.23171**	**9.57410**	**0.08123**	**0.00278**
%RSD	237.55591	70.05915	19.81122	0.00000	0.55862	0.61227	0.10314	0.42113	9.28008

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	764.68010	-0.00071	-0.01080	0.00107	-0.00254	19.55584	0.00164	0.00104	-0.00261
#2	760.87303	-0.00052	-0.01151	-0.00081	-0.00138	19.68345	0.00088	-0.00208	-0.00038
Mean	**762.77656**	**-0.00062**	**-0.01116**	**0.00013**	**-0.00196**	**19.61964**	**0.00126**	**-0.00052**	**-0.00150**
%RSD	0.35292	21.58169	4.44864	1010.11703	41.60658	0.45993	42.83726	426.28583	105.16243

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.26253	-0.00061	1.42837	-0.00460	-0.00101	-0.00368	0.00063	-0.00005	-0.00057
#2	0.26038	-0.00219	1.43294	-0.00419	-0.00099	-0.00417	-0.01721	-0.00050	-0.00126
Mean	**0.26146**	**-0.00140**	**1.43065**	**-0.00439**	**-0.00100**	**-0.00392**	**-0.00829**	**-0.00027**	**-0.00092**
%RSD	0.58228	79.86465	0.22586	6.63410	1.45506	8.79621	152.21100	116.23556	52.93821

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00006	-0.00134	-0.00139
#2	-0.00028	-0.00119	-0.00095
Mean	**-0.00011**	**-0.00126**	**-0.00117**
%RSD	218.48823	8.05451	26.96587

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:10
SampleId1 : 1002254-14 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 13:33:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE60

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00040	0.05687	0.00056	0.15717	0.00107	-0.00001	0.00072	14.42076	-0.00070
#2	0.00033	0.05772	0.00014	0.15892	0.00124	-0.00001	0.00121	14.65148	-0.00022
Mean	**-0.00003**	**0.05730**	**0.00035**	**0.15805**	**0.00115**	**-0.00001**	**0.00097**	**14.53612**	**-0.00046**
%RSD	1516.20636	1.05321	83.72187	0.78201	10.42668	9.90389	35.96159	1.12230	74.76932

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00023	-0.00042	-0.00194	-0.00826	39.68158	2.95083	8.96647	0.07924	0.00059
#2	-0.00007	-0.00049	-0.00143	-0.00784	40.03965	2.97740	9.12638	0.08051	0.00129
Mean	**-0.00015**	**-0.00045**	**-0.00168**	**-0.00805**	**39.86062**	**2.96411**	**9.04643**	**0.07987**	**0.00094**
%RSD	73.65872	11.62179	21.08710	3.71844	0.63519	0.63379	1.24994	1.12014	52.77538

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	699.03225	-0.00048	-0.01080	-0.00005	-0.00189	17.73795	0.00294	0.00346	-0.00366
#2	696.95872	0.00014	-0.01000	0.00263	-0.00322	17.92752	0.00217	0.00463	-0.00352
Mean	**697.99549**	**-0.00017**	**-0.01040**	**0.00129**	**-0.00256**	**17.83274**	**0.00255**	**0.00404**	**-0.00359**
%RSD	0.21006	259.08613	5.45166	147.24881	36.84877	0.75171	21.22642	20.55121	2.74692

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.26552	-0.00037	1.31850	-0.00805	-0.00093	-0.00210	0.00708	-0.00052	-0.00071

20000463

#2	0.27132	-0.00073	1.34062	-0.00487	-0.00101	-0.00063	0.00410	0.00066	-0.00044
Mean	**0.26842**	**-0.00055**	**1.32956**	**-0.00646**	**-0.00097**	**-0.00136**	**0.00559**	**0.00007**	**-0.00057**
%RSD	1.52843	47.01990	1.17647	34.79247	5.64525	76.36217	37.62731	1143.63115	33.84430

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00015	-0.00128	-0.00129
#2	0.00000	-0.00127	-0.00080
Mean	**0.00008**	**-0.00128**	**-0.00104**
%RSD	136.19881	0.34939	32.78790

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:10
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 13:34:51
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19996	49.98428	0.50909	0.97245	0.97696	0.49017	0.50655	48.66332	0.49763
#2	0.19968	49.25249	0.50448	0.96224	0.96747	0.48733	0.50128	48.33223	0.49285
Mean	**0.19982**	**49.61838**	**0.50678**	**0.96735**	**0.97222**	**0.48875**	**0.50392**	**48.49777**	**0.49524**
%RSD	0.09984	1.04287	0.64342	0.74620	0.68971	0.41002	0.73928	0.48274	0.68323

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49186	0.97689	0.98416	19.92399	49.57812	0.50817	49.59429	0.95628	0.98009
#2	0.48864	0.97193	0.97024	19.78137	48.99788	0.50205	49.22506	0.94998	0.97079
Mean	**0.49025**	**0.97441**	**0.97720**	**19.85268**	**49.28800**	**0.50511**	**49.40967**	**0.95313**	**0.97544**
%RSD	0.46456	0.35999	1.00769	0.50798	0.83244	0.85711	0.52840	0.46692	0.67414

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	48.10892	1.00666	4.93246	0.95151	0.93050	4.85476	0.48740	0.98836	0.96772
#2	47.59455	0.99900	4.87757	0.94599	0.92771	4.79347	0.48460	0.98338	0.96576
Mean	**47.85173**	**1.00283**	**4.90501**	**0.94875**	**0.92910**	**4.82412**	**0.48600**	**0.98587**	**0.96674**
%RSD	0.76009	0.53987	0.79132	0.41116	0.21211	0.89824	0.40731	0.35678	0.14284

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.65275	0.99249	0.49109	0.13562	0.45997	0.51105	4.82614	0.47911	0.98216
#2	4.60669	0.98822	0.48605	0.13633	0.45656	0.50107	4.80291	0.47601	0.97757
Mean	**4.62972**	**0.99036**	**0.48857**	**0.13598**	**0.45827**	**0.50606**	**4.81452**	**0.47756**	**0.97986**
%RSD	0.70344	0.30538	0.72868	0.36530	0.52612	1.39376	0.34110	0.45887	0.33106

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.96786	0.93750	0.97459
#2	0.96004	0.93380	0.97163

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Mean	**0.96395**	**0.93565**	**0.97311CH**
%RSD	0.57368	0.27932	0.21502

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:10
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 13:36:43
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00065	0.09073	0.00142	0.00052	0.00016	0.00038	0.00063	0.00250	0.00016
#2	0.00094	0.09158	-0.00136	-0.00103	0.00008	0.00039	0.00407	0.00341	0.00034
Mean	**0.00080**	**0.09116**	**0.00003**	**-0.00026**	**0.00012**	**0.00039**	**0.00235**	**0.00296**	**0.00025**
%RSD	26.03693	0.66170	6616.46548	427.24316	50.62245	1.97845	103.57642	21.75815	49.42682

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00024	0.00051	-0.00080	0.00952	-0.32553	0.00249	0.01111	0.00036	-0.00009
#2	0.00053	0.00058	-0.00115	0.01015	-0.32910	0.00248	0.01437	0.00039	0.00046
Mean	**0.00039**	**0.00055**	**-0.00097**	**0.00984**	**-0.32731**	**0.00248**	**0.01274**	**0.00037**	**0.00019**
%RSD	53.09657	10.10287	25.71874	4.56521	0.77150	0.08034	18.10482	7.02184	206.93315

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.11494	0.00032	-0.00328	0.00208	-0.00117	-0.00520	0.00161	0.00153	-0.00365
#2	-0.11677	-0.00008	0.00173	0.00312	-0.00037	-0.00378	0.00078	0.00362	-0.00076
Mean	**-0.11586**	**0.00012**	**-0.00078**	**0.00260**	**-0.00077**	**-0.00449**	**0.00120**	**0.00258**	**-0.00221**
%RSD	1.12168	241.90573	455.52755	28.25451	73.53022	22.31469	48.90728	57.22390	92.47156

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01087	-0.00122	-0.00201	-0.00213	-0.00061	0.00113	0.01301	0.00052	-0.00051
#2	-0.01079	-0.00122	-0.00203	0.00010	-0.00061	-0.00152	0.00954	0.00067	-0.00051
Mean	**-0.01083**	**-0.00122**	**-0.00202**	**-0.00101**	**-0.00061**	**-0.00019**	**0.01128**	**0.00059**	**-0.00051**
%RSD	0.49369	0.00035	0.75083	155.50840	0.59478	982.40743	21.75800	17.92742	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00068	-0.00009	-0.00193
#2	0.00075	0.00079	0.00070
Mean	**0.00072**	**0.00035**	**-0.00061**
%RSD	6.95879	175.81507	301.35460

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Method : Paragon File : 100305A Printed : 3/5/2010 16:43:11
SampleId1 : ZZZ **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 13:39:36
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE61

Final concentrations:**35** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01779	-0.03082	-0.01882	0.13568	-0.00083	0.00020	-0.06551	17.37373	-0.00531
#2	-0.01196	-0.00454	-0.01289	0.15133	-0.00004	0.00016	-0.04560	18.11273	-0.00332
Mean	**-0.01488**	**-0.01768**	**-0.01585**	**0.14351**	**-0.00043**	**0.00018**	**-0.05556**	**17.74323**	**-0.00432**
%RSD	27.67702	105.11408	26.45883	7.71142	129.32461	17.32945	25.33907	2.94505	32.61214

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01173	-0.01250	-0.01687	-0.01646	47.25258	3.28624	9.92739	0.05684	-0.00246
#2	-0.00840	-0.00865	-0.01152	-0.01302	50.00029	3.44640	10.39881	0.06038	-0.00006
Mean	**-0.01006**	**-0.01057**	**-0.01420**	**-0.01474**	**48.62644**	**3.36632**	**10.16310**	**0.05861**	**-0.00126**
%RSD	23.40297	25.75739	26.64784	16.49519	3.99561	3.36422	3.27995	4.26403	134.61965

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	840.46668	-0.01240	-0.02263	-0.07371	0.03765	19.88506	-0.04326	-0.07211	0.03647
#2	856.88387	-0.00880	-0.01592	-0.05035	0.02592	21.19012	-0.02944	-0.05080	0.02074
Mean	**848.67527**	**-0.01060**	**-0.01928**	**-0.06203**	**0.03179**	**20.53759**	**-0.03635**	**-0.06146**	**0.02861**
%RSD	1.36786	24.01148	24.64050	26.62815	26.07840	4.49332	26.88646	24.52168	38.88707

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.07022	-0.02700	1.35722	0.02565	0.00049	-0.02779	-0.34832	-0.01255	0.00142
#2	0.10102	-0.01727	1.45026	0.01599	-0.00011	-0.01596	-0.24820	-0.00917	0.00059
Mean	**0.08562**	**-0.02213**	**1.40374**	**0.02082**	**0.00019**	**-0.02188**	**-0.29826**	**-0.01086**	**0.00101**
%RSD	25.43754	31.07824	4.68636	32.82332	224.02243	38.22856	23.73682	21.99844	57.94857

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.01017	0.00057	0.00031
#2	-0.00732	0.00052	-0.00308
Mean	**-0.00875**	**0.00055**	**-0.00138**
%RSD	23.05430	5.25125	173.49416

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:11
SampleId1 : 1002254-16 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 13:41:24
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE62

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00104	0.05704	0.00029	0.16822	0.00152	0.00000	-0.00037	16.90164	-0.00046
#2	-0.00007	0.05924	0.00179	0.16619	0.00149	-0.00002	-0.00528	16.62301	-0.00049
Mean	**-0.00056**	**0.05814**	**0.00104**	**0.16720**	**0.00150**	**-0.00001**	**-0.00282**	**16.76233**	**-0.00048**
%RSD	124.32839	2.67171	101.77707	0.85682	1.32940	127.14322	123.10315	1.17537	5.65107

ted: 3/5/2010 16:43:35 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00018	-0.00093	-0.00235	-0.00773	51.91013	3.49143	9.86258	0.06343	0.00700
#2	0.00006	-0.00079	-0.00193	-0.00763	51.18445	3.44221	9.70088	0.06253	0.00572
Mean	**-0.00006**	**-0.00086**	**-0.00214**	**-0.00768**	**51.54729**	**3.46682**	**9.78173**	**0.06298**	**0.00636**
%RSD	280.33677	11.00602	13.88384	0.97445	0.99547	1.00387	1.16891	1.00252	14.19024

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	782.61655	-0.00061	-0.01481	-0.00049	-0.00228	21.38046	-0.00099	-0.00657	0.00049
#2	777.28231	0.00023	-0.02023	0.00248	-0.00131	21.08408	0.00114	0.00629	-0.00306
Mean	**779.94943**	**-0.00019**	**-0.01752**	**0.00100**	**-0.00180**	**21.23227**	**0.00008**	**-0.00014**	**-0.00129**
%RSD	0.48361	312.79335	21.84824	210.68873	38.16044	0.98705	1985.04695	6561.84040	194.72727

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.14423	-0.00280	1.43117	-0.00436	-0.00096	-0.00086	-0.00879	-0.00054	-0.00085
#2	0.14408	-0.00268	1.40090	-0.00266	-0.00073	-0.00162	0.00162	0.00001	-0.00057
Mean	**0.14416**	**-0.00274**	**1.41604**	**-0.00351**	**-0.00085**	**-0.00124**	**-0.00358**	**-0.00026**	**-0.00071**
%RSD	0.07722	3.13410	1.51147	34.16048	19.29811	43.73997	205.55353	145.43170	27.30883

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00034	-0.00168	-0.00186
#2	-0.00011	-0.00005	0.00005
Mean	**-0.00022**	**-0.00087**	**-0.00091**
%RSD	73.05161	133.23540	149.45015

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:11
SampleId1 : 1002254-17 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:43:13
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE63

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00134	0.05361	-0.00031	0.17771	0.00163	0.00003	-0.00637	16.79879	-0.00057
#2	-0.00132	0.06012	-0.00294	0.16929	0.00155	0.00003	0.00031	16.27182	-0.00093
Mean	**-0.00133**	**0.05687**	**-0.00162**	**0.17350**	**0.00159**	**0.00003**	**-0.00303**	**16.53530**	**-0.00075**
%RSD	1.12429	8.09959	114.55190	3.43251	3.77526	5.42979	156.13388	2.25348	33.87818

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00039	-0.00104	-0.00257	-0.00853	49.23548	3.45344	10.46233	0.06666	0.00724
#2	-0.00073	-0.00119	-0.00269	-0.00853	47.91538	3.37221	10.10788	0.06484	0.00721
Mean	**-0.00056**	**-0.00112**	**-0.00263**	**-0.00853**	**48.57543**	**3.41283**	**10.28510**	**0.06575**	**0.00722**
%RSD	43.24863	9.45920	3.24264	0.00000	1.92165	1.68306	2.43689	1.96061	0.25512

20000467

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	833.32356	-0.00061	-0.01963	-0.00310	0.00054	21.26276	-0.00140	0.00366	-0.00094
#2	805.53341	-0.00065	-0.02444	-0.00347	-0.00026	20.55114	-0.00164	-0.00455	-0.00091
Mean	**819.42849**	**-0.00063**	**-0.02203**	**-0.00328**	**0.00014**	**20.90695**	**-0.00152**	**-0.00045**	**-0.00092**
%RSD	2.39809	4.23026	15.44378	8.04917	393.04956	2.40684	11.00490	1299.33051	2.69784

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.15241	-0.00158	1.52322	-0.00458	-0.00101	-0.00328	-0.00631	-0.00041	-0.00037
#2	0.14707	-0.00195	1.47443	-0.00534	-0.00116	-0.00098	-0.03506	-0.00086	-0.00078
Mean	**0.14974**	**-0.00176**	**1.49883**	**-0.00496**	**-0.00108**	**-0.00213**	**-0.02068**	**-0.00063**	**-0.00057**
%RSD	2.52215	14.61314	2.30191	10.89497	10.08301	76.30414	98.29669	50.49335	50.76647

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00032	-0.00067	0.00059
#2	-0.00058	-0.00133	-0.00212
Mean	**-0.00045**	**-0.00100**	**-0.00076**
%RSD	40.97149	46.48472	250.76296

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:11
SampleId1 : 1002254-18 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 13:45:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE64

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00015	0.06334	0.00247	0.18864	0.00158	0.00003	0.00170	15.84549	-0.00031
#2	0.00052	0.06456	0.00187	0.19082	0.00160	0.00004	-0.00321	16.07781	-0.00045
Mean	**0.00033**	**0.06395**	**0.00217**	**0.18973**	**0.00159**	**0.00003**	**-0.00076**	**15.96165**	**-0.00038**
%RSD	77.25176	1.35687	19.57738	0.81440	1.25842	19.48354	460.65095	1.02915	24.90758

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00018	-0.00065	-0.00179	-0.00768	46.20308	3.16237	9.29503	0.05654	0.00838
#2	0.00001	-0.00065	-0.00172	-0.00768	46.82858	3.19833	9.43554	0.05729	0.00875
Mean	**-0.00009**	**-0.00065**	**-0.00175**	**-0.00768**	**46.51583**	**3.18035**	**9.36529**	**0.05692**	**0.00857**
%RSD	152.35908	0.08587	2.93051	0.00000	0.95085	0.79950	1.06091	0.92436	3.01204

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	759.92922	0.00028	-0.02143	0.00193	-0.00270	19.79948	0.00229	0.00495	-0.00341
#2	760.13823	-0.00053	-0.02634	-0.00063	-0.00097	20.15056	0.00152	0.00366	-0.00157
Mean	**760.03372**	**-0.00013**	**-0.02389**	**0.00065**	**-0.00183**	**19.97502**	**0.00191**	**0.00431**	**-0.00249**
%RSD	0.01945	452.99890	14.54134	277.90861	66.89093	1.24281	28.56475	21.11307	52.38414

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.08943	-0.00158	1.33334	-0.00538	-0.00081	0.00003	0.00063	-0.00011	-0.00105
#2	0.09025	-0.00110	1.35448	-0.00310	-0.00099	0.00117	-0.00085	0.00005	-0.00071
Mean	**0.08984**	**-0.00134**	**1.34391**	**-0.00424**	**-0.00090**	**0.00060**	**-0.00011**	**-0.00003**	**-0.00088**
%RSD	0.64674	25.69848	1.11229	37.94678	14.51422	134.20991	947.10334	353.40161	27.49845

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00002	-0.00116	-0.00063
#2	-0.00011	-0.00085	0.00018
Mean	**-0.00006**	**-0.00101**	**-0.00023**
%RSD	97.72677	21.57536	251.02523

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:12
SampleId1 : 1002254-19 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:46:51
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE65

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00064	0.06258	-0.00020	0.00469	-0.00004	0.00002	-0.00007	2.98310	-0.00043
#2	-0.00028	0.06270	0.00153	0.00473	-0.00004	0.00002	0.00042	2.98299	-0.00049
Mean	**-0.00046**	**0.06264**	**0.00067**	**0.00471**	**-0.00004**	**0.00002**	**0.00018**	**2.98305**	**-0.00046**
%RSD	56.59360	0.13863	182.83243	0.59649	0.00000	0.11318	198.02881	0.00271	8.84736

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00015	-0.00070	-0.00271	-0.00858	0.11450	4.99779	5.52855	-0.00054	-0.00110
#2	-0.00052	-0.00093	-0.00206	-0.00842	0.11235	5.00043	5.52442	-0.00046	-0.00100
Mean	**-0.00034**	**-0.00081**	**-0.00239**	**-0.00850**	**0.11342**	**4.99911**	**5.52648**	**-0.00050**	**-0.00105**
%RSD	77.03336	19.51578	19.19605	1.32063	1.33467	0.03727	0.05297	10.53033	7.01420

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	618.95494	-0.00017	-0.00288	-0.00073	-0.00131	0.86239	-0.00041	0.00013	-0.00268
#2	619.91426	-0.00121	-0.00499	-0.00076	-0.00020	0.86523	0.00162	-0.00106	-0.00345
Mean	**619.43460**	**-0.00069**	**-0.00394**	**-0.00075**	**-0.00075**	**0.86381**	**0.00061**	**-0.00046**	**-0.00306**
%RSD	0.10951	106.42584	37.82105	2.81783	104.44003	0.23221	235.88459	180.37033	17.66598

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.71118	-0.00231	0.01438	-0.00370	-0.00086	-0.00064	-0.00482	-0.00011	-0.00071
#2	0.71507	-0.00207	0.01436	-0.00444	-0.00102	-0.00039	-0.01176	-0.00007	-0.00154
Mean	**0.71313**	**-0.00219**	**0.01437**	**-0.00407**	**-0.00094**	**-0.00052**	**-0.00829**	**-0.00009**	**-0.00112**
%RSD	0.38666	7.85782	0.10565	12.90011	11.63097	34.58434	59.19828	30.70784	51.87477

	Zr	**Pb**	**Se**
	ppm	calc	calc

20000469

#1	-0.00073	-0.00112	-0.00175	**CH**
#2	-0.00032	-0.00039	-0.00265	
Mean	**-0.00052**	**-0.00075**	**-0.00220**	
%RSD	54.91775	68.91891	29.10371	

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:12
SampleId1 : 1002254-20 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:48:39
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE66

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00484	0.02967	-0.00703	0.14673	0.00101	-0.00005	-0.01466	15.43752	-0.00147
#2	-0.00172	0.05982	-0.00038	0.15070	0.00143	-0.00006	-0.00303	15.50709	-0.00057
Mean	**-0.00328**	**0.04475**	**-0.00371**	**0.14871**	**0.00122**	**-0.00005**	**-0.00884**	**15.47231**	**-0.00102**
%RSD	67.12303	47.64246	126.79358	1.88877	24.55788	3.47664	93.02459	0.31793	62.13889

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00361	-0.00376	-0.00615	-0.01133	53.09225	3.46775	9.56210	0.04114	0.01863
#2	-0.00092	-0.00111	-0.00277	-0.00921	53.39458	3.48339	9.64611	0.04189	0.02009
Mean	**-0.00227**	**-0.00244**	**-0.00446**	**-0.01027**	**53.24342**	**3.47557**	**9.60410**	**0.04152**	**0.01936**
%RSD	84.12065	76.95964	53.54631	14.56961	0.40151	0.31810	0.61852	1.26696	5.33223

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	788.02260	-0.00429	-0.02524	-0.02251	0.01115	21.20465	-0.01233	-0.02264	0.01068
#2	775.87697	-0.00121	-0.02394	-0.00373	0.00087	21.40080	-0.00141	-0.00604	0.00153
Mean	**781.94978**	**-0.00275**	**-0.02459**	**-0.01312**	**0.00601**	**21.30273**	**-0.00687**	**-0.01434**	**0.00611**
%RSD	1.09831	79.05224	3.74779	101.22534	121.05774	0.65109	112.39490	81.82763	105.99251

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.04586	-0.01022	1.46525	-0.00419	-0.00108	-0.01018	-0.08909	-0.00364	-0.00119
#2	0.06048	-0.00341	1.47048	-0.00688	-0.00111	-0.00425	-0.02167	-0.00108	-0.00140
Mean	**0.05317**	**-0.00681**	**1.46787**	**-0.00553**	**-0.00110**	**-0.00721**	**-0.05538**	**-0.00236**	**-0.00130**
%RSD	19.44921	70.69845	0.25170	34.38180	2.32507	58.06539	86.07568	76.56078	11.24934

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00266	-0.00006	-0.00041
#2	-0.00078	-0.00066	-0.00099
Mean	**-0.00172**	**-0.00036**	**-0.00070**
%RSD	77.41685	118.12670	58.25357

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Method : Paragon File : 100305A Printed : 3/5/2010 16:43:12
SampleId1 : 1002254-21 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:50:27

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE67

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00148	0.06066	0.00018	0.14367	0.00109	0.00004	-0.00253	13.93416	-0.00052
#2	-0.00028	0.06241	-0.00376	0.14498	0.00118	0.00001	0.00131	14.05065	-0.00068
Mean	**-0.00088**	**0.06153**	**-0.00179**	**0.14432**	**0.00114**	**0.00003**	**-0.00061**	**13.99241**	**-0.00060**
%RSD	96.66728	2.01880	155.62185	0.64224	5.27820	84.47513	442.87822	0.58869	18.60945

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00055	-0.00111	-0.00256	-0.00869	42.02946	2.87944	8.48265	0.05126	0.01302
#2	-0.00058	-0.00102	-0.00249	-0.00816	42.43232	2.90663	8.56051	0.05186	0.01339
Mean	**-0.00056**	**-0.00107**	**-0.00253**	**-0.00842**	**42.23089**	**2.89304**	**8.52158**	**0.05156**	**0.01320**
%RSD	3.28038	6.52420	1.86895	4.44358	0.67454	0.66467	0.64614	0.81626	1.95392

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	676.08381	-0.00119	-0.02083	-0.00189	-0.00069	17.58747	0.00013	-0.00465	-0.00052
#2	683.11435	-0.00124	-0.02083	-0.00112	-0.00024	17.79583	0.00049	0.00243	-0.00011
Mean	**679.59908**	**-0.00121**	**-0.02083**	**-0.00151**	**-0.00047**	**17.69165**	**0.00031**	**-0.00111**	**-0.00031**
%RSD	0.73151	2.92657	0.00000	36.62747	67.66824	0.83276	80.71333	450.69831	93.86077

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.12812	-0.00365	1.28104	-0.00551	-0.00083	-0.00211	-0.01523	-0.00059	-0.00064
#2	0.13254	-0.00353	1.29265	-0.00400	-0.00093	-0.00045	-0.00928	-0.00072	-0.00105
Mean	**0.13033**	**-0.00359**	**1.28685**	**-0.00475**	**-0.00088**	**-0.00128**	**-0.01226**	**-0.00066**	**-0.00085**
%RSD	2.39960	2.39839	0.63817	22.45833	8.25165	91.40476	34.31934	14.08746	34.33333

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00051	-0.00109	-0.00190
#2	-0.00033	-0.00053	0.00074
Mean	**-0.00042**	**-0.00081**	**-0.00058**
%RSD	30.65715	48.56865	321.45779

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:13
SampleId1 : 1002254-22 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:52:15
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE68

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00257	0.04905	-0.00346	0.15582	0.00092	0.00005	-0.00757	14.22479	-0.00102
#2	-0.00121	0.06002	-0.00155	0.16750	0.00118	0.00003	-0.00460	14.93901	-0.00071

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00021	0.06815	0.00025	0.24355	0.00160	0.00004	-0.00213	15.70572	-0.00062
#2	-0.00071	0.06509	-0.00177	0.23878	0.00155	0.00006	0.00003	15.48839	-0.00078
Mean	**-0.00046**	**0.06662**	**-0.00076**	**0.24117**	**0.00158**	**0.00005**	**-0.00105**	**15.59706**	**-0.00070**
%RSD	75.85616	3.23984	188.94049	1.39823	2.53944	23.25531	145.11949	0.98529	16.24681

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00014	-0.00035	-0.00222	-0.00794	47.93101	3.32718	9.61708	0.05435	0.01287
#2	0.00014	-0.00072	-0.00185	-0.00821	47.39910	3.28926	9.46042	0.05364	0.01261
Mean	**0.00014**	**-0.00054**	**-0.00203**	**-0.00808**	**47.66506**	**3.30822**	**9.53875**	**0.05400**	**0.01274**

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Mean	**-0.00146**	**-0.00175**	**-0.00393**	**-0.00932**	**43.79264**	**3.05871**	**9.01884**	**0.05444**	**0.01515**
%RSD	39.66565	31.19751	18.85718	7.22640	3.39342	3.23481	3.76980	3.72038	5.47542

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	721.23570	-0.00198	-0.01361	-0.00812	0.00335	18.20545	-0.00478	-0.00623	0.00247
#2	742.68325	-0.00176	-0.02725	-0.00393	0.00119	19.10644	-0.00139	-0.00926	-0.00042
Mean	**731.95947**	**-0.00187**	**-0.02043**	**-0.00603**	**0.00227**	**18.65595**	**-0.00308**	**-0.00774**	**0.00103**
%RSD	2.07193	8.05970	47.19373	49.19118	67.11422	3.41497	77.82664	27.64820	199.18040

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.13520	-0.00414	1.31342	-0.00846	-0.00116	-0.00427	-0.05538	-0.00172	-0.00140
#2	0.14914	-0.00219	1.39163	-0.00573	-0.00104	-0.00451	-0.02663	-0.00104	-0.00112
Mean	**0.14217**	**-0.00316**	**1.35252**	**-0.00710**	**-0.00110**	**-0.00439**	**-0.04101**	**-0.00138**	**-0.00126**
%RSD	6.93003	43.49543	4.08916	27.20424	7.91591	3.87394	49.57719	34.58774	15.40766

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00106	-0.00047	-0.00043
#2	-0.00071	-0.00051	-0.00336
Mean	**-0.00089**	**-0.00049**	**-0.00189**
%RSD	27.98854	5.89871	109.51297

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:13
SampleId1 : 1002254-23 50X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 13:54:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE69

Final concentrations

20000472

%RSD	0.08681	48.93634	12.92320	2.31641	0.78908	0.81052	1.16138	0.92560	1.44706

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	778.86833	-0.00056	-0.01622	0.00118	-0.00250	20.28551	0.00072	-0.00185	-0.00042
#2	763.20007	-0.00110	-0.02374	-0.00027	-0.00196	20.15781	0.00042	-0.00015	-0.00289
Mean	**771.03420**	**-0.00083**	**-0.01998**	**0.00046**	**-0.00223**	**20.22166**	**0.00057**	**-0.00100**	**-0.00165**
%RSD	1.43692	45.96714	26.61364	225.77236	17.18391	0.44654	36.52131	120.34413	105.59211

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.12039	-0.00268	1.46239	-0.00759	-0.00077	-0.00089	0.00262	-0.00024	-0.00099
#2	0.11789	-0.00097	1.43438	-0.00450	-0.00089	-0.00266	-0.01573	-0.00056	-0.00119
Mean	**0.11914**	**-0.00183**	**1.44839**	**-0.00604**	**-0.00083**	**-0.00178**	**-0.00655**	**-0.00040**	**-0.00109**
%RSD	1.48081	65.95025	1.36741	36.15527	10.04627	70.70933	197.85110	56.96685	13.37761

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00008	-0.00127	-0.00089
#2	-0.00033	-0.00140	-0.00198
Mean	**-0.00013**	**-0.00134**	**-0.00144**
%RSD	230.48672	6.52181	53.29352

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:13
SampleId1 : 1002254-24 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 13:55:53
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE70

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00094	0.07935	-0.00162	0.31585	0.00234	0.00003	-0.00076	15.02014	-0.00086
#2	-0.00053	0.07744	0.00044	0.30595	0.00220	0.00002	0.00062	14.55102	-0.00049
Mean	**-0.00074**	**0.07839**	**-0.00059**	**0.31090**	**0.00227**	**0.00003**	**-0.00007**	**14.78558**	**-0.00067**
%RSD	38.66735	1.72272	247.56485	2.25129	4.40897	20.49187	1411.71290	2.24354	39.32199

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00028	-0.00071	-0.00250	-0.00519	49.79133	3.42069	9.10937	0.03140	0.01331
#2	-0.00015	-0.00073	-0.00185	-0.00546	48.21699	3.32312	8.82598	0.03032	0.01302
Mean	**-0.00022**	**-0.00072**	**-0.00218**	**-0.00533**	**49.00416**	**3.37190**	**8.96767**	**0.03086**	**0.01317**
%RSD	42.83201	1.24614	20.89836	3.51349	2.27170	2.04602	2.23449	2.47097	1.53978

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	781.65015	0.00000	-0.02213	0.00016	-0.00013	21.29473	0.00114	-0.00175	-0.00292
#2	755.91659	-0.00032	-0.03015	0.00118	-0.00205	20.60775	0.00055	-0.00143	-0.00171
Mean	**768.78337**	**-0.00016**	**-0.02614**	**0.00067**	**-0.00109**	**20.95124**	**0.00085**	**-0.00159**	**-0.00231**
%RSD	2.36690	145.37797	21.69237	108.26188	124.27389	2.31855	49.91446	14.31562	37.19821

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ted: 3/5/2010 16:43:35 User: ROY FRENCH

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09396	-0.00426	1.42040	-0.00365	-0.00085	-0.00336	-0.00631	-0.00078	-0.00092
#2	0.09184	-0.00183	1.37408	-0.00314	-0.00075	0.00223	-0.00631	-0.00054	-0.00133
Mean	**0.09290**	**-0.00304**	**1.39724**	**-0.00339**	**-0.00080**	**-0.00057**	**-0.00631**	**-0.00066**	**-0.00112**
%RSD	1.60900	56.53815	2.34382	10.48024	9.10132	698.90489	0.00202	26.20121	25.93737

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00015	-0.00004	-0.00253
#2	-0.00043	-0.00097	-0.00161
Mean	**-0.00029**	**-0.00051**	**-0.00207**
%RSD	66.84288	131.33080	31.36411

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:13
SampleId1 : CCV SampleId2 : [CV]
Analysis commenced : 3/5/2010 13:57:42
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20252	50.01222	0.52005	0.98426	0.97984	0.49575	0.51316	49.48946	0.50762
#2	0.20227	50.17639	0.52145	0.98964	0.98733	0.49727	0.51595	49.60575	0.50890
Mean	**0.20239**	**50.09430**	**0.52075**	**0.98695**	**0.98358**	**0.49651**	**0.51456**	**49.54761**	**0.50826**
%RSD	0.08669	0.23174	0.18994	0.38572	0.53806	0.21738	0.38236	0.16595	0.17794

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49907	0.98583	0.99203	20.09750	49.40079	0.50609	50.17368	0.96031	0.99389
#2	0.49963	0.98857	0.99803	20.18436	49.54466	0.50802	50.29104	0.96423	0.99720
Mean	**0.49935**	**0.98720**	**0.99503**	**20.14093**	**49.47272**	**0.50705**	**50.23236**	**0.96227**	**0.99554**
%RSD	0.07977	0.19611	0.42588	0.30497	0.20564	0.26864	0.16520	0.28806	0.23514

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	47.54846	1.03876	4.92795	0.96439	0.93733	4.88184	0.49966	1.00393	0.97624
#2	47.73516	1.04307	4.96810	0.96632	0.93184	4.88611	0.49725	1.01370	0.97763
Mean	**47.64181**	**1.04091**	**4.94803**	**0.96536**	**0.93458**	**4.88397**	**0.49846**	**1.00881**	**0.97693**
%RSD	0.27711	0.29275	0.57380	0.14171	0.41518	0.06190	0.34208	0.68459	0.10008

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.66222	1.01611	0.49316	0.13246	0.45817	0.51410	4.82205	0.48348	0.99036
#2	4.67888	1.01953	0.49671	0.13361	0.46061	0.52074	4.83985	0.48472	0.99453
Mean	**4.67055**	**1.01782**	**0.49493**	**0.13304**	**0.45939**	**0.51742**	**4.83095**	**0.48410**	**0.99244**
%RSD	0.25230	0.23778	0.50707	0.60814	0.37443	0.90720	0.26061	0.18137	0.29719

	Zr	Pb	SeCH
	ppm	calc	calc
#1	0.97803	0.94634	0.98546
#2	0.98226	0.94332	0.98964
Mean	**0.98015**	**0.94483**	**0.98755**
%RSD	0.30526	0.22571	0.29891

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:14
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/5/2010 14:01:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00059	0.07426	-0.00091	-0.00155	-0.00035	0.00025	-0.00567	-0.01843	-0.00049
#2	-0.00040	0.07559	0.00112	-0.00270	-0.00029	0.00025	0.00633	-0.01899	-0.00034
Mean	**0.00009**	**0.07492**	**0.00010**	**-0.00212**	**-0.00032**	**0.00025**	**0.00033**	**-0.01871**	**-0.00041**
%RSD	749.34704	1.25391	1368.25807	38.36145	12.50460	0.61219	2570.85261	2.14922	24.46525

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00013	-0.00008	-0.00122	0.00089	-0.36076	0.00230	-0.01346	-0.00020	-0.00048
#2	0.00035	0.00021	-0.00093	0.00190	-0.35767	0.00230	-0.00977	-0.00005	-0.00092
Mean	**0.00011**	**0.00006**	**-0.00108**	**0.00140**	**-0.35922**	**0.00230**	**-0.01161**	**-0.00013**	**-0.00070**
%RSD	307.19750	337.78568	18.66689	50.94013	0.60929	0.00000	22.50433	82.46471	44.81330

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.12899	-0.00086	-0.00318	0.00018	-0.00119	-0.00236	0.00162	0.00570	-0.00452
#2	-0.13103	-0.00032	0.00083	0.00206	-0.00051	0.00189	0.00042	0.00201	-0.00431
Mean	**-0.13001**	**-0.00059**	**-0.00118**	**0.00112**	**-0.00085**	**-0.00024**	**0.00102**	**0.00386**	**-0.00442**
%RSD	1.10758	64.49204	240.48240	118.96850	56.56034	1256.81746	83.14403	67.71084	3.34242

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00915	-0.00085	-0.00227	-0.00306	-0.00098	-0.00237	0.00360	-0.00010	-0.00133
#2	-0.00909	0.00000	-0.00227	-0.00218	-0.00076	-0.00020	0.00558	-0.00008	-0.00071
Mean	**-0.00912**	**-0.00043**	**-0.00227**	**-0.00262**	**-0.00087**	**-0.00128**	**0.00459**	**-0.00009**	**-0.00102**
%RSD	0.48976	140.92139	0.22269	23.63062	18.00366	119.86250	30.52232	14.26893	42.83410

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00041	-0.00073	-0.00112
#2	0.00035	0.00035	-0.00221
Mean	**0.00038**	**-0.00019**	**-0.00166**
%RSD	11.86184	393.52985	46.35667

20000475

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:14

SampleId1 : 1002254-25 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 14:02:56
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE71

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00064	0.07117	0.00149	0.35732	0.00245	0.00011	0.00416	17.17304	-0.00041
#2	-0.00035	0.07250	-0.00222	0.33951	0.00225	0.00013	0.00121	16.38007	-0.00056
Mean	**0.00014**	**0.07184**	**-0.00036**	**0.34841**	**0.00235**	**0.00012**	**0.00269**	**16.77655**	**-0.00048**
%RSD	484.19672	1.31299	721.02375	3.61507	5.94997	11.74751	77.72905	3.34223	21.90163

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00038	-0.00072	-0.00135	-0.00355	55.50979	3.72831	10.23577	0.03493	0.01261
#2	0.00001	-0.00062	-0.00185	-0.00371	53.02123	3.57122	9.76111	0.03330	0.01263
Mean	**0.00019**	**-0.00067**	**-0.00160**	**-0.00363**	**54.26551**	**3.64977**	**9.99844**	**0.03411**	**0.01262**
%RSD	136.46656	10.57154	22.18847	3.09111	3.24272	3.04347	3.35692	3.39162	0.14605

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	863.82195	-0.00020	-0.01351	0.00313	-0.00288	24.12094	0.00257	0.00478	-0.00247
#2	832.42940	-0.00027	-0.01973	0.00226	-0.00213	23.10408	0.00334	0.00216	-0.00435
Mean	**848.12567**	**-0.00023**	**-0.01662**	**0.00269**	**-0.00251**	**23.61251**	**0.00295**	**0.00347**	**-0.00341**
%RSD	2.61729	22.75337	26.44707	22.98130	21.19194	3.04512	18.50118	53.47211	38.95607

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09438	-0.00037	1.53650	-0.00140	-0.00060	0.00318	-0.01424	0.00003	-0.00044
#2	0.08892	-0.00110	1.46784	-0.00260	-0.00059	0.00079	-0.01226	-0.00050	-0.00071
Mean	**0.09165**	**-0.00073**	**1.50217**	**-0.00200**	**-0.00060**	**0.00199**	**-0.01325**	**-0.00024**	**-0.00057**
%RSD	4.20874	70.54696	3.23190	42.47462	0.61018	85.02536	10.58221	157.65834	33.84430

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00023	-0.00088	-0.00006
#2	-0.00010	-0.00067	-0.00218
Mean	**-0.00017**	**-0.00077**	**-0.00112**
%RSD	55.19726	19.11947	134.22446

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:14
SampleId1 : 1003054-1 10X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 14:04:44
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE72

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Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	-0.00007	6.63035	-0.00023	1.27465	0.02313	0.00047	0.00177	24.91788	-0.00047
#2	-0.00011	6.61755	0.00048	1.27473	0.02322	0.00045	0.00020	24.86544	-0.00035
Mean	**-0.00009**	**6.62395**	**0.00012**	**1.27469**	**0.02318**	**0.00046**	**0.00098**	**24.89166**	**-0.00041**
%RSD	34.13235	0.13662	408.29418	0.00443	0.25898	3.47197	113.11971	0.14897	21.50158

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00212	0.00349	0.00307	4.48612	68.81025	2.30977	11.00763	0.13657	-0.00009
#2	0.00257	0.00403	0.00364	4.46409	68.86175	2.31244	10.98515	0.13661	0.00004
Mean	**0.00235**	**0.00376**	**0.00335**	**4.47511**	**68.83600**	**2.31111**	**10.99639**	**0.13659**	**-0.00002**
%RSD	13.62042	10.13615	11.87545	0.34801	0.05290	0.08190	0.14460	0.01928	428.99617

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	482.72176	0.00585	0.05207	0.00197	0.00154	14.39035	0.00111	0.00482	0.00120
#2	481.90003	0.00594	0.04805	0.00234	0.00032	14.37305	0.00021	0.00435	0.00050
Mean	**482.31089**	**0.00589**	**0.05006**	**0.00215**	**0.00093**	**14.38170**	**0.00066**	**0.00458**	**0.00085**
%RSD	0.12047	1.05349	5.66611	12.33758	92.37832	0.08504	96.39896	7.30528	58.13162

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	22.38219	0.00094	0.76037	-0.00514	0.23811	-0.00584	-0.00342	0.00766	0.00918
#2	22.33028	0.00276	0.76091	-0.00470	0.23660	-0.00246	0.00701	0.00778	0.00959
Mean	**22.35624**	**0.00185**	**0.76064**	**-0.00492**	**0.23735**	**-0.00415**	**0.00179**	**0.00772**	**0.00939**
%RSD	0.16420	69.80142	0.05064	6.30826	0.44898	57.69073	410.96604	1.16475	3.10509

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.01069	0.00168	0.00241
#2	0.01077	0.00100	0.00178
Mean	**0.01073**	**0.00134**	**0.00209**
%RSD	0.50813	36.30395	21.08349

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:15
SampleId1 : 1003054-2 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 14:06:33
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE73

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00057	0.18151	-0.00027	0.06325	0.00203	-0.00004	-0.00065	9.44216	-0.00026
#2	-0.00068	0.18266	-0.00234	0.06336	0.00206	-0.00005	-0.00232	9.40840	-0.00067
Mean	**-0.00063**	**0.18209**	**-0.00130**	**0.06331**	**0.00204**	**-0.00005**	**-0.00149**	**9.42528**	**-0.00046**
%RSD	12.13342	0.44688	112.04643	0.13306	0.97951	7.23740	79.69103	0.25324	62.58476

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00048	-0.00063	-0.00150	0.75521	0.31404	0.02645	2.52956	0.02062	-0.00074

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#2	-0.00082	-0.00078	-0.00249	0.75350	0.30357	0.02621	2.51433	0.02058	-0.00079
Mean	**-0.00065**	**-0.00070**	**-0.00200**	**0.75435**	**0.30880**	**0.02633**	**2.52194**	**0.02060**	**-0.00076**
%RSD	37.44307	15.12255	35.29713	0.15949	2.39577	0.66596	0.42716	0.12764	4.82268

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	17.91412	0.00009	-0.00188	-0.00010	-0.00122	7.77007	-0.00076	0.00157	0.00039
#2	17.79250	-0.00042	0.00133	-0.00278	0.00098	7.77007	-0.00171	0.00489	-0.00090
Mean	**17.85331**	**-0.00016**	**-0.00028**	**-0.00144**	**-0.00012**	**7.77007**	**-0.00124**	**0.00323**	**-0.00025**
%RSD	0.48168	220.53081	819.39600	131.35934	1293.77160	0.00000	54.40549	72.63872	362.13739

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.63901	-0.00159	0.17138	-0.00893	0.00348	-0.00218	-0.00435	-0.00011	0.00506
#2	1.64011	-0.00268	0.17087	-0.01701	0.00379	-0.00359	-0.00881	-0.00039	0.00444
Mean	**1.63956**	**-0.00213**	**0.17112**	**-0.01297**	**0.00364**	**-0.00289**	**-0.00658**	**-0.00025**	**0.00475**
%RSD	0.04741	36.26440	0.20821	44.05357	6.00417	34.32464	47.94245	80.23640	9.20434

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00004	-0.00085	0.00078
#2	0.00042	-0.00028	0.00103
Mean	**0.00023**	**-0.00056**	**0.00091**
%RSD	114.25005	71.94424	19.12810

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:15
SampleId1 : 1002254-15 50X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 14:08:21
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE61

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00067	0.05972	0.00123	0.12810	0.00124	0.00004	0.00101	13.98493	-0.00077
#2	0.00066	0.06327	-0.00072	0.12619	0.00118	0.00003	0.00023	13.65419	-0.00057
Mean	**-0.00001**	**0.06149**	**0.00025**	**0.12714**	**0.00121**	**0.00003**	**0.00062**	**13.81956**	**-0.00067**
%RSD	17717.74191	4.07992	541.47228	1.06030	3.31273	23.78173	89.29219	1.69228	20.94887

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00055	-0.00106	-0.00192	-0.00630	40.70292	2.82212	8.11362	0.04806	0.00281
#2	0.00030	-0.00045	-0.00164	-0.00599	39.80200	2.75847	7.92454	0.04717	0.00351
Mean	**-0.00013**	**-0.00076**	**-0.00178**	**-0.00615**	**40.25246**	**2.79029**	**8.01908**	**0.04762**	**0.00316**
%RSD	473.64289	57.43818	10.93607	3.65342	1.58263	1.61299	1.66722	1.32570	15.75572

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	651.15280	-0.00050	-0.00609	-0.00132	-0.00144	16.98729	-0.00287	-0.00577	0.00024
#2	631.82593	-0.00012	-0.01030	0.00241	-0.00257	16.65194	0.00100	0.00457	-0.00508

Mean	**641.48936**	**-0.00031**	**-0.00820**	**0.00055**	**-0.00201**	**16.81961**	**-0.00093**	**-0.00060**	**-0.00242**
%RSD	2.13038	86.07086	36.32268	482.70050	39.91680	1.40981	292.71583	1222.73542	155.59944

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.11778	-0.00365	1.18041	-0.00525	-0.00097	-0.00193	-0.01573	-0.00035	-0.00051
#2	0.11804	-0.00146	1.15380	-0.00452	-0.00086	-0.00189	-0.00234	-0.00003	-0.00002
Mean	**0.11791**	**-0.00256**	**1.16711**	**-0.00488**	**-0.00092**	**-0.00191**	**-0.00903**	**-0.00019**	**-0.00026**
%RSD	0.15302	60.57349	1.61218	10.62431	9.14265	1.64234	104.74857	119.21976	128.32666

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00013	-0.00140	-0.00176
#2	0.00010	-0.00091	-0.00187
Mean	**-0.00001**	**-0.00116**	**-0.00181**
%RSD	1345.07774	29.77003	4.14875

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:15
SampleId1 : 1002076-4 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 14:10:10
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE74

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00005	0.04764	-0.00147	0.26788	0.06335	0.00009	-0.00185	504.99667	0.00069
#2	0.00020	0.04551	0.00018	0.27412	0.06383	0.00008	0.00081	508.03911	0.00070
Mean	**0.00008**	**0.04657**	**-0.00065**	**0.27100**	**0.06359**	**0.00008**	**-0.00052**	**506.51789**	**0.00070**
%RSD	228.94049	3.22578	180.78849	1.62823	0.53510	5.78944	363.32433	0.42473	0.72731

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00158	-0.00077	0.03623	-0.00842	142.16515	12.89679	102.56403	0.44824	0.00184
#2	0.00137	-0.00098	0.03588	-0.00842	143.46106	12.99815	103.28528	0.45168	0.00257
Mean	**0.00147**	**-0.00087**	**0.03606**	**-0.00842**	**142.81311**	**12.94747**	**102.92466**	**0.44996**	**0.00221**
%RSD	10.14576	17.58588	0.70574	0.00000	0.64164	0.55355	0.49550	0.54094	23.38230

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1053.21091	0.03558	-0.02955	-0.00150	-0.00079	58.82450	-0.00139	-0.00176	-0.00313
#2	1033.73401	0.03487	-0.03817	-0.00097	-0.00061	59.37590	-0.00132	-0.00064	-0.00219
Mean	**1043.47246**	**0.03523**	**-0.03386**	**-0.00123**	**-0.00070**	**59.10020**	**-0.00136**	**-0.00120**	**-0.00266**
%RSD	1.31985	1.43562	18.00285	30.34147	18.28499	0.65973	3.53922	66.38541	24.94380

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.92451	-0.00170	15.12993	-0.01923	-0.00348	-0.00025	-0.02713	-0.00009	0.01433
#2	0.93447	-0.00097	15.44276	-0.01943	-0.00322	-0.00098	-0.02366	-0.00059	0.01433
Mean	**0.92949**	**-0.00134**	**15.28634**	**-0.01933**	**-0.00335**	**-0.00062**	**-0.02539**	**-0.00034**	**0.01433**

%RSD	0.75776	38.59656	1.44708	0.72653	5.54053	84.23873	9.66312	105.43140	0.00000

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00019	-0.00103	-0.00268
#2	0.00037	-0.00073	-0.00168
Mean	**0.00028**	**-0.00088**	**-0.00218**
%RSD	45.54550	23.90823	32.55767

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:16
SampleId1 : 1002076-7 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 14:11:59
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE75

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00077	0.04552	-0.00042	0.07043	0.21064	0.00013	-0.00461	756.76788	-0.00035
#2	-0.00056	0.04716	-0.00110	0.06992	0.21098	0.00011	0.00061	753.21210	-0.00041
Mean	**-0.00067**	**0.04634**	**-0.00076**	**0.07017**	**0.21081**	**0.00012**	**-0.00200**	**754.98999**	**-0.00038**
%RSD	22.16471	2.48972	62.97967	0.52015	0.11410	10.24791	184.51354	0.33303	11.16812

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00014	-0.00115	-0.00247	-0.00699	93.81672	8.09276	122.81574	0.16023	-0.00168
#2	-0.00022	-0.00102	-0.00213	-0.00678	94.04956	8.10130	122.50923	0.16008	-0.00204
Mean	**-0.00018**	**-0.00109**	**-0.00230**	**-0.00689**	**93.93314**	**8.09703**	**122.66249**	**0.16015**	**-0.00186**
%RSD	30.76716	8.61811	10.66905	2.17356	0.17528	0.07456	0.17670	0.06580	13.87948

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	847.80354	-0.00052	-0.01411	-0.00227	0.00081	19.86765	-0.00124	-0.00032	-0.00132
#2	844.71436	-0.00050	-0.01812	-0.00239	-0.00014	19.81978	-0.00350	-0.00337	-0.00139
Mean	**846.25895**	**-0.00051**	**-0.01612**	**-0.00233**	**0.00034**	**19.84372**	**-0.00237**	**-0.00185**	**-0.00136**
%RSD	0.25812	3.47932	17.59331	3.39260	197.71368	0.17057	67.54371	116.51974	3.63218

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.49771	-0.00219	26.30899	-0.01841	-0.00434	0.00006	-0.03506	-0.00061	-0.00002
#2	2.50111	-0.00048	26.31153	-0.01761	-0.00406	-0.00055	-0.02217	-0.00042	-0.00044
Mean	**2.49941**	**-0.00134**	**26.31026**	**-0.01801**	**-0.00420**	**-0.00024**	**-0.02861**	**-0.00052**	**-0.00023**
%RSD	0.09617	90.14605	0.00683	3.13444	4.76088	178.66250	31.84841	25.63233	126.37639

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00027	-0.00021	-0.00099
#2	0.00001	-0.00088	-0.00205
Mean	**-0.00013**	**-0.00055**	**-0.00152**
%RSD	148.06504	86.26183	49.26702

20000480

ted: 3/5/2010 16:43:36 User: ROY FRENCH
Method : Paragon File : 100305A Printed : 3/5/2010 16:43:16
SampleId1 : CRI SampleId2 : [FLEXQC]
Analysis commenced : 3/5/2010 14:13:47
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD3

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02112	0.48217	0.01107	0.42497	0.43208	0.01072	0.05320	5.51793	0.01063
#2	0.02094	0.48604	0.01325	0.42859	0.43350	0.01076	0.05330	5.50234	0.01044
Mean	**0.02103**	**0.48411**	**0.01216**	**0.42678**	**0.43279**	**0.01074**	**0.05325**	**5.51013**	**0.01054**
%RSD	0.62551	0.56479	12.66727	0.59970	0.23209	0.21687	0.13231	0.20001	1.27745

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10625	0.02089	0.05305	0.21834	3.87071	0.02050	5.47517	0.03118	0.02154
#2	0.10736	0.02121	0.05341	0.21902	3.86859	0.02011	5.49217	0.03129	0.02089
Mean	**0.10681**	**0.02105**	**0.05323**	**0.21868**	**3.86965**	**0.02031**	**5.48367**	**0.03123**	**0.02122**
%RSD	0.73697	1.06133	0.47242	0.22276	0.03884	1.38427	0.21914	0.25257	2.17143

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.54120	0.08798	0.21860	0.00412	0.00542	0.21870	0.12464	0.01031	0.00984
#2	4.50498	0.08829	0.21820	0.00510	0.00633	0.22579	0.12780	0.01353	0.01009
Mean	**4.52309**	**0.08813**	**0.21840**	**0.00461**	**0.00588**	**0.22224**	**0.12622**	**0.01192**	**0.00996**
%RSD	0.56621	0.25176	0.12997	15.00107	10.91737	2.25466	1.76668	19.06882	1.72917

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09924	0.11080	0.02287	0.09253	0.01975	0.01966	0.21017	0.10738	0.04059
#2	0.10168	0.10739	0.02172	0.09261	0.01963	0.02213	0.21215	0.10798	0.04004
Mean	**0.10046**	**0.10909**	**0.02229**	**0.09257**	**0.01969**	**0.02090**	**0.21116**	**0.10768**	**0.04031**
%RSD	1.72305	2.20838	3.65457	0.05636	0.42495	8.34452	0.66386	0.39496	0.96451

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.05344	0.00499	0.01000
#2	0.05405	0.00592	0.01123
Mean	**0.05374**	**0.00545**	**0.01062**
%RSD	0.79547	12.06626	8.21309

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:16
SampleId1 : ICSA SampleId2 : [FLEXQC]
Analysis commenced : 3/5/2010 14:15:40
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD4

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00104	278.34116	-0.00095	-0.00329	-0.00038	0.00051	0.00642	278.24319	-0.00037
#2	-0.00111	277.92115	-0.00572	-0.00389	-0.00040	0.00049	0.00917	276.42504	-0.00040
Mean	**-0.00107**	**278.13115**	**-0.00333**	**-0.00359**	**-0.00039**	**0.00050**	**0.00780**	**277.33412**	**-0.00039**
%RSD	4.19087	0.10678	101.23111	11.72577	5.12042	3.26070	24.94388	0.46357	4.17108

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00064	-0.00167	-0.00638	113.01380	-0.47077	0.00453	285.54579	-0.00143	-0.00131
#2	0.00051	-0.00168	-0.00651	112.51348	-0.49126	0.00440	284.05008	-0.00154	-0.00175
Mean	**0.00057**	**-0.00167**	**-0.00645**	**112.76364**	**-0.48102**	**0.00447**	**284.79793**	**-0.00148**	**-0.00153**
%RSD	16.26504	0.21959	1.44730	0.31374	3.01076	2.05494	0.37136	5.31256	20.43505

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.03814	-0.00026	0.00484	-0.00499	0.00294	0.00897	0.00573	-0.00366	0.00009
#2	-0.05736	0.00031	0.00353	-0.00715	0.00672	0.01180	0.00150	-0.00582	0.00345
Mean	**-0.04775**	**0.00002**	**0.00418**	**-0.00607**	**0.00483**	**0.01039**	**0.00361**	**-0.00474**	**0.00177**
%RSD	28.46809	1716.43497	22.02398	25.21932	55.43980	19.29043	82.66367	32.07885	134.62583

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01784	-0.00243	0.01173	-0.00231	-0.00120	-0.00170	0.02877	-0.00118	-0.00037
#2	-0.01953	0.00097	0.01143	-0.00551	-0.00141	-0.00416	0.01473	-0.00214	-0.00119
Mean	**-0.01869**	**-0.00073**	**0.01158**	**-0.00391**	**-0.00130**	**-0.00293**	**0.02175**	**-0.00166**	**-0.00078**
%RSD	6.37225	329.61333	1.83481	57.90548	11.46423	59.33663	45.63085	40.91131	74.71290

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00188	0.00030	-0.00116
#2	0.00202	0.00210	0.00037
Mean	**0.00195**	**0.00120**	**-0.00040**
%RSD	4.77094	106.35042	271.83278

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:16
SampleId1 : ICSAB SampleId2 : [FLEXQC]
Analysis commenced : 3/5/2010 14:17:34
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD5

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.21323	274.16861	0.11524	1.02107	0.52002	0.48769	0.54885	271.01178	1.04329
#2	0.21382	274.55239	0.11573	1.02211	0.52167	0.48880	0.55035	271.25851	1.04477
Mean	**0.21352**	**274.36050**	**0.11549**	**1.02159**	**0.52085**	**0.48825**	**0.54960**	**271.13514**	**1.04403**
%RSD	0.19364	0.09891	0.29933	0.07178	0.22390	0.15998	0.19288	0.06435	0.10084

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47760	0.47850	0.52848	110.41838	-0.48006	1.09003	279.42258	0.46882	1.01656
#2	0.47775	0.47980	0.53074	110.61484	-0.48792	1.09070	279.89968	0.46975	1.01638
Mean	**0.47768**	**0.47915**	**0.52961**	**110.51661**	**-0.48399**	**1.09036**	**279.66113**	**0.46929**	**1.01647**
%RSD	0.02320	0.19144	0.30079	0.12570	1.14819	0.04302	0.12063	0.14098	0.01280

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.10863	0.96795	1.03669	0.05409	0.05408	1.04680	0.61752	0.05809	0.05215
#2	-0.11618	0.96928	1.04495	0.05572	0.05346	1.05531	0.62258	0.06118	0.05368
Mean	**-0.11240**	**0.96861**	**1.04082**	**0.05491**	**0.05377**	**1.05105**	**0.62005**	**0.05963**	**0.05291**
%RSD	4.74955	0.09682	0.56111	2.09455	0.80684	0.57266	0.57753	3.66314	2.03893

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.95347	1.02618	1.02629	-0.03041	0.94804	0.10496	10.34975	0.49062	0.88385
#2	0.95886	1.02875	1.02629	-0.03343	0.95040	0.11342	10.39383	0.49145	0.88858
Mean	**0.95616**	**1.02746**	**1.02629**	**-0.03192**	**0.94922**	**0.10919**	**10.37179**	**0.49103**	**0.88621**
%RSD	0.39862	0.17663	0.00000	6.68726	0.17579	5.47632	0.30053	0.11945	0.37672

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.51116	0.05408	0.05413
#2	0.51263	0.05422	0.05617
Mean	**0.51190**	**0.05415**	**0.05515**
%RSD	0.20312	0.17281	2.62374

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:17
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 14:19:27
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19908	49.76694	0.50558	0.96372	0.97139	0.48962	0.50436	48.34639	0.49266
#2	0.19811	49.37992	0.50285	0.96149	0.97039	0.48866	0.49233	48.18501	0.48912
Mean	**0.19859**	**49.57343**	**0.50421**	**0.96260**	**0.97089**	**0.48914**	**0.49835**	**48.26570**	**0.49089**
%RSD	0.34660	0.55205	0.38165	0.16403	0.07281	0.13840	1.70650	0.23643	0.51092

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49039	0.97411	0.97818	19.89146	49.05812	0.50507	49.59406	0.95484	0.97318
#2	0.48843	0.97131	0.97468	19.83730	48.79415	0.50214	49.41299	0.95213	0.97287
Mean	**0.48941**	**0.97271**	**0.97643**	**19.86438**	**48.92614**	**0.50361**	**49.50353**	**0.95349**	**0.97303**
%RSD	0.28369	0.20409	0.25338	0.19281	0.38149	0.41193	0.25865	0.20123	0.02291

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	48.21788	0.99939	4.87142	0.94654	0.93799	4.79918	0.48424	0.97396	0.96975
#2	47.87939	0.99678	4.87019	0.94179	0.92680	4.81628	0.47939	0.98163	0.95896
Mean	**48.04864**	**0.99809**	**4.87081**	**0.94416**	**0.93240**	**4.80773**	**0.48181**	**0.97780**	**0.96435**
%RSD	0.49814	0.18528	0.01784	0.35510	0.84847	0.25152	0.71237	0.55492	0.79117

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.64912	0.98870	0.48616	0.13258	0.45879	0.50312	4.80234	0.47743	0.98035
#2	4.62298	0.98479	0.48568	0.13283	0.45693	0.50710	4.79593	0.47561	0.97931
Mean	**4.63605**	**0.98675**	**0.48592**	**0.13270**	**0.45786**	**0.50511**	**4.79913**	**0.47652**	**0.97983**
%RSD	0.39873	0.28033	0.06891	0.13531	0.28752	0.55637	0.09450	0.26999	0.07524

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.96364	0.94084	0.97115
#2	0.96145	0.93180	0.96651
Mean	**0.96254**	**0.93632**	**0.96883**
%RSD	0.16121	0.68280	0.33878

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:17
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 14:21:20
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00021	0.08330	-0.00448	0.00103	0.00002	0.00027	-0.00351	0.00262	0.00006
#2	0.00041	0.08593	0.00044	0.00044	-0.00004	0.00028	-0.00134	0.00398	-0.00007
Mean	**0.00010**	**0.08462**	**-0.00202**	**0.00074**	**-0.00001**	**0.00027**	**-0.00243**	**0.00330**	**-0.00001**
%RSD	448.21869	2.19169	172.46781	57.19305	456.89869	1.84449	63.07943	29.26082	1355.80393

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00003	-0.00014	-0.00157	0.00857	-0.35505	0.00232	0.00632	0.00017	-0.00105
#2	0.00014	0.00035	-0.00157	0.00931	-0.36052	0.00233	0.01154	0.00017	-0.00037
Mean	**0.00008**	**0.00010**	**-0.00157**	**0.00894**	**-0.35779**	**0.00233**	**0.00893**	**0.00017**	**-0.00071**
%RSD	90.00019	341.57317	0.10390	5.86221	1.08227	0.51509	41.30649	0.00000	67.28385

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.13143	0.00039	-0.00298	-0.00169	-0.00022	-0.01228	0.00042	-0.00094	-0.00177
#2	-0.13232	0.00041	-0.00509	0.00051	-0.00015	-0.00378	0.00024	0.00511	-0.00348
Mean	**-0.13187**	**0.00040**	**-0.00404**	**-0.00059**	**-0.00018**	**-0.00803**	**0.00033**	**0.00208**	**-0.00263**
%RSD	0.47939	2.21985	36.88166	263.33270	26.68685	74.84186	37.76227	205.28732	45.90802

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01378	-0.00292	-0.00206	0.00006	-0.00067	-0.00145	-0.00285	-0.00029	-0.00044

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#2	-0.01146	-0.00122	-0.00205	-0.00091	-0.00068	0.00006	0.00013	-0.00012	-0.00044
Mean	**-0.01262**	**-0.00207**	**-0.00206**	**-0.00043**	**-0.00068**	**-0.00069**	**-0.00136**	**-0.00021**	**-0.00044**
%RSD	12.97353	58.18725	0.24592	159.78262	1.07638	153.74645	154.43107	58.27864	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00026	-0.00071	-0.00150
#2	0.00039	0.00007	-0.00062
Mean	**0.00032**	**-0.00032**	**-0.00106**
%RSD	29.52860	172.60711	58.74883

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:17
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 14:59:30
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20175	50.85459	0.51287	0.97628	0.98478	0.50635	0.50512	49.52329	0.49364
#2	0.20174	50.88922	0.51291	0.97851	0.98976	0.50724	0.50386	49.58950	0.49401
Mean	**0.20175**	**50.87190**	**0.51289**	**0.97740**	**0.98727**	**0.50680**	**0.50449**	**49.55640**	**0.49383**
%RSD	0.00370	0.04813	0.00521	0.16156	0.35601	0.12325	0.17709	0.09447	0.05343

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50366	1.00290	0.98403	20.48849	49.51566	0.51516	51.07921	0.98662	0.99349
#2	0.50455	1.00474	0.98845	20.52242	49.52570	0.51567	51.19018	0.98870	0.99935
Mean	**0.50410**	**1.00382**	**0.98624**	**20.50546**	**49.52068**	**0.51542**	**51.13469**	**0.98766**	**0.99642**
%RSD	0.12364	0.12957	0.31735	0.11701	0.01433	0.07051	0.15345	0.14847	0.41580

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.27653	1.00850	4.96749	0.97933	0.96516	4.95453	0.48411	1.01435	1.00402
#2	49.26162	1.00646	4.97026	0.98020	0.95871	5.02009	0.48848	1.01921	0.99464
Mean	**49.26907**	**1.00748**	**4.96887**	**0.97977**	**0.96194**	**4.98731**	**0.48630**	**1.01678**	**0.99933**
%RSD	0.02140	0.14366	0.03936	0.06259	0.47394	0.92965	0.63533	0.33779	0.66338

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.81399	1.01242	0.49233	0.14034	0.47363	0.50744	4.91160	0.48921	1.03799
#2	4.82375	1.01486	0.49435	0.14215	0.47479	0.50911	4.92100	0.49021	1.04230
Mean	**4.81887**	**1.01364**	**0.49334**	**0.14124**	**0.47421**	**0.50828**	**4.91630**	**0.48971**	**1.04015**
%RSD	0.14319	0.17058	0.29038	0.90548	0.17178	0.23286	0.13527	0.14517	0.29318

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.98014	0.96988	1.00746
#2	0.98116	0.96587	1.00282

Mean	**0.98065**	**0.96787**	**1.00514CH**
%RSD	0.07369	0.29308	0.32613

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:18
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 15:01:22
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00014	0.07077	0.00217	-0.00095	0.00033	0.00043	0.00004	0.02070	-0.00013
#2	-0.00024	0.05418	0.00037	-0.00202	-0.00007	0.00027	-0.00548	0.00409	-0.00022
Mean	**-0.00019**	**0.06247**	**0.00127**	**-0.00149**	**0.00013**	**0.00035**	**-0.00272**	**0.01240**	**-0.00017**
%RSD	39.44827	18.77255	100.44616	50.97310	211.05509	31.52742	143.30428	94.71484	36.63665

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00024	0.00056	0.00029	0.01698	-0.35791	0.00233	0.02872	0.00065	0.00049
#2	0.00019	0.00004	-0.00064	0.01095	-0.37195	0.00223	0.00937	0.00032	0.00059
Mean	**0.00021**	**0.00030**	**-0.00017**	**0.01397**	**-0.36493**	**0.00228**	**0.01904**	**0.00049**	**0.00054**
%RSD	17.57889	123.96272	377.62832	30.54998	2.72196	3.23730	71.85361	48.69100	13.67988

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.13734	0.00022	0.00163	-0.00027	0.00082	0.00330	-0.00231	0.00371	-0.00139
#2	-0.15085	-0.00023	0.00042	-0.00103	0.00044	-0.00520	-0.00111	-0.00207	0.00042
Mean	**-0.14409**	**-0.00001**	**0.00103**	**-0.00065**	**0.00063**	**-0.00095**	**-0.00171**	**0.00082**	**-0.00049**
%RSD	6.62963	3939.45346	82.87658	83.52580	42.91763	634.38543	49.43391	498.18753	263.55901

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00402	-0.00073	-0.00187	-0.00245	-0.00051	-0.00020	-0.00732	0.00029	-0.00016
#2	-0.00476	-0.00158	-0.00208	0.00082	-0.00049	-0.00197	-0.00929	-0.00006	0.00018
Mean	**-0.00439**	**-0.00116**	**-0.00198**	**-0.00081**	**-0.00050**	**-0.00108**	**-0.00830**	**0.00011**	**0.00001**
%RSD	12.01437	52.02197	7.41553	284.92207	2.18951	115.33088	16.84740	220.14744	2474.87799

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00079	0.00046	0.00031
#2	0.00033	-0.00005	-0.00041
Mean	**0.00056**	**0.00020**	**-0.00005**
%RSD	58.08821	176.44057	1013.00258

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Method : Paragon File : 100305A Printed : 3/5/2010 16:43:18
SampleId1 : 1002176-1 25X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:03:15
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE1

Final concentrations:**36** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00146	0.02738	0.00161	0.06988	0.00036	0.00000	-0.00182	33.50285	-0.00075
#2	0.00012	0.03447	0.00089	0.07202	0.00056	0.00002	-0.00023	33.77572	-0.00037
Mean	**-0.00067**	**0.03093**	**0.00125**	**0.07095**	**0.00046**	**0.00001**	**-0.00103**	**33.63929**	**-0.00056**
%RSD	166.49304	16.21258	40.35724	2.13706	30.57204	158.56507	109.18737	0.57357	48.42950

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00073	-0.00103	-0.00155	-0.00440	23.67786	0.03283	26.70839	0.03103	0.00880
#2	0.00024	-0.00023	-0.00015	-0.00323	23.72109	0.03291	26.94070	0.03118	0.00979
Mean	**-0.00025**	**-0.00063**	**-0.00085**	**-0.00382**	**23.69947**	**0.03287**	**26.82455**	**0.03110**	**0.00930**
%RSD	281.18287	89.07127	117.10615	21.56812	0.12900	0.16359	0.61238	0.33818	7.53376

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	457.53482	-0.00035	-0.00429	-0.00406	0.00003	97.75136	-0.00383	0.00094	0.00285
#2	456.90744	0.00059	-0.00108	0.00182	-0.00270	98.11382	0.00063	0.00963	-0.00136
Mean	**457.22113**	**0.00012**	**-0.00268**	**-0.00112**	**-0.00134**	**97.93259**	**-0.00160**	**0.00528**	**0.00075**
%RSD	0.09703	538.19485	84.55171	371.61665	144.85603	0.26171	197.55454	116.37452	399.08707

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.35320	0.00036	0.88264	-0.01796	-0.00134	-0.00026	0.06755	-0.00095	-0.00030
#2	0.35787	-0.00097	0.88519	-0.01561	-0.00091	-0.00260	0.09432	0.00021	0.00004
Mean	**0.35553**	**-0.00031**	**0.88392**	**-0.01679**	**-0.00112**	**-0.00143**	**0.08093**	**-0.00037**	**-0.00013**
%RSD	0.92833	310.13840	0.20407	9.90718	27.19821	115.29969	23.38629	224.16867	190.37473

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00040	-0.00133	0.00221
#2	0.00096	-0.00120	0.00230
Mean	**0.00068**	**-0.00126**	**0.00226**
%RSD	58.51137	7.41295	2.73675

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:18
SampleId1 : 1002176-2 25X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:05:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00272	-0.00482	-0.00455	0.03962	-0.00018	-0.00011	-0.00821	21.71529	-0.00130
#2	0.00055	0.01660	-0.00200	0.04188	0.00025	-0.00011	-0.00159	21.67958	-0.00079
Mean	**-0.00109**	**0.00589**	**-0.00327**	**0.04075**	**0.00003**	**-0.00011**	**-0.00490**	**21.69744**	**-0.00105**
%RSD	212.49647	257.17970	55.13435	3.92666	890.94934	2.33791	95.42706	0.11639	34.39760

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ted: 3/5/2010 16:43:36 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00171	-0.00234	-0.00300	0.12774	27.11393	0.03627	42.14167	0.19299	0.02681
#2	0.00022	-0.00045	-0.00056	0.12991	27.04857	0.03617	42.04806	0.19265	0.02944
Mean	**-0.00075**	**-0.00139**	**-0.00178**	**0.12883**	**27.08125**	**0.03622**	**42.09486**	**0.19282**	**0.02813**
%RSD	182.23399	95.91196	97.18661	1.19189	0.17067	0.19240	0.15725	0.12303	6.61858

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	397.51639	-0.00048	-0.00318	-0.01188	0.00540	179.02900	-0.00729	-0.01602	0.00666
#2	394.62612	0.00128	-0.00278	0.00182	-0.00206	178.76270	0.00146	0.00471	-0.00235
Mean	**396.07125**	**0.00040**	**-0.00298**	**-0.00503**	**0.00167**	**178.89585**	**-0.00291**	**-0.00566**	**0.00216**
%RSD	0.51600	312.99709	9.50357	192.65450	315.45759	0.10526	212.09977	259.09302	295.41749

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.32229	-0.00438	0.81699	-0.01525	-0.00094	-0.00435	0.08878	-0.00196	-0.00112
#2	0.33180	-0.00037	0.81642	-0.01592	-0.00096	-0.00052	0.16214	-0.00047	-0.00057
Mean	**0.32704**	**-0.00237**	**0.81670**	**-0.01559**	**-0.00095**	**-0.00244**	**0.12546**	**-0.00121**	**-0.00085**
%RSD	2.05681	119.59970	0.04981	3.02203	1.14737	111.05529	41.34956	86.37463	45.77779

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00021	-0.00035	-0.00089
#2	0.00105	-0.00077	0.00000
Mean	**0.00042**	**-0.00056**	**-0.00044**
%RSD	212.26796	52.30946	141.49226

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:18
SampleId1 : 1002176-3 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:06:50
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE3

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00036	0.01332	-0.00155	0.07254	0.00223	-0.00014	0.00098	54.02897	-0.00065
#2	-0.00025	0.01612	0.00149	0.07150	0.00214	-0.00014	0.00216	53.94388	-0.00078
Mean	**-0.00030**	**0.01472**	**-0.00003**	**0.07202**	**0.00218**	**-0.00014**	**0.00157**	**53.98642**	**-0.00071**
%RSD	26.30746	13.42849	8077.35098	1.01364	2.74819	2.00730	52.96097	0.11145	13.06011

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00040	-0.00067	-0.00120	-0.00323	24.68057	0.06938	95.18054	0.44599	0.04876
#2	-0.00010	-0.00096	-0.00141	-0.00371	24.71347	0.06945	95.07617	0.44577	0.04863
Mean	**0.00015**	**-0.00082**	**-0.00130**	**-0.00347**	**24.69702**	**0.06942**	**95.12835**	**0.44588**	**0.04869**
%RSD	231.75222	25.07910	11.52128	9.69725	0.09419	0.06867	0.07758	0.03560	0.18929

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	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	502.30659	0.00194	-0.00078	0.00080	-0.00167	357.27562	-0.00159	0.01019	0.00201
#2	499.50732	0.00160	-0.00128	-0.00072	-0.00142	356.68172	-0.00075	0.00553	0.00034
Mean	**500.90696**	**0.00177**	**-0.00103**	**0.00004**	**-0.00155**	**356.97867**	**-0.00117**	**0.00786**	**0.00118**
%RSD	0.39516	13.55448	34.45418	2605.22994	11.15553	0.11764	50.39300	41.94340	100.22014

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.63466	0.00389	1.89257	-0.02588	-0.00113	-0.00071	0.25196	-0.00005	0.00272
#2	0.63323	0.00267	1.89892	-0.02704	-0.00121	0.00013	0.24948	-0.00029	0.00238
Mean	**0.63394**	**0.00328**	**1.89575**	**-0.02646**	**-0.00117**	**-0.00029**	**0.25072**	**-0.00017**	**0.00255**
%RSD	0.15941	26.19555	0.23696	3.09125	4.97556	207.25836	0.69897	101.53027	9.51889

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00140	-0.00085	0.00474
#2	0.00116	-0.00119	0.00207
Mean	**0.00128**	**-0.00102**	**0.00340**
%RSD	13.33676	23.74349	55.40615

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:19
SampleId1 : 1002176-4 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:08:37
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE4

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00061	0.01453	-0.00170	0.06980	0.00200	-0.00013	-0.00453	53.13873	-0.00030
#2	-0.00032	0.01215	-0.00204	0.07099	0.00208	-0.00013	0.00148	53.01866	-0.00046
Mean	**-0.00047**	**0.01334**	**-0.00187**	**0.07039**	**0.00204**	**-0.00013**	**-0.00152**	**53.07870**	**-0.00038**
%RSD	43.61521	12.61467	12.80215	1.19663	2.93853	3.38504	278.76870	0.15996	28.66054

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00011	-0.00080	-0.00141	-0.00456	24.32271	0.06853	93.73526	0.44008	0.04800
#2	0.00056	-0.00037	-0.00077	-0.00456	24.17252	0.06818	93.48640	0.43851	0.04756
Mean	**0.00034**	**-0.00058**	**-0.00109**	**-0.00456**	**24.24762**	**0.06836**	**93.61083**	**0.43930**	**0.04778**
%RSD	94.03453	51.73617	41.38844	0.00000	0.43798	0.36034	0.18798	0.25291	0.65587

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	491.31009	0.00180	-0.00389	-0.00095	-0.00083	352.24347	0.00073	0.00537	0.00365
#2	488.56557	0.00167	-0.00288	0.00100	-0.00299	351.33153	-0.00011	0.00467	0.00431
Mean	**489.93783**	**0.00174**	**-0.00338**	**0.00003**	**-0.00191**	**351.78750**	**0.00031**	**0.00502**	**0.00398**
%RSD	0.39611	5.11089	20.94400	5538.04123	80.12881	0.18330	194.49336	9.73604	11.74645

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

20000489

	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.62682	0.00121	1.87348	-0.02310	-0.00108	-0.00351	0.24948	-0.00016	0.00293
#2	0.62442	0.00121	1.86695	-0.02014	-0.00085	0.00083	0.25543	0.00018	0.00300
Mean	**0.62562**	**0.00121**	**1.87021**	**-0.02162**	**-0.00096**	**-0.00134**	**0.25245**	**0.00001**	**0.00296**
%RSD	0.27107	0.01602	0.24694	9.67784	17.35828	229.73646	1.66620	2949.37465	1.63902

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00110	-0.00087	0.00422
#2	0.00115	-0.00166	0.00443
Mean	**0.00112**	**-0.00127**	**0.00433**
%RSD	2.92038	44.22550	3.44431

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:19
SampleId1 : 1002176-5 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:10:23
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE5

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00072	0.00982	-0.00282	0.04871	0.00076	-0.00011	-0.00373	44.01096	-0.00034
#2	-0.00116	0.01300	-0.00076	0.04879	0.00067	-0.00011	-0.00314	44.34718	-0.00071
Mean	**-0.00094**	**0.01141**	**-0.00179**	**0.04875**	**0.00071**	**-0.00011**	**-0.00344**	**44.17907**	**-0.00053**
%RSD	32.90989	19.72084	81.51537	0.11517	8.42115	0.36684	12.09840	0.53814	49.14533

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00039	-0.00091	0.00059	-0.00747	13.20775	0.06677	71.95551	0.27538	0.05715
#2	-0.00076	-0.00141	-0.00013	-0.00800	13.33857	0.06737	72.54864	0.27806	0.05718
Mean	**-0.00058**	**-0.00116**	**0.00023**	**-0.00773**	**13.27316**	**0.06707**	**72.25207**	**0.27672**	**0.05717**
%RSD	45.44710	30.09691	218.62634	4.83891	0.69693	0.63384	0.58048	0.68665	0.03225

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	223.86722	0.00140	-0.00298	-0.00222	-0.00028	255.86167	-0.00092	0.00714	0.00135
#2	224.48916	0.00142	0.00253	-0.00560	0.00085	258.96831	-0.00210	0.00339	0.00480
Mean	**224.17819**	**0.00141**	**-0.00023**	**-0.00391**	**0.00028**	**257.41499**	**-0.00151**	**0.00526**	**0.00307**
%RSD	0.19617	1.25872	1719.79719	61.16747	282.84080	0.85338	55.38384	50.37154	79.23506

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.05576	0.00292	1.13669	-0.02248	-0.00111	-0.00203	0.25246	-0.00033	-0.00030
#2	1.06675	-0.00085	1.15446	-0.02448	-0.00114	-0.00394	0.25246	-0.00046	-0.00030
Mean	**1.06125**	**0.00103**	**1.14557**	**-0.02348**	**-0.00113**	**-0.00298**	**0.25246**	**-0.00040**	**-0.00030**
%RSD	0.73222	258.15146	1.09706	6.00489	2.26134	45.31001	0.00010	23.47542	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc

#1	0.00071	-0.00093	0.00328	**CH**
#2	0.00042	-0.00130	0.00433	
Mean	**0.00057**	**-0.00111**	**0.00380**	
%RSD	35.64432	23.41718	19.51627	

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:19
SampleId1 : 1002176-6 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:12:09
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00036	0.01696	0.00029	0.04927	0.00059	-0.00010	-0.00294	44.64304	-0.00047
#2	-0.00097	0.01331	-0.00297	0.04867	0.00067	-0.00011	0.00030	44.81168	-0.00072
Mean	**-0.00066**	**0.01514**	**-0.00134**	**0.04897**	**0.00063**	**-0.00011**	**-0.00132**	**44.72736**	**-0.00059**
%RSD	64.61294	17.05764	172.27506	0.85995	9.55963	1.23363	173.19717	0.26662	30.36633

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00002	-0.00066	0.00058	-0.00847	13.23052	0.06682	72.93297	0.27900	0.05713
#2	-0.00050	-0.00088	0.00017	-0.00853	13.30836	0.06728	73.25752	0.28045	0.05846
Mean	**-0.00026**	**-0.00077**	**0.00038**	**-0.00850**	**13.26944**	**0.06705**	**73.09524**	**0.27972**	**0.05779**
%RSD	129.92330	20.04278	78.09600	0.44021	0.41481	0.48294	0.31397	0.36795	1.62689

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	225.20203	0.00167	0.00534	0.00123	-0.00165	258.14627	0.00009	0.01083	0.00052
#2	226.03616	0.00115	0.00293	-0.00329	0.00024	260.19417	0.00022	0.00290	0.00156
Mean	**225.61909**	**0.00141**	**0.00413**	**-0.00103**	**-0.00071**	**259.17022**	**0.00015**	**0.00687**	**0.00104**
%RSD	0.26142	26.43313	41.15260	309.62987	189.28794	0.55874	60.54533	81.76002	71.09247

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.06544	0.00438	1.14355	-0.02337	-0.00106	0.00302	0.25791	-0.00035	-0.00071
#2	1.06977	0.00134	1.15295	-0.02101	-0.00092	-0.00134	0.24106	-0.00069	-0.00030
Mean	**1.06761**	**0.00286**	**1.14825**	**-0.02219**	**-0.00099**	**0.00084**	**0.24948**	**-0.00052**	**-0.00051**
%RSD	0.28685	75.26139	0.57880	7.52143	10.29131	366.17546	4.77713	46.10169	57.66679

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00105	-0.00069	0.00395
#2	0.00044	-0.00094	0.00201
Mean	**0.00075**	**-0.00082**	**0.00298**
%RSD	57.36286	21.24207	46.21783

20000491

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:20
SampleId1 : 1002176-7 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:13:56

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE7

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00091	0.00684	0.00243	0.04800	0.00067	-0.00016	0.00010	43.56834	-0.00086
#2	-0.00043	0.01147	-0.00297	0.04859	0.00064	-0.00014	-0.00304	43.86909	-0.00042
Mean	**-0.00067**	**0.00915**	**-0.00027**	**0.04830**	**0.00066**	**-0.00015**	**-0.00147**	**43.71872**	**-0.00064**
%RSD	50.53377	35.79304	1412.59881	0.87196	3.04914	5.33119	151.46921	0.48644	49.19659

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00006	-0.00088	0.00008	-0.00826	13.05528	0.06602	71.22174	0.27553	0.05509
#2	-0.00068	-0.00132	-0.00006	-0.00805	13.20356	0.06675	71.75716	0.27773	0.05723
Mean	**-0.00031**	**-0.00110**	**0.00001**	**-0.00816**	**13.12942**	**0.06638**	**71.48945**	**0.27663**	**0.05616**
%RSD	168.15239	28.35100	753.61734	1.83510	0.79861	0.77814	0.52958	0.56286	2.69165

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	221.51274	0.00127	-0.00088	0.00000	-0.00100	253.76817	0.00144	0.00098	0.00191
#2	223.21701	0.00041	0.00032	-0.00229	-0.00101	256.46402	-0.00246	0.00858	0.00222
Mean	**222.36487**	**0.00084**	**-0.00028**	**-0.00114**	**-0.00101**	**255.11610**	**-0.00051**	**0.00478**	**0.00206**
%RSD	0.54195	72.98085	307.26808	141.82892	0.55371	0.74721	541.23828	112.33864	10.72732

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.05075	0.00328	1.12926	-0.02668	-0.00130	-0.00221	0.25940	-0.00027	-0.00051
#2	1.06217	0.00170	1.14314	-0.02428	-0.00116	-0.00353	0.25494	0.00004	-0.00085
Mean	**1.05646**	**0.00249**	**1.13620**	**-0.02548**	**-0.00123**	**-0.00287**	**0.25717**	**-0.00011**	**-0.00068**
%RSD	0.76395	44.86311	0.86332	6.64875	7.99206	32.66568	1.22680	196.90705	35.86759

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00102	-0.00067	0.00160
#2	0.00079	-0.00144	0.00434
Mean	**0.00091**	**-0.00105**	**0.00297**
%RSD	17.78221	51.62661	65.22141

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:20
SampleId1 : 1002176-8 10X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:15:43
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE8

20000492

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00034	0.01776	0.00018	0.04883	0.00067	-0.00008	0.00402	42.07526	-0.00037
#2	0.00052	0.01414	0.00134	0.04713	0.00073	-0.00009	0.00354	42.28952	-0.00021

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00117	0.00880	-0.00143	0.04669	0.00056	-0.00016	-0.00356	41.50761	-0.00053
#2	-0.00045	0.01110	0.00307	0.04709	0.00067	-0.00017	-0.00130	41.62096	-0.00059
Mean	**-0.00081**	**0.00995**	**0.00082**	**0.04689**	**0.00061**	**-0.00016**	**-0.00243**	**41.56429**	**-0.00056**
%RSD	63.33535	16.32438	389.38892	0.59878	13.03999	2.68665	65.90730	0.19284	7.43642

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00058	-0.00102	-0.00128	-0.00937	14.00503	0.05650	61.83042	0.53375	0.08320
#2	-0.00036	-0.00070	-0.00100	-0.00858	14.02058	0.05661	61.99829	0.53603	0.08511
Mean	**-0.00047**	**-0.00086**	**-0.00114**	**-0.00898**	**14.01280**	**0.05656**	**61.91436**	**0.53489**	**0.08415**
%RSD	34.41927	2.29169	25.42868	1.38985	0.17396	0.09270	0.36852	0.39994	1.01695

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	237.02831	0.00201	0.00654	0.00257	-0.00270	264.70398	0.00264	0.00773	0.00080
#2	236.50249	0.00160	0.00373	0.00371	-0.00343	266.53829	0.00069	0.00694	0.00233
Mean	**236.76540**	**0.00180**	**0.00514**	**0.00314**	**-0.00307**	**265.62114**	**0.00166**	**0.00733**	**0.00156**
%RSD	0.15704	16.22110	38.64127	25.68359	16.74070	0.48831	83.08179	7.60334	69.32771

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.03221	0.00121	1.05680	-0.02138	-0.00101	-0.00033	0.18801	0.00076	-0.00071
#2	1.03751	0.00243	1.06487	-0.00267	0.00002	-0.00260	0.20635	0.00066	0.00073
Mean	**1.03486**	**0.00182**	**1.06083**	**-0.01202**	**-0.00050**	**-0.00146**	**0.19718**	**0.00071**	**0.00001**
%RSD	0.36215	47.14118	0.53771	110.03706	146.72452	109.64147	6.57740	9.32673	10391.33173

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00124	-0.00095	0.00310
#2	-0.00008	-0.00105	0.00386
Mean	**0.00058**	**-0.00100**	**0.00348**
%RSD	161.45581	7.40943	15.39879

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:20
SampleId1 : 1002176-9 10X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:17:30
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE9

Final concentrations

20000493

%RSD	31.82575	26.94753	17.61161	6.25277	0.07847	0.14062	0.19172	0.30209	1.59957

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	238.34006	0.00024	-0.00298	-0.00373	-0.00022	265.62809	-0.00105	0.00327	0.00288
#2	238.10143	0.00102	0.00032	0.00062	-0.00007	266.80366	-0.00003	0.00520	0.00233
Mean	**238.22074**	**0.00063**	**-0.00133**	**-0.00156**	**-0.00014**	**266.21587**	**-0.00054**	**0.00424**	**0.00261**
%RSD	0.07083	87.06528	175.95678	197.39679	76.73832	0.31225	133.48513	32.21922	15.10807

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.02540	0.00049	1.06674	-0.02165	-0.00113	-0.00383	0.17413	-0.00003	-0.00092
#2	1.03052	0.00073	1.07111	-0.01869	-0.00114	-0.00376	0.17711	0.00036	-0.00112
Mean	**1.02796**	**0.00061**	**1.06893**	**-0.02017**	**-0.00113**	**-0.00379**	**0.17562**	**0.00017**	**-0.00102**
%RSD	0.35234	28.33570	0.28906	10.40111	0.64170	1.40911	1.19735	167.17478	14.27803

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00046	-0.00139	0.00301
#2	0.00064	0.00016	0.00328
Mean	**0.00055**	**-0.00061**	**0.00315**
%RSD	22.60323	178.65626	6.09552

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:21
SampleId1 : 1002176-10 10X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:19:17
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE10

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00130	0.00877	-0.00098	0.04212	0.00050	-0.00016	-0.00377	42.47114	-0.00083
#2	0.00015	0.01254	-0.00170	0.04129	0.00061	-0.00016	0.00155	42.41452	-0.00042
Mean	**-0.00058**	**0.01065**	**-0.00134**	**0.04171**	**0.00056**	**-0.00016**	**-0.00111**	**42.44283**	**-0.00062**
%RSD	177.04503	25.02858	37.62282	1.41362	14.36448	2.62663	339.91068	0.09433	46.84607

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00068	-0.00124	-0.00169	-0.00900	12.35451	0.05203	59.54641	0.40695	0.09126
#2	-0.00010	-0.00094	-0.00070	-0.00874	12.30401	0.05192	59.50309	0.40672	0.09118
Mean	**-0.00039**	**-0.00109**	**-0.00119**	**-0.00887**	**12.32926**	**0.05198**	**59.52475**	**0.40683**	**0.09122**
%RSD	105.11394	19.35218	58.71946	2.10912	0.28964	0.14922	0.05146	0.03899	0.06065

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	221.77877	0.00128	0.00253	-0.00428	0.00130	242.50177	-0.00205	0.00464	0.00622
#2	221.01460	0.00172	-0.00178	-0.00089	-0.00009	241.53290	-0.00111	0.00663	0.00302
Mean	**221.39669**	**0.00150**	**0.00037**	**-0.00259**	**0.00060**	**242.01733**	**-0.00158**	**0.00564**	**0.00462**
%RSD	0.24406	20.64921	813.29490	92.58296	162.25382	0.28308	42.41192	24.94771	48.95783

ted: 3/5/2010 16:43:36 User: ROY FRENCH

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.11366	0.00146	1.04590	-0.02450	-0.00127	-0.00618	0.15133	0.00051	-0.00119
#2	1.11678	-0.00146	1.04187	-0.02343	-0.00104	-0.00357	0.16174	0.00200	-0.00126
Mean	**1.11522**	**0.00000**	**1.04389**	**-0.02397**	**-0.00115**	**-0.00488**	**0.15653**	**0.00126**	**-0.00123**
%RSD	0.19807197404	.19410	0.27305	3.17158	14.21253	37.94689	4.70243	83.51925	3.95977

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00034	-0.00056	0.00570
#2	0.00076	-0.00036	0.00423
Mean	**0.00055**	**-0.00046**	**0.00496**
%RSD	54.55068	31.39537	20.98835

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:21
SampleId1 : CCV SampleId2 : [CV]
Analysis commenced : 3/5/2010 15:21:05
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20123	50.26153	0.50799	0.96061	0.97010	0.50940	0.49631	49.72326	0.48946
#2	0.20184	50.36020	0.51869	0.96332	0.97130	0.51102	0.49652	49.94088	0.49090
Mean	**0.20154**	**50.31087**	**0.51334**	**0.96197**	**0.97070**	**0.51021**	**0.49641**	**49.83207**	**0.49018**
%RSD	0.21287	0.13867	1.47358	0.19931	0.08739	0.22417	0.02933	0.30879	0.20755

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.50372	1.00643	0.97134	20.50000	48.81915	0.50620	51.38754	0.98809	0.99305
#2	0.50691	1.01040	0.97349	20.56977	48.90015	0.50686	51.60840	0.99134	0.98727
Mean	**0.50532**	**1.00842**	**0.97242**	**20.53488**	**48.85965**	**0.50653**	**51.49797**	**0.98972**	**0.99016**
%RSD	0.44613	0.27813	0.15574	0.24026	0.11722	0.09268	0.30326	0.23169	0.41278

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	48.51951	0.99416	4.95899	0.98022	0.97108	4.98874	0.48010	1.00532	0.99555
#2	48.59635	0.99785	4.96052	0.98967	0.97077	5.00727	0.48350	1.00924	0.99936
Mean	**48.55793**	**0.99601**	**4.95976**	**0.98495**	**0.97093**	**4.99800**	**0.48180**	**1.00728**	**0.99746**
%RSD	0.11190	0.26190	0.02191	0.67840	0.02279	0.26217	0.49966	0.27561	0.26972

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.78744	1.01389	0.48559	0.13835	0.47434	0.50265	4.85303	0.48782	1.05107
#2	4.80766	1.02012	0.48632	0.14067	0.47544	0.51400	4.85745	0.49068	1.05497
Mean	**4.79755**	**1.01700**	**0.48596**	**0.13951**	**0.47489**	**0.50832**	**4.85524**	**0.48925**	**1.05302**
%RSD	0.29807	0.43371	0.10601	1.17245	0.16387	1.57917	0.06435	0.41323	0.26161

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	0.97376	0.97413	0.99880
#2	0.97666	0.97707	1.00265
Mean	**0.97521**	**0.97560**	**1.00073**
%RSD	0.21073	0.21294	0.27169

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:21
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 15:22:58
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00125	0.04714	0.00378	-0.00174	-0.00001	0.00028	-0.00430	0.00739	-0.00019
#2	-0.00201	0.04409	0.00153	-0.00254	-0.00021	0.00024	-0.00942	0.00080	-0.00037
Mean	**-0.00163**	**0.04561**	**0.00266**	**-0.00214**	**-0.00011**	**0.00026**	**-0.00686**	**0.00409**	**-0.00028**
%RSD	32.63688	4.72986	59.93320	26.21100	129.93083	10.20877	52.77947	113.92654	44.54701

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00023	-0.00016	-0.00127	0.01037	-0.32005	0.00243	0.00654	0.00028	-0.00069
#2	-0.00089	-0.00050	-0.00147	0.00830	-0.35005	0.00232	0.00198	0.00010	-0.00123
Mean	**-0.00056**	**-0.00033**	**-0.00137**	**0.00933**	**-0.33505**	**0.00238**	**0.00426**	**0.00019**	**-0.00096**
%RSD	82.69981	73.57080	10.32797	15.63605	6.33105	3.19244	75.82123	69.73256	40.32460

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.12313	-0.00038	0.00093	-0.00265	0.00066	0.02031	-0.00279	-0.00385	0.00091
#2	-0.13426	-0.00022	0.00012	-0.00371	0.00109	0.01889	-0.00433	0.00187	0.00056
Mean	**-0.12869**	**-0.00030**	**0.00053**	**-0.00318**	**0.00088**	**0.01960**	**-0.00356**	**-0.00099**	**0.00073**
%RSD	6.11308	38.06968	107.98682	23.45451	34.48372	5.11246	30.73143	407.44111	33.60227

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00877	-0.00377	-0.00204	0.00098	-0.00051	0.00196	-0.02268	-0.00044	-0.00002
#2	-0.01031	-0.00280	-0.00210	-0.00026	-0.00075	-0.00589	-0.04102	-0.00080	-0.00016
Mean	**-0.00954**	**-0.00329**	**-0.00207**	**0.00036**	**-0.00063**	**-0.00196**	**-0.03185**	**-0.00062**	**-0.00009**
%RSD	11.42530	20.94657	2.19803	242.78592	27.26657	282.70642	40.71898	40.85054	104.20496

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00006	-0.00044	-0.00068
#2	-0.00006	-0.00051	0.00099
Mean	**0.00000**	**-0.00047**	**0.00016**
%RSD	29113.67725	9.82728	746.61051

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Method : Paragon File : 100305A Printed : 3/5/2010 16:43:21

SampleId1 : 1002176-11 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:24:51
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE11

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00111	0.01678	0.00010	-0.00337	-0.00052	-0.00002	0.00121	0.28292	-0.00077
#2	-0.00150	0.01685	-0.00038	-0.00464	-0.00063	-0.00004	-0.00568	0.28156	-0.00050
Mean	**-0.00131**	**0.01682**	**-0.00014**	**-0.00401**	**-0.00057**	**-0.00003**	**-0.00223**	**0.28224**	**-0.00063**
%RSD	21.31412	0.29364	247.80760	22.41323	13.92656	40.63487	218.18638	0.34208	30.26327

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00013	-0.00116	-0.00056	-0.00498	-0.29172	0.00206	-0.00890	0.00649	-0.00123
#2	-0.00023	-0.00137	-0.00155	-0.00556	-0.32934	0.00197	-0.01172	0.00645	-0.00126
Mean	**-0.00005**	**-0.00127**	**-0.00106**	**-0.00527**	**-0.31053**	**0.00202**	**-0.01031**	**0.00647**	**-0.00125**
%RSD	518.72969	11.74149	66.46887	7.80727	8.56546	3.06940	19.38687	0.40624	1.47855

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.14225	-0.00119	-0.00228	-0.00112	-0.00020	0.05998	-0.00058	0.00188	-0.00365
#2	-0.14553	-0.00155	-0.00379	-0.00211	0.00065	0.05431	-0.00325	0.00054	-0.00045
Mean	**-0.14389**	**-0.00137**	**-0.00303**	**-0.00162**	**0.00023**	**0.05715**	**-0.00192**	**0.00121**	**-0.00205**
%RSD	1.61088	18.78764	35.04957	43.14879	265.35437	7.01324	98.62179	78.50441	110.21985

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00306	-0.00110	0.00172	0.00286	-0.00024	0.00255	-0.01672	-0.00069	0.00334
#2	-0.00345	-0.00183	0.00169	0.00009	-0.00074	0.00041	-0.02564	-0.00082	0.00382
Mean	**-0.00326**	**-0.00146**	**0.00171**	**0.00147**	**-0.00049**	**0.00148**	**-0.02118**	**-0.00075**	**0.00358**
%RSD	8.58156	35.28276	1.18357	133.11801	72.64875	102.08807	29.78736	12.36152	9.49287

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00073	-0.00051	-0.00181
#2	-0.00102	-0.00027	-0.00012
Mean	**-0.00087**	**-0.00039**	**-0.00097**
%RSD	23.71581	42.88802	123.46999

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:22
SampleId1 : 1002176-11L 5X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:26:39
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE12

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Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	-0.00071	0.00732	-0.00369	-0.00452	-0.00072	-0.00022	-0.00440	0.02241	-0.00089
#2	-0.00090	0.00903	-0.00001	-0.00341	-0.00074	-0.00024	-0.00076	0.02150	-0.00053
Mean	**-0.00080**	**0.00818**	**-0.00185**	**-0.00397**	**-0.00073**	**-0.00023**	**-0.00258**	**0.02195**	**-0.00071**
%RSD	16.34149	14.83494	140.81929	19.80778	2.73970	5.06323	99.82983	2.93107	36.13840

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00063	-0.00091	-0.00142	-0.00784	-0.41910	0.00192	-0.02977	0.00076	-0.00173
#2	-0.00045	-0.00091	-0.00185	-0.00832	-0.42648	0.00187	-0.03238	0.00080	-0.00139
Mean	**-0.00054**	**-0.00091**	**-0.00164**	**-0.00808**	**-0.42279**	**0.00190**	**-0.03108**	**0.00078**	**-0.00156**
%RSD	24.31921	0.18428	18.68480	4.16955	1.23459	1.78841	5.93724	3.35599	15.36558

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.17618	-0.00085	-0.00148	-0.00125	-0.00033	0.01039	-0.00088	-0.00588	0.00104
#2	-0.17772	-0.00062	-0.00639	-0.00262	0.00158	0.00897	-0.00362	-0.00491	0.00049
Mean	**-0.17695**	**-0.00074**	**-0.00394**	**-0.00193**	**0.00063**	**0.00968**	**-0.00225**	**-0.00539**	**0.00076**
%RSD	0.61525	21.70284	88.24936	50.15193	215.63364	10.35118	85.85013	12.68340	51.52959

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01172	-0.00183	-0.00169	-0.00103	-0.00093	-0.00580	-0.01424	-0.00078	-0.00030
#2	-0.01131	-0.00231	-0.00169	-0.00311	-0.00104	0.00071	-0.00978	-0.00091	-0.00030
Mean	**-0.01151**	**-0.00207**	**-0.00169**	**-0.00207**	**-0.00098**	**-0.00254**	**-0.01201**	**-0.00085**	**-0.00030**
%RSD	2.47833	16.62359	0.29896	71.19254	7.38934	181.13486	26.27380	10.98156	0.00000

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00049	-0.00064	-0.00126
#2	-0.00041	0.00018	-0.00131
Mean	**-0.00045**	**-0.00023**	**-0.00129**
%RSD	12.79974	256.94824	2.71298

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:22
SampleId1 : 1002176-11MS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:28:27
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE13

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00048	2.35816	2.45094	1.14096	2.25996	0.05480	0.00254	0.26859	0.06037
#2	-0.00130	2.35073	2.46221	1.14890	2.27700	0.05501	-0.00759	0.26859	0.06097
Mean	**-0.00089**	**2.35444**	**2.45657**	**1.14493**	**2.26848**	**0.05491**	**-0.00253**	**0.26859**	**0.06067**
%RSD	65.81786	0.22324	0.32449	0.49049	0.53109	0.26474	283.45978	0.00000	0.69691

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	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.57458	0.22767	0.28978	1.16423	-0.40648	0.00181	-0.02129	0.56972	1.13956

#2	0.57691	0.22796	0.29080	1.16674	-0.42815	0.00176	-0.02499	0.57167	1.14348
Mean	**0.57574**	**0.22782**	**0.29029**	**1.16548**	**-0.41731**	**0.00179**	**-0.02314**	**0.57069**	**1.14152**
%RSD	0.28642	0.09288	0.24629	0.15200	3.67166	2.12195	11.29607	0.24149	0.24279

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.15805	0.57305	-0.00128	0.55727	0.55048	0.03873	0.56352	2.55429	2.50565
#2	-0.15904	0.57394	-0.00098	0.55585	0.54242	0.04865	0.56482	2.58084	2.49218
Mean	**-0.15855**	**0.57349**	**-0.00113**	**0.55656**	**0.54645**	**0.04369**	**0.56417**	**2.56756**	**2.49891**
%RSD	0.44302	0.11027	18.83683	0.17967	1.04256	16.05476	0.16268	0.73127	0.38114

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.35572	0.58738	0.56217	0.00384	0.55572	2.33299	-0.02743	0.57097	0.56909
#2	2.35480	0.58688	0.56632	0.00080	0.55828	2.36459	-0.04131	0.57308	0.56812
Mean	**2.35526**	**0.58713**	**0.56425**	**0.00232**	**0.55700**	**2.34879**	**-0.03437**	**0.57203**	**0.56861**
%RSD	0.02771	0.05915	0.52012	92.89667	0.32512	0.95139	28.55878	0.26114	0.12043

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00231	0.55274	2.52185
#2	-0.00246	0.54689	2.52170
Mean	**-0.00239**	**0.54982**	**2.52178**
%RSD	4.24700	0.75170	0.00398

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:22
SampleId1 : 1002176-11MSD **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:30:14
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE14

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00120	2.27302	2.35465	1.10205	2.18201	0.05310	-0.00332	0.25744	0.05783
#2	-0.00141	2.27087	2.36599	1.11410	2.20441	0.05274	-0.00215	0.25903	0.05840
Mean	**-0.00131**	**2.27195**	**2.36032**	**1.10808**	**2.19321**	**0.05292**	**-0.00273**	**0.25823**	**0.05812**
%RSD	11.50833	0.06677	0.33964	0.76899	0.72225	0.47703	30.46148	0.43618	0.69319

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.55538	0.21872	0.27971	1.12607	-0.44458	0.00172	-0.02738	0.55177	1.09661
#2	0.55382	0.21807	0.28172	1.12010	-0.46244	0.00166	-0.02673	0.54933	1.10013
Mean	**0.55460**	**0.21840**	**0.28072**	**1.12308**	**-0.45351**	**0.00169**	**-0.02705**	**0.55055**	**1.09837**
%RSD	0.19858	0.21209	0.50569	0.37579	2.78477	2.12614	1.70502	0.31281	0.22685

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	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.15949	0.54422	-0.00338	0.53225	0.57795	0.04581	0.54339	2.49666	2.61978
#2	-0.16143	0.55141	-0.00639	0.53172	0.51837	0.04298	0.54934	2.49403	2.38422

Mean	**-0.16046**	**0.54781**	**-0.00489**	**0.53199**	**0.54816**	**0.04439**	**0.54637**	**2.49535**	**2.50200**
%RSD	0.85359	0.92818	43.50355	0.07125	7.68551	4.51387	0.77008	0.07460	6.65714

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	2.28212	0.56653	0.54128	0.00177	0.54068	2.26626	-0.03385	0.55303	0.54627
#2	2.27771	0.56299	0.54794	0.00384	0.53767	2.27648	-0.04277	0.55092	0.54336
Mean	**2.27991**	**0.56476**	**0.54461**	**0.00281**	**0.53918**	**2.27137**	**-0.03831**	**0.55198**	**0.54482**
%RSD	0.13692	0.44259	0.86460	52.10217	0.39454	0.31793	16.46291	0.27067	0.37694

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00262	0.56273	2.57878
#2	-0.00263	0.52281	2.42079
Mean	**-0.00262**	**0.54277**	**2.49979**
%RSD	0.37188	5.20034	4.46905

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:23
SampleId1 : 1002176-12 10X **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:32:02
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE15

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00056	0.01167	0.00063	0.05010	0.00095	-0.00018	0.00274	40.60675	-0.00058
#2	-0.00002	0.01123	0.00063	0.04986	0.00090	-0.00019	0.00107	40.85409	-0.00064
Mean	**-0.00029**	**0.01145**	**0.00063**	**0.04998**	**0.00092**	**-0.00019**	**0.00190**	**40.73042**	**-0.00061**
%RSD	130.62969	2.75399	0.00000	0.33701	4.32609	3.23019	62.03565	0.42941	7.47963

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00011	-0.00069	-0.00065	-0.00821	13.73598	0.05519	60.43251	0.52045	0.08508
#2	-0.00010	-0.00030	-0.00072	-0.00832	13.82420	0.05561	60.80520	0.52423	0.08440
Mean	**0.00001**	**-0.00049**	**-0.00068**	**-0.00826**	**13.78009**	**0.05540**	**60.61885**	**0.52234**	**0.08474**
%RSD	2645.00007	55.70544	7.93718	0.90579	0.45272	0.54193	0.43474	0.51210	0.56577

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	236.47340	0.00095	0.00223	0.00151	-0.00044	260.34974	0.00211	0.00531	0.00153
#2	236.64919	0.00111	0.00053	0.00177	-0.00080	262.43904	0.00139	0.00195	0.00292
Mean	**236.56129**	**0.00103**	**0.00138**	**0.00164**	**-0.00062**	**261.39439**	**0.00175**	**0.00363**	**0.00222**
%RSD	0.05254	11.23029	87.49765	11.18432	41.04196	0.56518	29.25713	65.57891	44.27857

20000500

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.01509	0.00328	1.04751	-0.02580	-0.00094	-0.00107	0.18603	0.00016	-0.00064
#2	1.02251	0.00292	1.05611	-0.02250	-0.00100	-0.00073	0.19297	0.00068	-0.00112
Mean	**1.01880**	**0.00310**	**1.05181**	**-0.02415**	**-0.00097**	**-0.00090**	**0.18950**	**0.00042**	**-0.00088**

%RSD	0.51542	8.32073	0.57816	9.64372	4.50421	26.34628	2.58969	88.41142	38.49784

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00102	0.00021	0.00279
#2	0.00091	0.00005	0.00259
Mean	**0.00096**	**0.00013**	**0.00269**
%RSD	7.99737	85.11406	5.07414

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:23
SampleId1 : 1002219-1 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:33:49
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE16

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00223	0.04080	0.00168	0.42266	0.03527	-0.00003	-0.00721	148.68031	-0.00109
#2	-0.00090	0.04523	-0.00215	0.42242	0.03522	-0.00004	-0.00129	148.42361	-0.00097
Mean	**-0.00156**	**0.04302**	**-0.00023**	**0.42254**	**0.03524**	**-0.00004**	**-0.00425**	**148.55196**	**-0.00103**
%RSD	59.72488	7.28104	1161.64420	0.03994	0.11355	12.27025	98.35049	0.12219	8.77522

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00029	-0.00208	0.00047	0.02572	10.07654	0.08421	50.10238	1.31441	0.13686
#2	0.00071	-0.00116	0.00137	0.02609	9.98379	0.08356	49.96644	1.31092	0.13600
Mean	**0.00021**	**-0.00162**	**0.00092**	**0.02590**	**10.03016**	**0.08389**	**50.03441**	**1.31267**	**0.13643**
%RSD	336.50182	40.08631	69.16763	1.01153	0.65387	0.55112	0.19212	0.18773	0.44623

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	185.88139	-0.00060	0.01536	-0.00641	0.00281	226.27295	-0.00065	0.03877	0.04131
#2	184.81673	-0.00025	0.01857	-0.00118	0.00105	225.47821	-0.00150	0.04775	0.03730
Mean	**185.34906**	**-0.00042**	**0.01697**	**-0.00379**	**0.00193**	**225.87558**	**-0.00107**	**0.04326**	**0.03930**
%RSD	0.40617	58.84459	13.37063	97.61428	64.56430	0.24879	56.03536	14.67060	7.20235

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	8.77325	0.01581	1.29295	-0.01839	-0.00038	-0.00832	0.49485	0.00107	0.00066
#2	8.72802	0.01447	1.28482	-0.01787	-0.00032	-0.00503	0.52856	0.00225	0.00046
Mean	**8.75064**	**0.01514**	**1.28889**	**-0.01813**	**-0.00035**	**-0.00667**	**0.51171**	**0.00166**	**0.00056**
%RSD	0.36551	6.24896	0.44621	2.03612	12.40799	34.87812	4.65841	50.48468	26.05140

20000501

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00221	-0.00026	0.04046
#2	-0.00135	0.00031	0.04078
Mean	**-0.00178**	**0.00003**	**0.04062**
%RSD	33.99932	1587.73695	0.55435

ted: 3/5/2010 16:43:36 User: ROY FRENCH
Method : Paragon File : 100305A Printed : 3/5/2010 16:43:23
SampleId1 : 1002219-2 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:35:36
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE17

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00022	0.01874	0.00213	0.09370	0.03490	-0.00007	-0.00182	94.19651	-0.00069
#2	0.00036	0.01632	-0.00121	0.09354	0.03496	-0.00008	-0.00054	93.73745	-0.00047
Mean	**0.00007**	**0.01753**	**0.00046**	**0.09362**	**0.03493**	**-0.00007**	**-0.00118**	**93.96698**	**-0.00058**
%RSD	615.79773	9.75647	512.02281	0.11997	0.11456	11.37468	76.37900	0.34544	26.33193

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00048	-0.00106	0.00105	0.03720	4.29382	0.04284	31.21294	0.55345	0.02147
#2	0.00026	-0.00110	0.00048	0.03710	4.27895	0.04272	31.07659	0.55177	0.01977
Mean	**0.00037**	**-0.00108**	**0.00076**	**0.03715**	**4.28638**	**0.04278**	**31.14477**	**0.55261**	**0.02062**
%RSD	40.49220	2.64968	53.15801	0.20151	0.24529	0.20471	0.30957	0.21576	5.80982

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.93809	0.00056	0.02299	-0.00033	-0.00037	98.38023	0.00193	0.00888	0.00596
#2	49.78030	0.00066	0.02549	0.00000	-0.00012	97.81124	0.00150	0.02045	0.00676
Mean	**49.85919**	**0.00061**	**0.02424**	**-0.00017**	**-0.00025**	**98.09574**	**0.00172**	**0.01466**	**0.00636**
%RSD	0.22378	11.69891	7.31312	140.03845	71.31767	0.41015	17.73398	55.79992	8.90391

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	7.98939	0.00936	0.67348	-0.01497	-0.00078	0.00017	0.02291	0.00210	0.00183
#2	7.95109	0.00900	0.67232	-0.01396	-0.00058	0.00040	0.02737	0.00253	0.00217
Mean	**7.97024**	**0.00918**	**0.67290**	**-0.01447**	**-0.00068**	**0.00029**	**0.02514**	**0.00232**	**0.00200**
%RSD	0.33986	2.81206	0.12258	4.94986	20.90991	55.03676	12.54885	13.18301	12.13188

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00121	-0.00036	0.00693
#2	-0.00122	-0.00008	0.01132
Mean	**-0.00122**	**-0.00022**	**0.00912**
%RSD	0.78524	88.63924	34.00718

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:23
SampleId1 : 1002219-2L 5X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:37:23
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE18

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00014	0.01689	-0.00121	0.01636	0.00621	-0.00020	0.00318	17.88725	-0.00036
#2	0.00052	0.01471	0.00292	0.01616	0.00624	-0.00019	0.00141	17.88096	-0.00048
Mean	**0.00019**	**0.01580**	**0.00086**	**0.01626**	**0.00623**	**-0.00019**	**0.00230**	**17.88410**	**-0.00042**
%RSD	244.12969	9.77829	341.28088	0.86332	0.32114	2.80403	54.45540	0.02488	20.15139

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00001	-0.00049	-0.00107	0.00036	0.23271	0.00863	6.02667	0.10999	0.00403
#2	0.00001	-0.00027	-0.00065	0.00073	0.23152	0.00863	6.01796	0.11002	0.00322
Mean	**0.00001**	**-0.00038**	**-0.00086**	**0.00055**	**0.23211**	**0.00863**	**6.02232**	**0.11000**	**0.00363**
%RSD	1.20434	39.88801	35.18779	47.71190	0.36225	0.02312	0.10235	0.02393	15.75032

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	9.03732	0.00031	-0.00048	0.00239	-0.00123	18.23875	-0.00066	0.00629	0.00118
#2	9.03793	0.00042	-0.00078	0.00046	-0.00182	18.22283	0.00117	0.00452	0.00035
Mean	**9.03762**	**0.00036**	**-0.00063**	**0.00142**	**-0.00152**	**18.23079**	**0.00026**	**0.00541**	**0.00077**
%RSD	0.00476	22.05591	33.87858	95.88965	27.12589	0.06177	507.16830	23.09707	77.15897

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.51763	0.00061	0.13054	-0.00595	-0.00096	-0.00051	-0.00036	0.00033	-0.00099
#2	1.51715	-0.00049	0.13047	-0.00538	-0.00084	0.00100	0.00112	0.00063	-0.00078
Mean	**1.51739**	**0.00006**	**0.13050**	**-0.00566**	**-0.00090**	**0.00024**	**0.00038**	**0.00048**	**-0.00088**
%RSD	0.02254	1301.67037	0.03505	7.07576	9.67614	438.44789	277.35245	44.40558	16.49907

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00031	-0.00003	0.00288
#2	-0.00031	-0.00106	0.00174
Mean	**-0.00031**	**-0.00054**	**0.00231**
%RSD	0.13714	134.59894	35.03988

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:24
SampleId1 : 1002219-2MS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:39:10
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE19

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00144	2.40874	2.44493	1.23201	2.29728	0.05370	-0.00073	90.66135	0.05902
#2	-0.00155	2.47231	2.52182	1.26922	2.37897	0.05507	-0.00421	90.81827	0.06011
Mean	**-0.00150**	**2.44053**	**2.48337**	**1.25062**	**2.33812**	**0.05439**	**-0.00247**	**90.73981**	**0.05956**
%RSD	5.39818	1.84183	2.18919	2.10408	2.47039	1.77986	99.77322	0.12229	1.29623

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.55607	0.21888	0.28797	1.16700	4.19091	0.04267	30.24633	1.08408	1.14461
#2	0.57003	0.22365	0.29733	1.19926	4.20955	0.04287	30.35317	1.10028	1.17442
Mean	**0.56305**	**0.22127**	**0.29265**	**1.18313**	**4.20023**	**0.04277**	**30.29975**	**1.09218**	**1.15951**
%RSD	1.75354	1.52365	2.26053	1.92764	0.31394	0.31643	0.24935	1.04883	1.81783

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	49.76328	0.54852	0.02309	0.53594	0.53810	96.03222	0.55219	2.64546	2.57827
#2	49.95091	0.56648	0.01697	0.54811	0.52620	96.72614	0.57521	2.71068	2.54347
Mean	**49.85709**	**0.55750**	**0.02003**	**0.54203**	**0.53215**	**96.37918**	**0.56370**	**2.67807**	**2.56087**
%RSD	0.26611	2.27788	21.59593	1.58740	1.58110	0.50911	2.88807	1.72199	0.96076

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	10.12024	0.58824	1.23199	-0.01193	0.54392	2.33677	0.00231	0.56339	0.53839
#2	10.22592	0.60299	1.25818	-0.01391	0.55885	2.40933	0.00824	0.57792	0.55139
Mean	**10.17308**	**0.59562**	**1.24508**	**-0.01292**	**0.55139**	**2.37305**	**0.00527**	**0.57065**	**0.54489**
%RSD	0.73454	1.75097	1.48737	10.87348	1.91516	2.16229	79.45210	1.79997	1.68706

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00333	0.53738	2.60064
#2	-0.00312	0.53349	2.59915
Mean	**-0.00322**	**0.53544**	**2.59990**
%RSD	4.60263	0.51301	0.04054

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:24
SampleId1 : 1002219-2MSD **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:40:57
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE20

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00129	2.42845	2.47317	1.24586	2.31354	0.05470	-0.00425	90.84994	0.06021
#2	-0.00189	2.46263	2.52996	1.27585	2.37231	0.05559	-0.00510	91.41864	0.06141
Mean	**-0.00159**	**2.44554**	**2.50157**	**1.26086**	**2.34293**	**0.05514**	**-0.00467**	**91.13429**	**0.06081**
%RSD	26.70503	0.98822	1.60512	1.68177	1.77351	1.13686	12.76369	0.44125	1.39751

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.56480	0.22253	0.28969	1.18630	4.15809	0.04202	30.20236	1.09096	1.16247
#2	0.57369	0.22564	0.29618	1.20816	4.19327	0.04246	30.47673	1.10542	1.18631
Mean	**0.56924**	**0.22408**	**0.29294**	**1.19723**	**4.17568**	**0.04224**	**30.33955**	**1.09819**	**1.17439**
%RSD	1.10436	0.98115	1.56526	1.29106	0.59563	0.74921	0.63948	0.93133	1.43538

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	49.09420	0.55973	0.02008	0.54549	0.54467	94.90030	0.56305	2.65688	2.57363
#2	49.44551	0.57109	0.02649	0.55133	0.53386	96.50580	0.57831	2.71467	2.55652
Mean	**49.26985**	**0.56541**	**0.02329**	**0.54841**	**0.53926**	**95.70305**	**0.57068**	**2.68577**	**2.56508**
%RSD	0.50419	1.42077	19.48735	0.75296	1.41804	1.18623	1.89148	1.52142	0.47173

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	10.06023	0.60288	1.23233	-0.00945	0.55117	2.37740	-0.00464	0.57141	0.55118
#2	10.19161	0.60836	1.25561	-0.01200	0.56085	2.42512	0.01815	0.58209	0.56010
Mean	**10.12592**	**0.60562**	**1.24397**	**-0.01073**	**0.55601**	**2.40126**	**0.00675**	**0.57675**	**0.55564**
%RSD	0.91742	0.63991	1.32342	16.82407	1.23084	1.40499	238.64440	1.30913	1.13535

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00369	0.54494	2.60135
#2	-0.00353	0.53967	2.60918
Mean	**-0.00361**	**0.54231**	**2.60527**
%RSD	2.99825	0.68697	0.21250

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:24
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 15:42:45
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19821	49.39223	0.49756	0.94729	0.95831	0.49256	0.48808	47.93373	0.47846
#2	0.19883	49.60999	0.49783	0.95220	0.96316	0.49379	0.49825	48.03951	0.48167
Mean	**0.19852**	**49.50111**	**0.49769**	**0.94974**	**0.96073**	**0.49317**	**0.49317**	**47.98662**	**0.48007**
%RSD	0.22067	0.31106	0.03759	0.36514	0.35734	0.17723	1.45744	0.15587	0.47394

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.48919	0.97504	0.96503	19.88117	48.38797	0.50012	49.58654	0.95775	0.96050
#2	0.49069	0.97758	0.96929	19.93103	48.53350	0.50165	49.75169	0.96020	0.96557
Mean	**0.48994**	**0.97631**	**0.96716**	**19.90610**	**48.46074**	**0.50089**	**49.66911**	**0.95897**	**0.96303**
%RSD	0.21547	0.18455	0.31143	0.17711	0.21234	0.21634	0.23511	0.18065	0.37224

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	47.90379	0.96723	4.80119	0.94911	0.93257	4.88611	0.47647	0.98718	0.97459
#2	48.06626	0.96934	4.83518	0.95337	0.93361	4.88469	0.47745	0.98901	0.97650
Mean	**47.98502**	**0.96829**	**4.81818**	**0.95124**	**0.93309**	**4.88540**	**0.47696**	**0.98810**	**0.97555**
%RSD	0.23941	0.15405	0.49880	0.31689	0.07925	0.02063	0.14537	0.13090	0.13798

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.68608	0.98564	0.47854	0.13120	0.46345	0.49292	4.79044	0.47663	0.99766

20000505

#2	4.70362	0.98026	0.48063	0.13086	0.46424	0.49447	4.83010	0.47683	1.00183
Mean	**4.69485**	**0.98295**	**0.47958**	**0.13103**	**0.46385**	**0.49370**	**4.81027**	**0.47673**	**0.99974**
%RSD	0.26408	0.38721	0.30822	0.18757	0.12074	0.22159	0.58305	0.02938	0.29505

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.95524	0.93807	0.97879
#2	0.95791	0.94019	0.98067
Mean	**0.95658**	**0.93913**	**0.97973**
%RSD	0.19755	0.15940	0.13560

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:25
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 15:44:43
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00004	0.06463	-0.00087	0.00147	0.00016	0.00030	-0.00163	0.00762	0.00007
#2	0.00017	0.05969	-0.00072	0.00155	0.00005	0.00023	0.00230	-0.00023	0.00002
Mean	**0.00007**	**0.06216**	**-0.00080**	**0.00151**	**0.00010**	**0.00026**	**0.00034**	**0.00370**	**0.00005**
%RSD	230.35694	5.61849	13.33560	3.71720	76.64130	18.45136	829.25433	150.12952	74.02265

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00043	0.00065	-0.00044	0.01079	-0.33981	0.00235	0.01263	0.00036	0.00007
#2	0.00103	0.00057	0.00020	0.00783	-0.34314	0.00229	0.01133	0.00028	-0.00001
Mean	**0.00073**	**0.00061**	**-0.00012**	**0.00931**	**-0.34148**	**0.00232**	**0.01198**	**0.00032**	**0.00003**
%RSD	58.82480	9.20172	376.11097	22.51558	0.69022	1.72324	7.70207	16.50168	180.40611

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.14216	-0.00007	-0.00268	0.00356	-0.00111	0.01322	0.00239	-0.00018	-0.00369
#2	-0.14951	0.00092	-0.00549	0.00584	-0.00164	0.01747	0.00262	0.00614	-0.00160
Mean	**-0.14583**	**0.00042**	**-0.00409**	**0.00470**	**-0.00138**	**0.01535**	**0.00250**	**0.00298**	**-0.00264**
%RSD	3.56429	165.00774	48.57235	34.26167	27.24036	19.58543	6.72050	149.95752	55.82801

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00548	0.00219	-0.00199	-0.00291	-0.00062	0.00058	0.01202	0.00033	-0.00044
#2	-0.00549	0.00109	-0.00205	-0.00179	-0.00066	0.00003	0.01748	0.00071	-0.00023
Mean	**-0.00548**	**0.00164**	**-0.00202**	**-0.00235**	**-0.00064**	**0.00031**	**0.01475**	**0.00052**	**-0.00033**
%RSD	0.10974	47.18594	2.25249	33.52008	4.54784	126.23589	26.15248	51.20834	43.67414

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	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00077	0.00044	-0.00252
#2	0.00100	0.00085	0.00098

Mean	**0.00088**	**0.00065**	**-0.00077CH**
%RSD	18.96266	44.24227	320.99449

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:25
SampleId1 : 1003045-4A **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:46:40
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE28

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00044	29.15045	4.16127	1.96100	4.73150	0.09837	-0.00240	57.34748	0.10112
#2	-0.00030	29.09349	4.14723	1.96008	4.71542	0.09824	0.01136	57.36364	0.10174
Mean	**-0.00037**	**29.12197**	**4.15425**	**1.96054**	**4.72346**	**0.09830**	**0.00448**	**57.35556**	**0.10143**
%RSD	26.57721	0.13832	0.23893	0.03323	0.24064	0.09002	217.36500	0.01992	0.42855

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.00855	0.42146	0.53826	49.14694	5.20219	0.03050	11.64279	1.67139	2.02257
#2	1.00626	0.42030	0.53753	49.09946	5.19465	0.03051	11.66048	1.66983	2.02271
Mean	**1.00740**	**0.42088**	**0.53789**	**49.12320**	**5.19842**	**0.03050**	**11.65164**	**1.67061**	**2.02264**
%RSD	0.16033	0.19496	0.09492	0.06834	0.10256	0.02612	0.10734	0.06607	0.00463

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.41230	1.02473	1.08394	0.98663	0.97117	1.72805	0.96837	4.01525	3.90974
#2	1.40841	1.02652	1.07628	0.98557	0.96626	1.71953	0.96411	4.01457	3.92868
Mean	**1.41036**	**1.02563**	**1.08011**	**0.98610**	**0.96872**	**1.72379**	**0.96624**	**4.01491**	**3.91921**
%RSD	0.19484	0.12371	0.50122	0.07533	0.35828	0.34946	0.31158	0.01196	0.34182

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	11.96930	1.04768	1.26575	0.01224	1.50110	4.16059	-0.02243	1.06742	1.04912
#2	11.94228	1.04634	1.26200	0.01235	1.49640	4.15459	-0.01298	1.06504	1.05030
Mean	**11.95579**	**1.04701**	**1.26387**	**0.01230**	**1.49875**	**4.15759**	**-0.01770**	**1.06623**	**1.04971**
%RSD	0.15977	0.09053	0.20970	0.60872	0.22138	0.10206	37.75158	0.15751	0.07967

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.02409	0.97632	3.94487
#2	0.02439	0.97270	3.95728
Mean	**0.02424**	**0.97451**	**3.95108**
%RSD	0.89531	0.26293	0.22211

20000507

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:25
SampleId1 : EX100304-1MB **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:48:28
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE29

Final concentrations:**36** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00019	0.04373	-0.00121	0.00195	0.00262	-0.00010	0.00496	-0.01297	-0.00017
#2	-0.00046	0.04020	0.00225	0.00139	0.00231	-0.00010	-0.00508	-0.01717	-0.00056
Mean	**-0.00014**	**0.04197**	**0.00052**	**0.00167**	**0.00247**	**-0.00010**	**-0.00006**	**-0.01507**	**-0.00037**
%RSD	334.84069	5.95254	471.71281	23.54493	8.92101	0.32596	11140.78033	19.74525	76.01611

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00024	0.00006	-0.00036	0.00566	-0.43410	0.00177	-0.02586	0.00017	-0.00014
#2	-0.00050	-0.00006	-0.00099	0.00269	-0.44982	0.00175	-0.03347	-0.00002	-0.00147
Mean	**-0.00013**	**0.00000**	**-0.00068**	**0.00417**	**-0.44196**	**0.00176**	**-0.02966**	**0.00008**	**-0.00080**
%RSD	418.29623	1715.20986	66.01850	50.20451	2.51458	1.13383	18.14208	170.78726	116.99404

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	110.40996	-0.00035	0.00654	0.00213	-0.00197	0.00189	0.00138	0.00329	0.00028
#2	111.34310	-0.00061	0.00905	-0.00252	-0.00053	0.00330	-0.00166	0.00409	-0.00188
Mean	**110.87653**	**-0.00048**	**0.00779**	**-0.00019**	**-0.00125**	**0.00259**	**-0.00014**	**0.00369**	**-0.00080**
%RSD	0.59510	38.92713	22.74031	1693.43318	81.63750	38.61418	1509.62891	15.19206	190.72249

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01020	0.01532	-0.00205	-0.00120	-0.00054	-0.00181	0.00360	-0.00003	0.00334
#2	0.00770	0.01508	-0.00217	0.00081	-0.00063	-0.00355	-0.00929	-0.00029	0.00300
Mean	**0.00895**	**0.01520**	**-0.00211**	**-0.00019**	**-0.00059**	**-0.00268**	**-0.00285**	**-0.00016**	**0.00317**
%RSD	19.80653	1.13105	4.08135	737.29176	11.12721	45.78049	320.22786	117.01752	7.66230

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00002	-0.00061	0.00128
#2	-0.00051	-0.00119	0.00011
Mean	**-0.00027**	**-0.00090**	**0.00070**
%RSD	129.84543	45.87311	119.52475

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:26
SampleId1 : EX100304-1RVS **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:50:16
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE30

Final concentrations

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	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00218	0.13183	0.00390	0.00393	0.00429	0.00096	0.01108	0.46830	0.00161
#2	0.00319	0.13516	0.00326	0.00512	0.00449	0.00097	0.01099	0.46864	0.00168
Mean	**0.00269**	**0.13350**	**0.00358**	**0.00453**	**0.00439**	**0.00096**	**0.01104**	**0.46847**	**0.00164**
%RSD	26.52705	1.76056	12.61521	18.60088	3.18954	0.65094	0.59642	0.05154	3.36362

ted: 3/5/2010 16:43:36 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00156	0.00480	0.00404	0.11943	0.30857	0.00484	0.47081	0.00448	0.00888
#2	0.00233	0.00522	0.00417	0.11900	0.31855	0.00483	0.47603	0.00456	0.00969
Mean	**0.00194**	**0.00501**	**0.00410**	**0.11922**	**0.31356**	**0.00484**	**0.47342**	**0.00452**	**0.00928**
%RSD	27.88319	5.95387	2.23668	0.25130	2.25216	0.08251	0.77958	1.16333	6.15459

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.63748	0.00461	0.10141	0.00345	0.00331	0.08974	0.01080	0.00787	0.00621
#2	0.62345	0.00508	0.09850	0.00728	0.00379	0.09257	0.01182	0.00596	0.00433
Mean	**0.63047**	**0.00485**	**0.09996**	**0.00537**	**0.00355**	**0.09116**	**0.01131**	**0.00692**	**0.00527**
%RSD	1.57328	6.95490	2.05777	50.47694	9.62763	2.19845	6.33767	19.56406	25.21072

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02503	0.00948	0.00246	-0.00115	0.00366	0.00739	0.04169	0.00467	0.00499
#2	0.02699	0.01082	0.00248	0.00076	0.00392	0.00861	0.05854	0.00525	0.00527
Mean	**0.02601**	**0.01015**	**0.00247**	**-0.00020**	**0.00379**	**0.00800**	**0.05012**	**0.00496**	**0.00513**
%RSD	5.31124	9.31961	0.61405	690.54873	4.79970	10.81346	23.78018	8.29556	3.78940

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00475	0.00335	0.00676
#2	0.00504	0.00495	0.00487
Mean	**0.00490**	**0.00415**	**0.00582**
%RSD	4.16516	27.20285	22.97547

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:26
SampleId1 : EX100304-1LCS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:52:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE31

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10093	2.12421	2.05690	0.95443	2.00860	0.04692	0.00055	-0.01854	0.05070
#2	0.10108	2.12699	2.06441	0.96157	2.02077	0.04685	-0.00240	-0.01911	0.05049
Mean	**0.10101**	**2.12560**	**2.06065**	**0.95800**	**2.01469**	**0.04689**	**-0.00093**	**-0.01882**	**0.05060**
%RSD	0.10936	0.09249	0.25795	0.52682	0.42739	0.10261	225.30029	2.13623	0.29167

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49539	0.19643	0.25997	1.00551	-0.46839	0.00181	-0.03347	0.48053	1.01291
#2	0.49503	0.19669	0.26077	1.00738	-0.48221	0.00179	-0.03673	0.48155	1.01457
Mean	**0.49521**	**0.19656**	**0.26037**	**1.00645**	**-0.47530**	**0.00180**	**-0.03510**	**0.48104**	**1.01374**
%RSD	0.05111	0.09395	0.21638	0.13095	2.05491	0.66536	6.57095	0.14856	0.11548

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	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	109.92223	0.50318	0.00514	0.47805	0.47163	-0.00236	0.48576	1.99063	1.97361
#2	110.29983	0.50287	0.00564	0.47581	0.47012	-0.00095	0.48535	1.98563	1.96712
Mean	**110.11103**	**0.50303**	**0.00539**	**0.47693**	**0.47087**	**-0.00166**	**0.48555**	**1.98813**	**1.97036**
%RSD	0.24248	0.04424	6.57923	0.33185	0.22646	60.49915	0.05976	0.17772	0.23285

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.83292	0.51646	0.49601	0.00022	0.47892	2.09349	-0.00501	0.49751	0.48399
#2	1.83705	0.51719	0.49885	-0.00086	0.48034	2.09883	-0.01890	0.49823	0.48336
Mean	**1.83499**	**0.51682**	**0.49743**	**-0.00032**	**0.47963**	**2.09616**	**-0.01195**	**0.49787**	**0.48368**
%RSD	0.15902	0.09991	0.40408	241.39694	0.20926	0.18007	82.10306	0.10177	0.09092

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00119	0.47377	1.97927
#2	-0.00134	0.47202	1.97328
Mean	**-0.00126**	**0.47289**	**1.97628**
%RSD	8.09386	0.26186	0.21438

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:26
SampleId1 : 1002133-3 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 15:53:51
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE32

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00046	0.12786	-0.00050	0.00548	0.00718	-0.00003	0.00194	0.01661	-0.00010
#2	-0.00106	0.13540	-0.00162	0.00266	0.00675	-0.00005	0.00016	0.01638	-0.00065
Mean	**-0.00076**	**0.13163**	**-0.00106**	**0.00407**	**0.00696**	**-0.00004**	**0.00105**	**0.01649**	**-0.00037**
%RSD	56.09645	4.04748	75.19844	48.95886	4.30844	47.49921	119.71167	0.97534	103.49584

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00635	0.00448	0.00479	0.82083	-0.36338	0.00190	-0.02455	0.00768	-0.00032
#2	0.00567	0.00396	0.00431	0.82812	-0.39767	0.00182	-0.02825	0.00764	-0.00056
Mean	**0.00601**	**0.00422**	**0.00455**	**0.82447**	**-0.38053**	**0.00186**	**-0.02640**	**0.00766**	**-0.00044**
%RSD	8.08767	8.68425	7.45383	0.62501	6.37134	3.10628	9.90052	0.34316	37.82630

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	109.76751	0.00567	0.00885	0.00244	0.00234	0.02031	0.00306	0.00456	0.00123
#2	110.90352	0.00508	0.00504	0.00031	0.00354	0.03164	-0.00092	0.00229	0.00068
Mean	**110.33551**	**0.00538**	**0.00694**	**0.00137**	**0.00294**	**0.02597**	**0.00107**	**0.00343**	**0.00095**
%RSD	0.72804	7.74965	38.80854	109.87381	28.97008	30.85960	264.15688	46.82730	41.20175

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn

20000510

	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00823	-0.00122	0.01628	-0.00077	-0.00055	-0.00007	0.45316	0.00002	0.03062
#2	0.00541	-0.00122	0.01648	-0.00019	-0.00058	0.00050	0.42688	-0.00017	0.03083
Mean	**0.00682**	**-0.00122**	**0.01638**	**-0.00048**	**-0.00056**	**0.00022**	**0.44002**	**-0.00008**	**0.03072**
%RSD	29.27708	0.00208	0.86487	85.92053	3.87861	187.04676	4.22308	174.97234	0.47451

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00002	0.00237	0.00234
#2	-0.00049	0.00246	0.00121
Mean	**-0.00023**	**0.00242**	**0.00178**
%RSD	156.23269	2.70255	44.81529

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:26
SampleId1 : 1002133-4 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:55:39
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE33

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00079	0.09101	-0.00162	0.21323	0.00457	-0.00016	-0.00378	0.26711	0.00042
#2	-0.00043	0.08642	-0.00125	0.21713	0.00514	-0.00017	-0.00447	0.26802	0.00048
Mean	**-0.00061**	**0.08872**	**-0.00143**	**0.21518**	**0.00486**	**-0.00016**	**-0.00412**	**0.26756**	**0.00045**
%RSD	41.92992	3.65882	18.50588	1.27964	8.23720	4.10415	11.78803	0.24056	8.28075

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01026	0.00128	0.00808	6.58635	-0.39672	0.00344	7.11518	1.69969	-0.00063
#2	0.01063	0.00153	0.00793	6.59709	-0.39624	0.00341	7.13110	1.70319	-0.00019
Mean	**0.01045**	**0.00141**	**0.00800**	**6.59172**	**-0.39648**	**0.00343**	**7.12314**	**1.70144**	**-0.00041**
%RSD	2.51163	12.58750	1.30610	0.11517	0.08493	0.58258	0.15798	0.14563	75.96495

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	133.41645	0.02449	1.65999	-0.00204	-0.00041	0.13509	-0.00096	0.00138	-0.00008
#2	133.62876	0.02478	1.65949	0.00102	0.00015	0.13367	0.00089	0.00277	0.00124
Mean	**133.52261**	**0.02464**	**1.65974**	**-0.00051**	**-0.00013**	**0.13438**	**-0.00003**	**0.00207**	**0.00058**
%RSD	0.11243	0.82821	0.02151	425.03431	305.24576	0.74571	3738.27042	47.64117	161.49038

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.41348	-0.00085	0.00101	-0.00449	-0.00084	-0.00423	-0.01129	-0.00014	0.16047
#2	0.42650	-0.00061	0.00103	-0.00448	-0.00102	-0.00658	-0.00486	-0.00016	0.16157
Mean	**0.41999**	**-0.00073**	**0.00102**	**-0.00448**	**-0.00093**	**-0.00540**	**-0.00807**	**-0.00015**	**0.16102**
%RSD	2.19138	23.54803	1.48887	0.20569	13.75804	30.72093	56.36928	7.88015	0.48362

	Zr	**Pb**	**Se**
	ppm	calc	calc

#1	-0.00030	-0.00095	0.00040	**CH**
#2	-0.00021	0.00044	0.00175	
Mean	**-0.00025**	**-0.00026**	**0.00108**	
%RSD	25.90703	384.45543	88.50163	

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:27
SampleId1 : 1002174-10 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:57:27
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE34

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00053	0.03329	-0.00080	0.00242	0.00610	-0.00010	-0.00517	0.01820	-0.00043
#2	0.00026	0.03652	0.00277	0.00298	0.00636	-0.00010	0.00024	0.01899	-0.00004
Mean	**-0.00013**	**0.03491**	**0.00099**	**0.00270**	**0.00623**	**-0.00010**	**-0.00246**	**0.01860**	**-0.00023**
%RSD	425.45248	6.54490	255.50728	14.54848	2.89030	1.28299	155.47114	3.02743	117.71853

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00057	0.00002	0.00458	3.92319	-0.38362	0.00191	-0.01085	0.01485	0.00385
#2	0.00007	0.00039	0.00472	3.95680	-0.38862	0.00190	-0.00607	0.01482	0.00377
Mean	**-0.00025**	**0.00020**	**0.00465**	**3.93999**	**-0.38612**	**0.00191**	**-0.00846**	**0.01484**	**0.00381**
%RSD	178.91903	130.74564	2.01486	0.60320	0.91570	0.31420	39.97468	0.17721	1.45123

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	111.31944	0.00357	0.00644	0.00315	0.00294	0.02597	-0.00037	-0.00076	-0.00042
#2	111.69477	0.00404	0.01386	0.00371	0.00209	0.02881	0.00069	0.00321	-0.00215
Mean	**111.50710**	**0.00381**	**0.01015**	**0.00343**	**0.00251**	**0.02739**	**0.00016**	**0.00123**	**-0.00128**
%RSD	0.23801	8.85778	51.68679	11.43912	23.95222	7.31582	465.05031	228.67176	95.61774

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00535	-0.00268	-0.00215	-0.00097	-0.00110	-0.00442	-0.01692	-0.00039	0.02581
#2	0.01071	-0.00255	-0.00212	-0.00130	-0.00116	-0.00315	-0.00355	0.00001	0.02615
Mean	**0.00803**	**-0.00262**	**-0.00214**	**-0.00114**	**-0.00113**	**-0.00378**	**-0.01023**	**-0.00019**	**0.02598**
%RSD	47.24129	3.28927	0.94586	20.54221	3.53737	23.63124	92.31208	145.82527	0.93512

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00032	0.00301	-0.00053
#2	0.00001	0.00263	-0.00036
Mean	**-0.00016**	**0.00282**	**-0.00045**
%RSD	147.29377	9.60059	26.24292

20000512

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:27
SampleId1 : 1002174-11 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 15:59:14

Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE35

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00093	0.04482	-0.00350	0.00449	0.01066	-0.00011	-0.00607	1.08212	-0.00073
#2	-0.00022	0.04858	0.00022	0.00433	0.01085	-0.00011	-0.00095	1.08759	-0.00011
Mean	**-0.00057**	**0.04670**	**-0.00164**	**0.00441**	**0.01076**	**-0.00011**	**-0.00351**	**1.08485**	**-0.00042**
%RSD	88.15909	5.69671	160.15693	2.54712	1.30198	3.28709	103.20409	0.35638	102.96676

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00032	0.00239	-0.00128	5.04591	-0.35481	0.00196	-0.02020	0.02054	-0.00173
#2	0.00010	0.00292	-0.00108	5.04919	-0.34172	0.00198	-0.01542	0.02069	-0.00186
Mean	**-0.00011**	**0.00265**	**-0.00118**	**5.04755**	**-0.34826**	**0.00197**	**-0.01781**	**0.02062**	**-0.00179**
%RSD	265.10755	14.24030	11.90530	0.04586	2.65877	0.80968	18.99068	0.51010	5.13702

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	110.48161	0.00090	0.00664	0.00421	0.00477	0.02739	-0.00133	0.00133	0.00021
#2	110.35751	0.00115	0.00905	0.00716	0.00557	0.02597	-0.00045	0.00386	-0.00115
Mean	**110.41956**	**0.00102**	**0.00784**	**0.00568**	**0.00517**	**0.02668**	**-0.00089**	**0.00259**	**-0.00047**
%RSD	0.07947	17.38356	21.69118	36.74750	11.01728	3.75503	70.17849	69.07967	203.37045

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00641	0.00036	-0.00158	-0.00184	-0.00106	-0.00159	-0.01471	-0.00033	0.16192
#2	0.01088	0.00036	-0.00154	0.00169	-0.00086	-0.00345	0.00611	-0.00027	0.16288
Mean	**0.00864**	**0.00036**	**-0.00156**	**-0.00008**	**-0.00096**	**-0.00252**	**-0.00430**	**-0.00030**	**0.16240**
%RSD	36.53356	0.04656	1.94594	3178.25353	15.17514	52.32588	342.59187	13.47631	0.41959

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00043	0.00458	0.00058
#2	-0.00022	0.00610	0.00052
Mean	**-0.00032**	**0.00534**	**0.00055**
%RSD	45.10829	20.13502	7.91100

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:27
SampleId1 : 1002174-11D SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 16:01:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE36

20000513

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00021	0.04721	-0.00042	0.00306	0.01066	-0.00013	0.00062	1.07699	-0.00045
#2	0.00040	0.04929	-0.00098	0.00373	0.01091	-0.00013	-0.00291	1.08132	-0.00015

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00013	0.02663	0.00010	-0.00159	0.00152	-0.00010	-0.00174	0.19418	-0.00024
#2	-0.00046	0.02140	-0.00237	-0.00178	0.00163	-0.00010	-0.00066	0.19566	-0.00065
Mean	**-0.00029**	**0.02401**	**-0.00113**	**-0.00169**	**0.00158**	**-0.00010**	**-0.00120**	**0.19492**	**-0.00045**
%RSD	80.45785	15.39605	154.48493	8.32775	5.07887	0.99697	63.67548	0.53654	64.56247

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00039	-0.00073	-0.00120	1.02602	-0.33314	0.00219	-0.03564	0.00366	-0.00162
#2	-0.00042	-0.00039	-0.00192	1.03363	-0.33933	0.00217	-0.03412	0.00370	-0.00087
Mean	**-0.00040**	**-0.00056**	**-0.00156**	**1.02983**	**-0.33624**	**0.00218**	**-0.03488**	**0.00368**	**-0.00125**
%RSD	1543.31311	1.64807	46.48382	0.39568	0.00000	0.00000	1.79206	1.15292	28.04177

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	110.28363	0.00115	0.00464	0.00456	0.00443	0.02456	-0.00080	0.00391	-0.00011
#2	110.44316	0.00169	0.01075	0.00677	0.00381	0.02031	-0.00015	0.00177	-0.00052
Mean	**110.36339**	**0.00142**	**0.00769**	**0.00567**	**0.00412**	**0.02243**	**-0.00048**	**0.00284**	**-0.00032**
%RSD	0.10221	26.94259	56.20927	27.66763	10.60622	13.39979	95.86550	53.15478	91.97275

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00755	0.00073	-0.00157	-0.00078	-0.00097	-0.00243	0.00266	-0.00016	0.16309
#2	0.00992	-0.00195	-0.00151	0.00124	-0.00090	0.00144	0.00909	-0.00005	0.16412
Mean	**0.00873**	**-0.00061**	**-0.00154**	**0.00023**	**-0.00093**	**-0.00049**	**0.00588**	**-0.00010**	**0.16360**
%RSD	19.22000	310.47193	2.95277	611.92757	5.45771	556.35670	77.31198	79.61038	0.44626

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00033	0.00447	0.00123
#2	-0.00009	0.00480	0.00024
Mean	**-0.00021**	**0.00463**	**0.00073**
%RSD	80.68373	4.98201	95.03795

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:28
SampleId1 : 1002174-11L 5X SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 16:02:51
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE37

Final concentrations

20000514

%RSD	4.60589	42.55662	32.56443	0.52296	1.30179	0.82417	3.08556	0.71376	42.87793

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	22.19785	-0.00045	0.00032	0.00099	0.00202	0.00189	-0.00142	0.00065	-0.00085
#2	22.21070	-0.00012	-0.00308	-0.00054	0.00152	0.00189	-0.00064	0.00205	0.00019
Mean	**22.20427**	**-0.00028**	**-0.00138**	**0.00022**	**0.00177**	**0.00189**	**-0.00103**	**0.00135**	**-0.00033**
%RSD	0.04093	81.18258	174.70201	483.82138	20.08943	0.00000	53.13980	73.37232	222.94680

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00769	-0.00207	-0.00234	-0.00103	-0.00109	-0.00424	-0.01742	-0.00096	0.03289
#2	-0.00647	-0.00292	-0.00232	-0.00153	-0.00111	-0.00170	-0.01098	-0.00090	0.03241
Mean	**-0.00708**	**-0.00249**	**-0.00233**	**-0.00128**	**-0.00110**	**-0.00297**	**-0.01420**	**-0.00093**	**0.03265**
%RSD	12.18210	24.13367	0.43376	27.64058	0.99180	60.57373	32.06026	4.40748	1.04195

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00034	0.00168	-0.00035
#2	-0.00047	0.00083	0.00081
Mean	**-0.00040**	**0.00126**	**0.00023**
%RSD	22.79782	47.51310	361.47105

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:28
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 16:04:40
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.19867	50.07858	0.50013	0.95076	0.96756	0.49340	0.49216	48.21249	0.48310
#2	0.19897	49.98753	0.50384	0.94960	0.96850	0.49325	0.48989	48.19796	0.48341
Mean	**0.19882**	**50.03306**	**0.50198**	**0.95018**	**0.96803**	**0.49332**	**0.49103**	**48.20522**	**0.48325**
%RSD	0.10461	0.12868	0.52176	0.08605	0.06885	0.02054	0.32686	0.02131	0.04545

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49037	0.97876	0.97623	19.97960	49.06013	0.50896	49.77139	0.96065	0.96995
#2	0.49075	0.97850	0.97408	19.96878	48.97936	0.50821	49.71472	0.96091	0.96638
Mean	**0.49056**	**0.97863**	**0.97516**	**19.97419**	**49.01974**	**0.50859**	**49.74305**	**0.96078**	**0.96817**
%RSD	0.05367	0.01834	0.15550	0.03833	0.11651	0.10364	0.08056	0.01942	0.26092

20000515

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	48.83017	0.97250	4.83978	0.94815	0.94978	4.87613	0.47434	0.98378	0.98876
#2	48.70668	0.97897	4.82975	0.94834	0.94253	4.85618	0.47558	0.98667	0.98321
Mean	**48.76842**	**0.97573**	**4.83477**	**0.94825**	**0.94616**	**4.86616**	**0.47496**	**0.98522**	**0.98599**
%RSD	0.17905	0.46871	0.14674	0.01395	0.54231	0.28994	0.18421	0.20712	0.39815

ted: 3/5/2010 16:43:37 User: ROY FRENCH

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.71174	0.98209	0.48275	0.13796	0.46412	0.49861	4.82461	0.47728	0.99808
#2	4.70994	0.98173	0.48352	0.13242	0.46457	0.49167	4.82362	0.47874	0.99947
Mean	**4.71084**	**0.98191**	**0.48314**	**0.13519**	**0.46435**	**0.49514**	**4.82412**	**0.47801**	**0.99877**
%RSD	0.02699	0.02646	0.11195	2.89794	0.06735	0.99187	0.01444	0.21711	0.09844

	Zr	Pb	Se
	ppm	calc	calc
#1	0.96137	0.94924	0.98710
#2	0.96107	0.94446	0.98436
Mean	**0.96122**	**0.94685**	**0.98573**
%RSD	0.02206	0.35680	0.19670

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:28
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/5/2010 16:06:33
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00045	0.05051	-0.00020	-0.00020	-0.00015	0.00016	0.00092	-0.00466	-0.00058
#2	-0.00137	0.05076	-0.00204	-0.00147	-0.00026	0.00011	-0.00361	-0.00808	-0.00001
Mean	**-0.00046**	**0.05064**	**-0.00112**	**-0.00083**	**-0.00021**	**0.00013**	**-0.00135**	**-0.00637**	**-0.00029**
%RSD	282.05066	0.34203	116.62317	107.98241	38.69505	26.84044	237.54489	37.87978	138.32537

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00008	0.00027	-0.00077	0.00777	-0.40124	0.00215	-0.00194	0.00017	-0.00183
#2	-0.00052	-0.00030	-0.00149	0.00640	-0.40529	0.00212	-0.00129	0.00006	-0.00066
Mean	**-0.00030**	**-0.00002**	**-0.00113**	**0.00708**	**-0.40326**	**0.00213**	**-0.00161**	**0.00011**	**-0.00125**
%RSD	105.79300	2450.25602	44.53171	13.73317	0.70979	1.02864	28.60677	69.09531	66.53476

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.14638	-0.00027	-0.00399	-0.00312	0.00206	0.00330	-0.00209	0.00092	-0.00167
#2	-0.15020	-0.00048	-0.00168	-0.00097	0.00131	0.00189	-0.00225	0.00178	0.00038
Mean	**-0.14829**	**-0.00038**	**-0.00283**	**-0.00205**	**0.00169**	**0.00259**	**-0.00217**	**0.00135**	**-0.00064**
%RSD	1.82364	39.87502	57.54597	74.46392	31.40405	38.61418	5.30137	44.78847	225.85105

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01131	-0.00195	-0.00215	-0.00140	-0.00072	-0.00138	-0.01574	-0.00033	-0.00071
#2	-0.01177	-0.00207	-0.00222	-0.00170	-0.00074	-0.00197	-0.01821	-0.00035	0.00025
Mean	**-0.01154**	**-0.00201**	**-0.00218**	**-0.00155**	**-0.00073**	**-0.00168**	**-0.01697**	**-0.00034**	**-0.00023**
%RSD	2.87038	4.28112	2.31814	13.83147	2.49182	24.86477	10.32054	3.99564	294.87971

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	Zr	Pb	SeCH
	ppm	calc	calc
#1	0.00034	0.00034	-0.00081
#2	0.00001	0.00055	0.00085
Mean	**0.00017**	**0.00044**	**0.00002**
%RSD	135.75090	34.51854	5660.97422

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:28
SampleId1 : 1002174-11MS SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 16:08:27
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE38

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10000	2.12140	2.04826	0.94964	1.98961	0.04740	-0.00753	1.09488	0.05105
#2	0.10112	2.11087	2.05443	0.95076	1.99267	0.04749	0.00192	1.09886	0.05094
Mean	**0.10056**	**2.11614**	**2.05135**	**0.95020**	**1.99114**	**0.04745**	**-0.00280**	**1.09687**	**0.05099**
%RSD	0.78931	0.35194	0.21259	0.08308	0.10860	0.13126	238.45022	0.25702	0.14835

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49844	0.19880	0.25627	6.10482	-0.32005	0.00208	-0.02216	0.50435	1.01020
#2	0.50003	0.19950	0.25612	6.11492	-0.30719	0.00211	-0.02042	0.50566	1.01160
Mean	**0.49923**	**0.19915**	**0.25620**	**6.10987**	**-0.31362**	**0.00210**	**-0.02129**	**0.50500**	**1.01090**
%RSD	0.22623	0.25012	0.04188	0.11692	2.89857	1.04663	5.77726	0.18351	0.09742

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	110.31360	0.49972	0.00574	0.48431	0.48430	0.03022	0.47661	1.97469	1.93875
#2	110.18818	0.49995	0.00303	0.48915	0.48132	0.03164	0.48071	1.95870	1.94414
Mean	**110.25089**	**0.49983**	**0.00439**	**0.48673**	**0.48281**	**0.03093**	**0.47866**	**1.96669**	**1.94144**
%RSD	0.08044	0.03206	43.65048	0.70233	0.43722	3.23903	0.60573	0.57507	0.19630

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.79214	0.51804	0.49171	0.00942	0.48286	2.08875	-0.02534	0.49865	0.65567
#2	1.79992	0.52158	0.49245	0.01362	0.48348	2.08789	-0.01395	0.50044	0.65934
Mean	**1.79603**	**0.51981**	**0.49208**	**0.01152**	**0.48317**	**2.08832**	**-0.01964**	**0.49955**	**0.65750**
%RSD	0.30623	0.48111	0.10681	25.76073	0.09032	0.02885	41.01644	0.25371	0.39468

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00225	0.48431	1.95072
#2	-0.00205	0.48393	1.94898
Mean	**-0.00215**	**0.48412**	**1.94985**
%RSD	6.59933	0.05570	0.06279

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SampleId1 : 1002174-11MSD **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 16:10:15
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE39

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10093	2.10616	2.05420	0.94414	1.96731	0.04743	0.00417	1.09602	0.05089
#2	0.10101	2.09864	2.05077	0.94837	1.98044	0.04751	-0.00340	1.09613	0.05087
Mean	**0.10097**	**2.10240**	**2.05248**	**0.94626**	**1.97388**	**0.04747**	**0.00039**	**1.09607**	**0.05088**
%RSD	0.06121	0.25287	0.11819	0.31583	0.47015	0.12096	1386.89930	0.00735	0.03159

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49868	0.20073	0.25390	6.11075	-0.26887	0.00219	-0.01520	0.50360	1.00671
#2	0.49906	0.19957	0.25412	6.12624	-0.28839	0.00216	-0.02064	0.50476	1.01112
Mean	**0.49887**	**0.20015**	**0.25401**	**6.11849**	**-0.27863**	**0.00217**	**-0.01792**	**0.50418**	**1.00892**
%RSD	0.05491	0.40902	0.06353	0.17895	4.95402	1.00994	21.44939	0.16280	0.30940

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	109.41487	0.49627	0.00574	0.49263	0.48201	0.02456	0.47934	1.97227	1.94669
#2	109.36841	0.49936	0.00514	0.48698	0.48344	0.02456	0.47692	1.96788	1.93918
Mean	**109.39164**	**0.49781**	**0.00544**	**0.48980**	**0.48273**	**0.02456**	**0.47813**	**1.97008**	**1.94293**
%RSD	0.03003	0.43810	7.82229	0.81632	0.20926	0.00000	0.35791	0.15755	0.27341

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	1.78649	0.52207	0.48675	-0.00012	0.47938	2.08689	-0.00155	0.49886	0.65955
#2	1.78325	0.52134	0.48967	0.00002	0.48077	2.08946	-0.01941	0.49884	0.65664
Mean	**1.78487**	**0.52170**	**0.48821**	**-0.00005**	**0.48008**	**2.08818**	**-0.01048**	**0.49885**	**0.65809**
%RSD	0.12822	0.09942	0.42317	195.62140	0.20528	0.08710	120.49287	0.00225	0.31249

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00104	0.48555	1.95521
#2	-0.00154	0.48462	1.94874
Mean	**-0.00129**	**0.48508**	**1.95197**
%RSD	27.51716	0.13558	0.23447

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:29
SampleId1 : 1002174-12 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 16:12:03
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE40

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Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	-0.00024	0.32068	0.00491	0.02934	0.01074	-0.00012	-0.00340	0.43803	0.00016
#2	0.00002	0.31965	-0.00279	0.02847	0.01012	-0.00014	0.00132	0.43734	0.00038
Mean	**-0.00011**	**0.32016**	**0.00106**	**0.02890**	**0.01043**	**-0.00013**	**-0.00104**	**0.43768**	**0.00027**
%RSD	160.63272	0.22737	512.34379	2.13687	4.21957	9.91250	320.68265	0.11032	57.80796

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00009	0.00089	0.00222	0.02227	0.22771	0.00219	0.14745	0.01508	0.00056
#2	0.00020	0.00051	0.00265	0.02148	0.22296	0.00218	0.14940	0.01500	0.00033
Mean	**0.00006**	**0.00070**	**0.00243**	**0.02188**	**0.22533**	**0.00218**	**0.14842**	**0.01504**	**0.00045**
%RSD	352.03169	38.47693	12.51396	2.56603	1.49262	0.45728	0.93236	0.34960	37.05184

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	137.41228	0.00185	7.43245	0.00140	0.00055	8.08905	0.01833	0.00029	0.00206
#2	137.12503	0.00171	7.45367	0.00035	0.00104	8.17061	0.01726	0.00135	0.00320
Mean	**137.26866**	**0.00178**	**7.44306**	**0.00088**	**0.00080**	**8.12983**	**0.01779**	**0.00082**	**0.00263**
%RSD	0.14797	5.48327	0.20158	85.04642	43.17316	0.70933	4.24794	92.17310	30.86796

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03844	-0.00024	0.00004	-0.00159	-0.00079	-0.00090	-0.00831	0.00056	0.08012
#2	0.03626	-0.00268	-0.00006	-0.00183	-0.00076	0.00010	-0.01128	-0.00001	0.08025
Mean	**0.03735**	**-0.00146**	**-0.00001**	**-0.00171**	**-0.00078**	**-0.00040**	**-0.00980**	**0.00028**	**0.08018**
%RSD	4.12194	117.73286	698.58620	9.75881	2.80254	175.16765	21.46195	144.30355	0.12128

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00025	0.00084	0.00147
#2	-0.00025	0.00081	0.00259
Mean	**-0.00025**	**0.00082**	**0.00203**
%RSD	0.22569	2.33668	39.12161

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:29
SampleId1 : 1002174-13 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 16:13:51
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE41

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00036	0.02925	0.00097	0.00592	0.01405	-0.00015	0.00220	1.23443	-0.00066
#2	-0.00033	0.02811	-0.00068	0.00449	0.01397	-0.00016	0.00338	1.23397	-0.00034
Mean	**-0.00035**	**0.02868**	**0.00014**	**0.00520**	**0.01401**	**-0.00015**	**0.00279**	**1.23420**	**-0.00050**
%RSD	6.73971	2.82762	820.78069	19.42546	0.42841	4.01861	30.01598	0.02611	45.86002

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00486	0.00127	-0.00244	22.52558	-0.35481	0.00192	-0.01781	0.06607	-0.00050

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#2	0.00499	0.00096	-0.00173	22.50084	-0.35672	0.00193	-0.01999	0.06610	-0.00043
Mean	**0.00492**	**0.00112**	**-0.00208**	**22.51321**	**-0.35576**	**0.00193**	**-0.01890**	**0.06609**	**-0.00046**
%RSD	1.89562	19.42837	24.14911	0.07772	0.37858	0.20716	8.13554	0.03981	11.90137

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	109.54533	0.00458	0.00704	0.00160	-0.00082	0.17618	0.00130	0.00254	-0.00306
#2	109.54135	0.00524	0.00684	0.00094	0.00008	0.16910	0.00137	0.00266	0.00034
Mean	**109.54334**	**0.00491**	**0.00694**	**0.00127**	**-0.00037**	**0.17264**	**0.00134**	**0.00260**	**-0.00136**
%RSD	0.00257	9.39564	2.04256	36.57740	173.23785	2.90230	3.35218	3.01397	176.95702

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00188	0.00109	-0.00110	0.00167	-0.00099	-0.00077	0.00859	-0.00054	0.06561
#2	0.00671	0.00000	-0.00113	0.00210	-0.00101	-0.00114	0.01307	-0.00053	0.06678
Mean	**0.00430**	**0.00055**	**-0.00112**	**0.00189**	**-0.00100**	**-0.00096**	**0.01083**	**-0.00054**	**0.06619**
%RSD	79.48829	141.73641	1.81284	16.16787	1.45506	27.30674	29.24734	1.83913	1.24858

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00006	-0.00001	-0.00120
#2	0.00000	0.00037	0.00111
Mean	**-0.00003**	**0.00018**	**-0.00004**
%RSD	122.67021	153.06577	3890.08437

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:30
SampleId1 : 1002174-14 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 16:15:40
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE42

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00023	0.02486	0.00198	0.00357	0.01450	-0.00022	0.00377	0.48492	-0.00057
#2	0.00084	0.02852	-0.00065	0.00346	0.01476	-0.00023	0.00092	0.48719	-0.00028
Mean	**0.00053**	**0.02669**	**0.00067**	**0.00351**	**0.01463**	**-0.00022**	**0.00235**	**0.48605**	**-0.00043**
%RSD	81.54671	9.69131	278.22058	2.39577	1.23058	2.88328	85.89958	0.33115	47.36624

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00639	0.00079	-0.00093	3.20269	-0.42339	0.00177	-0.02086	0.01459	-0.00136
#2	0.00642	0.00071	-0.00086	3.21186	-0.42982	0.00171	-0.02107	0.01463	-0.00063
Mean	**0.00640**	**0.00075**	**-0.00090**	**3.20728**	**-0.42660**	**0.00174**	**-0.02096**	**0.01461**	**-0.00100**
%RSD	0.29263	7.44138	5.27164	0.20229	1.06570	2.51866	0.73339	0.17991	51.66174

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	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	108.79945	0.00457	0.00895	0.00036	0.00012	0.08265	-0.00007	-0.00208	-0.00094
#2	109.18198	0.00408	0.00865	0.00335	-0.00046	0.09257	-0.00059	0.00264	-0.00136

Mean	**108.99071**	**0.00433**	**0.00880**	**0.00185**	**-0.00017**	**0.08761**	**-0.00033**	**0.00028**	**-0.00115**
%RSD	0.24817	7.99689	2.41782	114.13872	242.42401	8.00568	113.01791	1197.32549	25.58371

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00380	-0.00341	-0.00143	-0.00022	-0.00089	-0.00028	-0.00056	-0.00033	0.10150
#2	0.00270	-0.00110	-0.00142	0.00090	-0.00076	-0.00358	0.00538	-0.00008	0.10143
Mean	**0.00325**	**-0.00225**	**-0.00142**	**0.00034**	**-0.00083**	**-0.00193**	**0.00241**	**-0.00020**	**0.10147**
%RSD	23.83749	72.57063	0.71057	231.85308	10.98773	121.01586	174.41273	84.83482	0.04793

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00009	0.00020	-0.00132
#2	-0.00010	0.00080	-0.00003
Mean	**-0.00009**	**0.00050**	**-0.00067**
%RSD	4.11585	84.99724	135.52254

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:30
SampleId1 : 1002174-15 **SampleId2 :** **[SAMPLE]**
Analysis commenced : 3/5/2010 16:17:32
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE43

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00039	0.02633	-0.00005	0.00357	0.00972	-0.00012	0.00142	0.79285	-0.00005
#2	0.00019	0.03149	0.00104	0.00282	0.00984	-0.00013	0.00003	0.79592	-0.00045
Mean	**0.00029**	**0.02891**	**0.00050**	**0.00320**	**0.00978**	**-0.00012**	**0.00072**	**0.79439**	**-0.00025**
%RSD	49.34180	12.63456	154.29121	16.68022	0.81824	0.93917	135.10684	0.27365	114.39687

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00448	0.00040	-0.00102	1.18022	-0.31719	0.00203	-0.01846	0.00701	-0.00131
#2	0.00395	0.00077	-0.00143	1.18726	-0.32029	0.00202	-0.01803	0.00701	-0.00131
Mean	**0.00422**	**0.00059**	**-0.00122**	**1.18374**	**-0.31874**	**0.00202**	**-0.01825**	**0.00701**	**-0.00131**
%RSD	8.85725	44.16580	23.91223	0.42036	0.68660	0.09860	1.68528	0.00000	0.00000

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	108.51592	0.00456	0.00504	0.00342	-0.00148	0.05998	0.00119	0.00373	-0.00226
#2	109.10263	0.00409	0.00875	0.00314	0.00186	0.05998	0.00065	0.01040	-0.00062
Mean	**108.80928**	**0.00433**	**0.00689**	**0.00328**	**0.00019**	**0.05998**	**0.00092**	**0.00707**	**-0.00144**
%RSD	0.38128	7.58680	38.06212	6.12580	1227.28847	0.00000	41.54313	66.82008	80.41036

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00854	-0.00231	-0.00162	-0.00339	-0.00092	-0.00025	0.01767	-0.00021	0.14595
#2	0.00816	-0.00134	-0.00164	-0.00211	-0.00084	0.00106	-0.00216	-0.00002	0.14609
Mean	**0.00835**	**-0.00183**	**-0.00163**	**-0.00275**	**-0.00088**	**0.00040**	**0.00775**	**-0.00012**	**0.14602**

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%RSD	3.20810	37.68012	1.24040	32.74612	6.64006	230.75560	180.89536	113.01236	0.06665

	Zr	Pb	Se
	ppm	calc	calc
#1	0.00022	0.00015	-0.00026
#2	-0.00001	0.00229	0.00305
Mean	**0.00011**	**0.00122**	**0.00139**
%RSD	150.91898	123.58147	168.28483

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:30
SampleId1 : 1002174-16 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 16:19:21
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE44

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00082	0.02163	-0.00072	0.00326	0.01481	-0.00020	0.00013	0.76996	-0.00039
#2	-0.00086	0.02764	-0.00192	0.00215	0.01493	-0.00020	-0.00282	0.77304	-0.00067
Mean	**-0.00084**	**0.02464**	**-0.00132**	**0.00270**	**0.01487**	**-0.00020**	**-0.00135**	**0.77150**	**-0.00053**
%RSD	3.00665	17.24513	64.26466	29.09696	0.53808	3.23642	154.66474	0.28176	36.88001

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00370	0.00287	-0.00178	4.01281	-0.41624	0.00180	-0.02173	0.01746	-0.00116
#2	0.00370	0.00275	-0.00135	4.03586	-0.43529	0.00176	-0.01933	0.01757	-0.00113
Mean	**0.00370**	**0.00281**	**-0.00156**	**4.02434**	**-0.42577**	**0.00178**	**-0.02053**	**0.01751**	**-0.00114**
%RSD	0.01152	2.85831	19.44116	0.40502	3.16379	1.57224	8.23821	0.45038	1.61350

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	108.78483	0.00126	0.00764	-0.00016	0.00297	0.03873	-0.00157	0.00155	0.00151
#2	109.32578	0.00175	0.00684	-0.00074	0.00273	0.03589	-0.00133	0.00615	0.00207
Mean	**109.05531**	**0.00150**	**0.00724**	**-0.00045**	**0.00285**	**0.03731**	**-0.00145**	**0.00385**	**0.00179**
%RSD	0.35075	23.00912	7.83093	90.42151	5.96976	5.37098	11.64277	84.59597	22.10814

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00409	0.00049	-0.00157	0.00010	-0.00101	-0.00447	-0.01400	-0.00109	0.07613
#2	0.00887	0.00109	-0.00155	0.00032	-0.00122	-0.00447	-0.01501	-0.00079	0.07681
Mean	**0.00648**	**0.00079**	**-0.00156**	**0.00021**	**-0.00111**	**-0.00447**	**-0.01451**	**-0.00094**	**0.07647**
%RSD	52.06891	54.49069	0.64865	73.15509	13.42905	0.05738	4.90938	22.97280	0.63581

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00049	0.00193	0.00152
#2	-0.00052	0.00157	0.00343
Mean	**-0.00050**	**0.00175**	**0.00248**
%RSD	4.19271	14.30341	54.44058

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ted: 3/5/2010 16:43:37 User: ROY FRENCH
Method : Paragon File : 100305A Printed : 3/5/2010 16:43:30
SampleId1 : 1002174-17 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 16:21:09
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE45

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00010	0.02803	-0.00215	0.00238	0.00771	-0.00024	0.00112	0.28315	0.00081
#2	-0.00030	0.02360	0.00003	0.00207	0.00777	-0.00022	-0.00381	0.28349	0.00105
Mean	**-0.00020**	**0.02582**	**-0.00106**	**0.00222**	**0.00774**	**-0.00023**	**-0.00135**	**0.28332**	**0.00093**
%RSD	70.60429	12.12253	145.38443	10.09341	0.51674	5.91747	258.84401	0.08519	18.54947

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00012	0.00114	-0.00050	0.94375	-0.38814	0.00185	-0.01977	0.00917	-0.00095
#2	-0.00054	0.00088	-0.00077	0.95025	-0.40862	0.00179	-0.02542	0.00913	-0.00102
Mean	**-0.00033**	**0.00101**	**-0.00064**	**0.94700**	**-0.39838**	**0.00182**	**-0.02260**	**0.00915**	**-0.00099**
%RSD	90.97789	17.86413	29.92576	0.48493	3.63467	2.08571	17.69198	0.28738	5.60835

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	107.61779	0.00039	0.03171	0.01588	0.01495	0.06848	0.00094	0.00130	-0.00114
#2	108.31202	0.00051	0.03161	0.01412	0.01595	0.07415	0.00035	-0.00064	0.00035
Mean	**107.96491**	**0.00045**	**0.03166**	**0.01500**	**0.01545**	**0.07132**	**0.00065**	**0.00033**	**-0.00040**
%RSD	0.45468	17.74978	0.22397	8.29022	4.57336	5.61987	64.65527	414.85856	267.28600

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.01505	0.00097	0.00087	-0.00012	-0.00088	-0.00421	-0.00101	-0.00043	15.61560
#2	0.01440	-0.00243	0.00087	0.00025	-0.00095	-0.00172	-0.02282	-0.00043	15.65336
Mean	**0.01472**	**-0.00073**	**0.00087**	**0.00007**	**-0.00092**	**-0.00296**	**-0.01191**	**-0.00043**	**15.63448**
%RSD	3.11608	329.37970	0.00000	383.74069	5.16758	59.39039	129.47191	0.20840	0.17080

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	-0.00015	0.01526	-0.00033
#2	-0.00041	0.01534	0.00002
Mean	**-0.00028**	**0.01530**	**-0.00015**
%RSD	65.33228	0.37368	161.38237

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:31
SampleId1 : 1002174-18 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 16:22:58
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE46

Final concentrations

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	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00086	0.02947	0.00097	0.00195	0.01165	-0.00015	0.00052	0.29999	0.00805
#2	0.00062	0.02895	0.00179	0.00143	0.01190	-0.00015	0.00200	0.30204	0.00801
Mean	**-0.00012**	**0.02921**	**0.00138**	**0.00169**	**0.01177**	**-0.00015**	**0.00126**	**0.30101**	**0.00803**
%RSD	867.40410	1.24939	42.28394	21.60621	1.52919	1.99252	82.79380	0.48112	0.37505

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00015	0.00010	-0.00100	3.71972	-0.33553	0.00200	-0.01759	0.02526	-0.00076
#2	0.00050	0.00004	-0.00072	3.72887	-0.33957	0.00199	-0.01172	0.02545	-0.00079
Mean	**0.00032**	**0.00007**	**-0.00086**	**3.72429**	**-0.33755**	**0.00200**	**-0.01466**	**0.02536**	**-0.00078**
%RSD	74.92896	60.83245	22.48397	0.17372	0.84787	0.29956	28.31967	0.51845	2.37091

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	109.94997	0.00182	0.05227	0.01003	0.00830	0.03731	-0.00095	0.00337	-0.00173
#2	109.95536	0.00132	0.05307	0.01074	0.00813	0.03589	0.00351	0.00365	-0.00062
Mean	**109.95266**	**0.00157**	**0.05267**	**0.01038**	**0.00821**	**0.03660**	**0.00128**	**0.00351**	**-0.00118**
%RSD	0.00347	22.56368	1.07713	4.80363	1.47225	2.73747	245.60850	5.64314	66.98415

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02276	-0.00085	0.00147	0.00151	-0.00086	-0.00485	-0.00637	-0.00047	34.61770
#2	0.02498	-0.00122	0.00150	0.00262	-0.00084	0.00057	0.00949	0.00004	34.69415
Mean	**0.02387**	**-0.00104**	**0.00148**	**0.00206**	**-0.00085**	**-0.00214**	**0.00156**	**-0.00022**	**34.65593**
%RSD	6.59092	24.92447	1.70407	38.16764	1.71020	178.76347	718.09828	165.47966	0.15598

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00033	0.00888	-0.00003
#2	-0.00030	0.00900	0.00080
Mean	**-0.00031**	**0.00894**	**0.00039**
%RSD	7.06284	0.95636	153.46722

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:31
SampleId1 : 1002175-2 SampleId2 : [SAMPLE]
Analysis commenced : 3/5/2010 16:24:46
Dilution ratio : 1.00000 to 1.00000 Tray : Position : TUBE47

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00046	0.37627	0.00348	0.01068	0.03414	-0.00007	-0.00229	20.67480	0.01428
#2	-0.00046	0.38125	0.00341	0.01060	0.03422	-0.00008	-0.00149	20.65352	0.01390
Mean	**-0.00046**	**0.37876**	**0.00345**	**0.01064**	**0.03418**	**-0.00007**	**-0.00189**	**20.66416**	**0.01409**
%RSD	0.87577	0.92952	1.54073	0.52762	0.17561	6.17589	29.75307	0.07282	1.89787

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo

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	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00303	0.00523	2.13280	0.32823	5.71632	0.00547	4.38776	0.24489	0.04571
#2	0.00308	0.00529	2.13523	0.32749	5.72950	0.00549	4.38776	0.24471	0.04605
Mean	**0.00306**	**0.00526**	**2.13401**	**0.32786**	**5.72291**	**0.00548**	**4.38776**	**0.24480**	**0.04588**
%RSD	1.22157	0.79961	0.08047	0.16012	0.16288	0.29144	0.00000	0.05388	0.52234

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	138.68298	0.01533	0.55204	0.00562	0.00900	18.88473	0.00493	0.00552	0.00809
#2	138.79371	0.01552	0.54360	0.00778	0.00992	18.80214	0.00427	0.00767	0.00645
Mean	**138.73834**	**0.01543**	**0.54782**	**0.00670**	**0.00946**	**18.84344**	**0.00460**	**0.00660**	**0.00727**
%RSD	0.05643	0.86248	1.08972	22.79738	6.85537	0.30990	10.02148	23.01555	15.91011

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.03870	-0.00098	0.04294	-0.00490	0.00157	-0.00687	-0.01595	0.00172	1.14100
#2	0.04148	-0.00219	0.04298	-0.00542	0.00162	-0.00315	-0.00852	0.00161	1.13466
Mean	**0.04009**	**-0.00159**	**0.04296**	**-0.00516**	**0.00160**	**-0.00501**	**-0.01224**	**0.00167**	**1.13783**
%RSD	4.91057	54.24981	0.07073	7.03622	2.50816	52.48307	42.97089	4.78050	0.39383

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00069	0.00788	0.00723
#2	0.00082	0.00921	0.00686
Mean	**0.00075**	**0.00854**	**0.00705**
%RSD	12.66505	11.01719	3.77099

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:31
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 16:26:35
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20117	50.06504	0.50686	0.95463	0.96682	0.49830	0.50143	48.88150	0.48685
#2	0.20047	49.95211	0.50830	0.95718	0.96685	0.49904	0.50822	48.89810	0.48865
Mean	**0.20082**	**50.00857**	**0.50758**	**0.95590**	**0.96683**	**0.49867**	**0.50482**	**48.88980**	**0.48775**
%RSD	0.24718	0.15968	0.20010	0.18877	0.00209	0.10426	0.95135	0.02401	0.26107

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49621	0.98912	0.97816	20.12852	48.86020	0.50582	50.33444	0.96770	0.97468
#2	0.49579	0.98823	0.97608	20.14688	48.75644	0.50474	50.34927	0.96841	0.97303
Mean	**0.49600**	**0.98868**	**0.97712**	**20.13770**	**48.80832**	**0.50528**	**50.34185**	**0.96806**	**0.97385**
%RSD	0.06068	0.06413	0.15074	0.06445	0.15033	0.15194	0.02084	0.05232	0.12017

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

#1	48.50996	0.98714	4.77601	0.96305	0.93123	4.91034	0.48000	0.99690	0.96013
#2	48.39289	0.98867	4.84050	0.96000	0.93665	4.90179	0.48301	0.99898	0.97042
Mean	**48.45143**	**0.98790**	**4.80826**	**0.96153**	**0.93394**	**4.90606**	**0.48150**	**0.99794**	**0.96527**
%RSD	0.17084	0.10941	0.94843	0.22434	0.41061	0.12325	0.44171	0.14735	0.75401

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.72405	0.99518	0.48425	0.13519	0.46643	0.50566	4.82351	0.48300	1.01907
#2	4.72499	1.00044	0.48442	0.13472	0.46670	0.50216	4.83541	0.48240	1.02130
Mean	**4.72452**	**0.99781**	**0.48434**	**0.13496**	**0.46657**	**0.50391**	**4.82946**	**0.48270**	**1.02019**
%RSD	0.01401	0.37272	0.02446	0.24805	0.04131	0.49073	0.17419	0.08781	0.15424

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.96694	0.94183	0.97237
#2	0.96682	0.94443	0.97993
Mean	**0.96688**	**0.94313**	**0.97615**
%RSD	0.00909	0.19505	0.54748

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:32
SampleId1 : CCB **SampleId2 :** **[CB]**
Analysis commenced : 3/5/2010 16:28:29
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00010	0.05113	0.00153	-0.00206	-0.00024	0.00006	-0.00282	-0.00853	0.00011
#2	-0.00036	0.04968	-0.00080	-0.00079	-0.00024	0.00004	0.00397	-0.01228	-0.00010
Mean	**-0.00023**	**0.05040**	**0.00037**	**-0.00143**	**-0.00024**	**0.00005**	**0.00057**	**-0.01041**	**0.00000**
%RSD	79.40085	2.02763	447.77729	62.93294	0.00000	34.99233	835.17117	25.50171	3033.88966

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00029	-0.00007	-0.00071	0.00587	-0.41648	0.00210	-0.00194	0.00002	-0.00048
#2	-0.00013	-0.00042	-0.00136	0.00481	-0.43291	0.00207	-0.00977	-0.00005	-0.00097
Mean	**0.00008**	**-0.00025**	**-0.00104**	**0.00534**	**-0.42470**	**0.00209**	**-0.00585**	**-0.00002**	**-0.00073**
%RSD	361.19577	102.75983	44.16761	14.01980	2.73565	1.14874	94.57703	328.99309	48.28538

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.14792	-0.00060	0.00073	0.00075	-0.00082	0.00047	-0.00017	0.00500	-0.00303
#2	-0.15184	-0.00002	-0.00198	-0.00092	0.00176	-0.00236	0.00161	0.00286	0.00275
Mean	**-0.14988**	**-0.00031**	**-0.00063**	**-0.00008**	**0.00047**	**-0.00095**	**0.00072**	**0.00393**	**-0.00014**
%RSD	1.85116	131.97539	304.90917	1401.66244	384.33896	211.45964	174.45997	38.45168	2946.62888

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01118	-0.00280	-0.00219	-0.00142	-0.00067	-0.00097	-0.00483	0.00012	0.00059

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#2	-0.01276	-0.00195	-0.00224	-0.00142	-0.00074	-0.00303	0.00013	-0.00020	0.00046
Mean	**-0.01197**	**-0.00237**	**-0.00221**	**-0.00142**	**-0.00070**	**-0.00200**	**-0.00235**	**-0.00004**	**0.00053**
%RSD	9.31457	25.36865	1.59911	0.12163	6.71538	72.66624	149.14175	611.73437	18.50379

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00035	-0.00029	-0.00035
#2	0.00022	0.00087	0.00279
Mean	**0.00029**	**0.00029**	**0.00122**
%RSD	30.70553	284.97858	182.52767

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:32
SampleId1 : CRI **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/5/2010 16:30:23
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD3

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.02054	0.44949	0.01505	0.41502	0.42228	0.01047	0.05527	5.34754	0.01040
#2	0.02079	0.45882	0.01058	0.41685	0.42617	0.01054	0.05359	5.37263	0.01040
Mean	**0.02066**	**0.45416**	**0.01282**	**0.41594**	**0.42423**	**0.01050**	**0.05443**	**5.36008**	**0.01040**
%RSD	0.85908	1.45201	24.65716	0.31103	0.64870	0.49629	2.17215	0.33102	0.04301

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.10579	0.02113	0.05305	0.21637	3.73370	0.01854	5.41090	0.03077	0.02061
#2	0.10608	0.02104	0.05276	0.21706	3.76158	0.01859	5.43182	0.03095	0.02055
Mean	**0.10594**	**0.02109**	**0.05291**	**0.21672**	**3.74764**	**0.01857**	**5.42136**	**0.03086**	**0.02058**
%RSD	0.19771	0.30475	0.38601	0.22477	0.52600	0.19328	0.27280	0.42603	0.17910

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.31907	0.08474	0.20857	0.00772	0.00502	0.21445	0.12428	0.01728	0.00939
#2	4.36505	0.08559	0.21107	0.00615	0.00533	0.21870	0.12296	0.01053	0.00901
Mean	**4.34206**	**0.08517**	**0.20982**	**0.00693**	**0.00517**	**0.21657**	**0.12362**	**0.01390**	**0.00920**
%RSD	0.74881	0.70864	0.84551	15.99202	4.23633	1.38820	0.75052	34.29777	2.94227

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.09998	0.10897	0.01931	0.09257	0.01967	0.02139	0.21265	0.10670	0.04120
#2	0.10256	0.10678	0.01946	0.09244	0.01976	0.02261	0.21661	0.10738	0.04079
Mean	**0.10127**	**0.10788**	**0.01939**	**0.09251**	**0.01971**	**0.02200**	**0.21463**	**0.10704**	**0.04100**
%RSD	1.80392	1.43581	0.54805	0.10330	0.35059	3.90870	1.30641	0.44697	0.71126

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.05308	0.00592	0.01202
#2	0.05343	0.00560	0.00951

20000527

Mean	**0.05326**	**0.00576**	**0.01077CH**
%RSD	0.46928	3.87238	16.42853

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:32
SampleId1 : ICSA **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/5/2010 16:32:17
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD4

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00041	272.45920	0.00007	-0.00278	-0.00035	0.00029	0.00416	269.49624	-0.00046
#2	-0.00126	274.72397	-0.00065	-0.00357	-0.00046	0.00029	0.00101	269.86899	-0.00047
Mean	**-0.00043**	**273.59158**	**-0.00029**	**-0.00317**	**-0.00040**	**0.00029**	**0.00259**	**269.68261**	**-0.00047**
%RSD	277.53339	0.58534	174.26622	17.68755	19.76601	0.61622	86.10557	0.09773	0.65912

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00130	-0.00094	-0.00546	110.21549	-0.53031	0.00367	278.67078	-0.00113	-0.00160
#2	0.00069	-0.00143	-0.00545	110.52497	-0.55151	0.00364	279.40229	-0.00124	-0.00066
Mean	**0.00099**	**-0.00118**	**-0.00545**	**110.37023**	**-0.54091**	**0.00365**	**279.03653**	**-0.00119**	**-0.00113**
%RSD	43.18890	29.18505	0.11192	0.19827	2.77108	0.65535	0.18537	6.64363	58.75649

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.15313	0.00081	0.00534	0.00000	0.00177	0.00472	0.00352	0.00578	-0.00392
#2	-0.15502	0.00046	0.00945	-0.00502	0.00412	0.01039	0.00288	0.00304	-0.00370
Mean	**-0.15408**	**0.00063**	**0.00739**	**-0.00251**	**0.00294**	**0.00755**	**0.00320**	**0.00441**	**-0.00381**
%RSD	0.86617	39.31983	39.31708	141.25391	56.45328	53.05431	14.18057	43.96634	4.09898

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.01547	0.00049	0.01073	-0.00487	-0.00113	-0.00690	0.03761	-0.00174	-0.00030
#2	-0.01579	0.00024	0.01082	-0.00462	-0.00119	-0.00380	0.02650	-0.00211	-0.00037
Mean	**-0.01563**	**0.00036**	**0.01077**	**-0.00475**	**-0.00116**	**-0.00535**	**0.03205**	**-0.00193**	**-0.00033**
%RSD	1.44761	47.26168	0.61032	3.71165	3.76479	41.04096	24.52296	13.64345	14.55804

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.00219	0.00118	-0.00069
#2	0.00205	0.00107	-0.00146
Mean	**0.00212**	**0.00113**	**-0.00107**
%RSD	4.68710	6.53563	50.39857

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Method : Paragon File : 100305A Printed : 3/5/2010 16:43:33
SampleId1 : ICSAB **SampleId2 :** **[FLEXQC]**
Analysis commenced : 3/5/2010 16:34:11
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD5

Final concentrations:**37** **User: ROY FRENCH**

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.21174	273.33151	0.11148	1.00069	0.51334	0.48625	0.53673	267.76492	1.01718
#2	0.21140	274.53176	0.11438	1.00587	0.51632	0.48821	0.53617	268.67530	1.02238
Mean	**0.21157**	**273.93163**	**0.11293**	**1.00328**	**0.51483**	**0.48723**	**0.53645**	**268.22011**	**1.01978**
%RSD	0.11068	0.30982	1.81305	0.36542	0.41005	0.28444	0.07459	0.24000	0.36058

	Co	**Cr**	**Cu**	**Fe**	**K**	**Li**	**Mg**	**Mn**	**Mo**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.47381	0.47607	0.52665	109.73096	-0.52627	1.08553	278.37718	0.46747	0.99756
#2	0.47556	0.47814	0.52890	110.17362	-0.52936	1.08893	279.50543	0.46946	0.99927
Mean	**0.47468**	**0.47710**	**0.52778**	**109.95229**	**-0.52781**	**1.08723**	**278.94131**	**0.46846**	**0.99842**
%RSD	0.26046	0.30728	0.30211	0.28468	0.41480	0.22139	0.28601	0.29940	0.12096

	Na	**Ni**	**P**	**Pb I**	**Pb II**	**S**	**Sb**	**Se I**	**Se II**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.17379	0.94003	1.02098	0.05405	0.05317	1.03261	0.60451	0.06627	0.05567
#2	-0.17399	0.94184	1.02461	0.05361	0.05305	1.03545	0.61042	0.06158	0.05438
Mean	**-0.17389**	**0.94094**	**1.02279**	**0.05383**	**0.05311**	**1.03403**	**0.60746**	**0.06392**	**0.05502**
%RSD	0.08078	0.13666	0.25066	0.57368	0.15302	0.19403	0.68874	5.18228	1.65932

	Si	**Sn**	**Sr**	**Th**	**Ti**	**Tl**	**U**	**V**	**Zn**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.95405	1.01455	1.00985	-0.03212	0.95254	0.10849	10.31992	0.48638	0.88969
#2	0.96074	1.01907	1.01562	-0.03389	0.95680	0.10724	10.36135	0.48893	0.89302
Mean	**0.95740**	**1.01681**	**1.01274**	**-0.03301**	**0.95467**	**0.10787**	**10.34063**	**0.48766**	**0.89135**
%RSD	0.49462	0.31443	0.40303	3.79351	0.31492	0.82124	0.28330	0.37035	0.26440

	Zr	**Pb**	**Se**
	ppm	calc	calc
#1	0.50614	0.05346	0.05920
#2	0.50869	0.05324	0.05678
Mean	**0.50742**	**0.05335**	**0.05799**
%RSD	0.35454	0.29435	2.95259

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:33
SampleId1 : CCV **SampleId2 :** **[CV]**
Analysis commenced : 3/5/2010 16:36:05
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD6

Final concentrations

	Ag	**Al**	**As**	**B**	**Ba**	**Be**	**Bi**	**Ca**	**Cd**
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.20070	50.00163	0.50849	0.95666	0.96656	0.49591	0.50044	48.58847	0.48659
#2	0.20218	50.05391	0.50622	0.96236	0.96825	0.49638	0.50428	48.66393	0.48743
Mean	**0.20144**	**50.02777**	**0.50735**	**0.95951**	**0.96740**	**0.49614**	**0.50236**	**48.62620**	**0.48701**
%RSD	0.51910	0.07389	0.31608	0.42021	0.12317	0.06745	0.54092	0.10973	0.12151

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ted: 3/5/2010 16:43:37 User: ROY FRENCH

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.49399	0.98404	0.97873	20.02576	48.92982	0.50650	50.11390	0.96268	0.97292
#2	0.49486	0.98458	0.97757	20.05505	48.93161	0.50662	50.21221	0.96397	0.97350
Mean	**0.49442**	**0.98431**	**0.97815**	**20.04041**	**48.93072**	**0.50656**	**50.16305**	**0.96333**	**0.97321**
%RSD	0.12560	0.03944	0.08382	0.10337	0.00258	0.01709	0.13858	0.09407	0.04199

	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	48.67835	0.98554	4.80344	0.95733	0.94072	4.89466	0.47829	0.99500	0.97174
#2	48.69476	0.98554	4.80641	0.96277	0.93837	4.89039	0.48058	0.99725	0.97708
Mean	**48.68655**	**0.98554**	**4.80493**	**0.96005**	**0.93954**	**4.89252**	**0.47943**	**0.99613**	**0.97441**
%RSD	0.02382	0.00000	0.04369	0.40092	0.17697	0.06180	0.33755	0.15967	0.38773

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	4.70811	0.98919	0.48336	0.13592	0.46494	0.50342	4.82607	0.48056	1.00642
#2	4.71790	0.99347	0.48407	0.13554	0.46537	0.50913	4.84589	0.48074	1.00739
Mean	**4.71301**	**0.99133**	**0.48371**	**0.13573**	**0.46515**	**0.50627**	**4.83598**	**0.48065**	**1.00691**
%RSD	0.14687	0.30533	0.10436	0.19769	0.06567	0.79673	0.28993	0.02578	0.06836

	Zr	Pb	Se
	ppm	calc	calc
#1	0.96526	0.94625	0.97948
#2	0.96663	0.94650	0.98380
Mean	**0.96595**	**0.94637**	**0.98164**
%RSD	0.10011	0.01825	0.31066

Method : Paragon File : 100305A Printed : 3/5/2010 16:43:33
SampleId1 : CCB SampleId2 : [CB]
Analysis commenced : 3/5/2010 16:37:59
Dilution ratio : 1.00000 to 1.00000 Tray : Position : STD2

Final concentrations

	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	0.00020	0.06112	0.00093	-0.00107	-0.00032	0.00020	0.00328	-0.01092	-0.00013
#2	-0.00025	0.05683	-0.00046	-0.00079	-0.00038	0.00017	-0.00203	-0.01297	-0.00022
Mean	**-0.00002**	**0.05898**	**0.00024**	**-0.00093**	**-0.00035**	**0.00018**	**0.00062**	**-0.01194**	**-0.00017**
%RSD	1280.32683	5.15411	415.90671	21.10338	11.48875	10.78553	604.02418	12.12160	37.33055

	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00005	-0.00029	-0.00142	0.00486	-0.36172	0.00215	-0.00629	-0.00002	-0.00009
#2	-0.00005	-0.00062	-0.00114	0.00465	-0.38148	0.00213	-0.01064	-0.00013	-0.00048
Mean	**-0.00005**	**-0.00046**	**-0.00128**	**0.00476**	**-0.37160**	**0.00214**	**-0.00846**	**-0.00007**	**-0.00028**
%RSD	0.16483	51.30530	15.54307	3.14714	3.76055	0.65286	36.34062	109.92084	97.99017

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	Na	Ni	P	Pb I	Pb II	S	Sb	Se I	Se II
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.16252	-0.00042	-0.00078	-0.00155	0.00000	0.00047	-0.00010	-0.00411	-0.00115
#2	-0.16485	-0.00072	-0.00539	-0.00147	0.00133	-0.00803	-0.00034	0.00056	-0.00007
Mean	**-0.16369**	**-0.00057**	**-0.00308**	**-0.00151**	**0.00067**	**-0.00378**	**-0.00022**	**-0.00178**	**-0.00061**
%RSD	1.00840	37.17841	105.73861	3.50087	141.08403	158.97272	75.50740	185.63648	125.35747

	Si	Sn	Sr	Th	Ti	Tl	U	V	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
#1	-0.00926	-0.00158	-0.00225	-0.00070	-0.00060	-0.00344	-0.01127	-0.00025	-0.00051
#2	-0.01145	-0.00073	-0.00224	-0.00209	-0.00070	-0.00160	-0.00582	-0.00016	-0.00044
Mean	**-0.01036**	**-0.00116**	**-0.00224**	**-0.00139**	**-0.00065**	**-0.00252**	**-0.00855**	**-0.00021**	**-0.00047**
%RSD	14.95390	52.03539	0.22553	70.71508	10.07071	51.68677	45.11540	32.20821	10.31194

	Zr	Pb	Se
	ppm	calc	calc
#1	-0.00001	-0.00051	-0.00213
#2	0.00024	0.00040	0.00014
Mean	**0.00012**	**-0.00006**	**-0.00100**
%RSD	149.01373	1099.94378	161.10657

Header Information for Analytical Run:10030501

Analyst: SL

Standards:

Stock A: 10ppm (ST100112-7)
Stock B: 10ppm (ST100112-4)
Daily standards made by diluting stock solution 100X

Reagents:

See digestion log

Pipettes Used:

M-57 - 0.01 mL to 0.1 mL
M-1010 - 1.0 mL to 5.0 mL
M-61 - 0.1 mL to 1.0 mL

Method of Dilution:

2X - Dilution made by diluting 5ml of sample to 10ml final volume.
5X - Dilution made by diluting 2.0ml of sample to 10ml final volume.
10X - Dilution made by diluting 1.0ml of sample to 10ml final volume.
20X - Dilution made by diluting 0.5ml of sample to 10ml final volume.
50X - Dilution made by diluting 0.2ml of sample to 10ml final volume.
100X - Dilution made by diluting 0.1ml of sample to 10ml final volume.
500X - Dilution made by diluting a 5X dilution 100X
1000X – Dilution made by diluting a 10X dilution 100X

Daily Maintenance:

1. Check / Change peristaltic pump tubing
2. Check gas liquid separator for deposits, clean if necessary
3. Check / Refill rinse water and stannous chloride reservoirs

Daily Maintenance done by: SL

Monthly Maintenance:

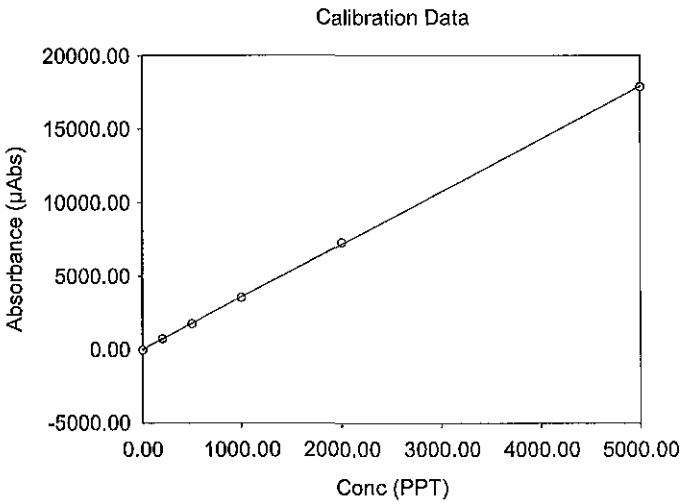
1. Check / Clean sample and reference cells
2. Check / Change Nafion drying cartridge

Monthly Maintenance done by: SL 2-12-2009

CETAC Hg Analysis Report - 10030501.DB - Friday, March 05, 2010, 10:15:40 AM

Analyst
Date Started Friday, March 05, 2010, 09:03:42
Worksheet PARAGON
Comment

Sample ID	Analysis Time	Conc (PPT)	%RSD	Avg. µAbs	Readings				Flags
Calibration Zero	05-Mar-2010, 09:03	0.00	33.40	-14.00	-16	-18	-15	-7	
Standard #1	05-Mar-2010, 09:05	200.00	0.60	735.00	731	733	735	741	
Standard #2	05-Mar-2010, 09:06	500.00	0.17	1780.00	1773	1775	1776	1780	
Standard #3	05-Mar-2010, 09:08	1000.00	1.19	3560.00	3526	3526	3555	3616	
Standard #4	05-Mar-2010, 09:10	2000.00	1.21	7310.00	7194	7287	7344	7401	
Standard #5	05-Mar-2010, 09:11	5000.00	0.36	17900.00	17803	17881	17933	17943	



Int.	11.780
Slope	3.584
Correlation	0.99995

Sample ID	Analysis Time	Conc (PPT)	%RSD	Avg. µAbs	Readings				Flags
ICV	05-Mar-2010, 09:13	1040.00	0.63	3720.00	3694	3715	3736	3746	
ICB	05-Mar-2010, 09:14	-4.96	15.70	-6.01	-5	-9	-7	-3	
CRA	05-Mar-2010, 09:16	198.00	1.31	723.00	711	720	728	732	
HG100304-4MB	05-Mar-2010, 09:18	6.63	15.10	35.50	36	40	35	31	
HG100304-4LCS	05-Mar-2010, 09:19	997.00	0.99	3590.00	3543	3572	3603	3624	
HG100304-4LCSD	05-Mar-2010, 09:21	976.00	0.24	3510.00	3496	3510	3513	3514	
1003045-1	05-Mar-2010, 09:22	6.48	4.05	35.00	35	34	36	35	
1003045-1D	05-Mar-2010, 09:24	12.20	6.40	55.40	54	52	58	57	
1003045-1L 5X	05-Mar-2010, 09:26	12.50	4.10	56.50	58	56	54	58	
1003045-1MS	05-Mar-2010, 09:27	2020.00	0.75	7240.00	7172	7231	7272	7295	
1003045-1MSD	05-Mar-2010, 09:29	2010.00	0.67	7220.00	7154	7214	7238	7267	
1003045-3	05-Mar-2010, 09:30	8.91	17.70	43.70	35	46	46	47	
CCV	05-Mar-2010, 09:32	2020.00	1.12	7250.00	7158	7222	7283	7346	
CCB	05-Mar-2010, 09:34	5.44	14.20	31.30	28	31	33	34	
1003045-6	05-Mar-2010, 09:35	13.40	11.10	59.70	55	56	61	67	
1003045-7	05-Mar-2010, 09:37	13.80	6.32	61.20	57	64	63	61	
1003045-14	05-Mar-2010, 09:38	11.60	8.99	53.40	49	52	54	58	
1003045-15	05-Mar-2010, 09:40	9.28	1.94	45.00	46	45	44	45	
1003045-20	05-Mar-2010, 09:42	11.30	6.01	52.40	49	52	53	55	
1003045-22	05-Mar-2010, 09:43	11.60	2.30	53.30	53	55	52	53	
1003045-24	05-Mar-2010, 09:45	11.20	4.03	52.00	52	54	52	50	
1003045-25	05-Mar-2010, 09:47	11.20	3.11	51.80	53	50	52	52	
CRA	05-Mar-2010, 09:48	202.00	1.10	736.00	726	733	738	745	
CCV	05-Mar-2010, 09:50	2030.00	0.85	7280.00	7202	7271	7302	7349	
CCB	05-Mar-2010, 09:51	5.11	32.20	30.10	22	30	34	35	

Header Information for Analytical Run:10030502
Analyst: SL

Standards:

Stock A: 10ppm (ST100112-7)
Stock B: 10ppm (ST100112-4)
Daily standards made by diluting stock solution 100X

Reagents:

See digestion log

Pipettes Used:

M-57 - 0.01 mL to 0.1 mL
M-1010 - 1.0 mL to 5.0 mL
M-61 - 0.1 mL to 1.0 mL

Method of Dilution:

2X - Dilution made by diluting 5ml of sample to 10ml final volume.
5X - Dilution made by diluting 2.0ml of sample to 10ml final volume.
10X - Dilution made by diluting 1.0ml of sample to 10ml final volume.
20X - Dilution made by diluting 0.5ml of sample to 10ml final volume.
50X - Dilution made by diluting 0.2ml of sample to 10ml final volume.
100X - Dilution made by diluting 0.1ml of sample to 10ml final volume.
500X - Dilution made by diluting a 5X dilution 100X
1000X – Dilution made by diluting a 10X dilution 100X

Daily Maintenance:

1. Check / Change peristaltic pump tubing
2. Check gas liquid separator for deposits, clean if necessary
3. Check / Refill rinse water and stannous chloride reservoirs

Daily Maintenance done by: SL

Monthly Maintenance:

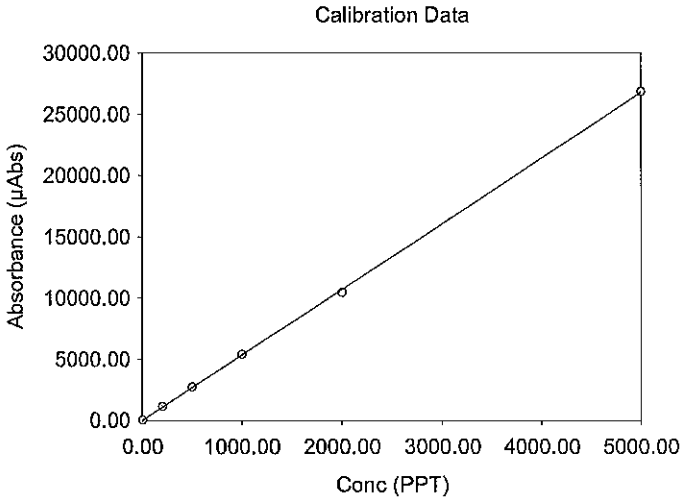
1. Check / Clean sample and reference cells
2. Check / Change Nafion drying cartridge

Monthly Maintenance done by: SL 2-12-2009

CETAC Hg Analysis Report - 10030502.DB - Friday, March 05, 2010, 12:21:23 PM

Analyst
Date Started Friday, March 05, 2010, 11:18:47
Worksheet PARAGON
Comment

Sample ID	Analysis Time	Conc (PPT)	%RSD	Avg. µAbs	Readings				Flags
Calibration Zero	05-Mar-2010, 11:18	0.00	5.52	39.60	38	39	39	43	
Standard #1	05-Mar-2010, 11:20	200.00	1.40	1130.00	1112	1124	1136	1149	
Standard #2	05-Mar-2010, 11:21	500.00	1.00	2730.00	2698	2724	2742	2763	
Standard #3	05-Mar-2010, 11:23	1000.00	1.70	5420.00	5289	5408	5466	5498	
Standard #4	05-Mar-2010, 11:25	2000.00	1.40	10500.00	10275	10455	10555	10609	
Standard #5	05-Mar-2010, 11:26	5000.00	1.13	26900.00	26471	26861	27059	27157	



Int.	9.990
Slope	5.358
Correlation	0.99992

Sample ID	Analysis Time	Conc (PPT)	%RSD	Avg. µAbs	Readings				Flags
ICV	05-Mar-2010, 11:28	1010.00	1.17	5410.00	5325	5414	5451	5466	
ICB	05-Mar-2010, 11:29	0.93	20.20	15.00	15	14	15	16	
CRA	05-Mar-2010, 11:31	203.00	1.15	1100.00	1080	1097	1103	1108	
HG100304-5MB	05-Mar-2010, 11:33	1.56	51.80	18.40	21	13	17	23	
HG100304-5LCS	05-Mar-2010, 11:34	998.00	2.95	5360.00	5128	5371	5457	5465	
HG100304-5LCSD	05-Mar-2010, 11:36	1020.00	0.49	5490.00	5495	5477	5470	5530	
1003045-2	05-Mar-2010, 11:37	116.00	1.63	630.00	616	630	635	639	
1003045-4	05-Mar-2010, 11:39	31.60	3.08	179.00	173	177	184	183	
1003045-4D	05-Mar-2010, 11:41	37.00	3.78	208.00	202	203	212	217	
1003045-4L 5X	05-Mar-2010, 11:42	9.88	2.95	62.90	61	63	65	63	
1003045-4MS	05-Mar-2010, 11:46	2100.00	0.83	11200.00	11120	11217	11297	11328	
1003045-4MSD	05-Mar-2010, 11:47	2090.00	1.08	11200.00	11083	11126	11260	11346	
CCV	05-Mar-2010, 11:49	1960.00	0.87	10500.00	10446	10532	10491	10659	
CCB	05-Mar-2010, 11:50	-1.24	20.60	3.35	2	4	3	5	
1003045-5	05-Mar-2010, 11:52	47.50	2.31	264.00	258	261	267	271	
1003045-8	05-Mar-2010, 11:54	79.80	0.38	438.00	437	436	437	440	
1003045-9	05-Mar-2010, 11:55	28.60	1.89	163.00	162	163	162	168	
1003045-10	05-Mar-2010, 11:57	23.00	2.43	133.00	131	134	137	130	
1003045-11	05-Mar-2010, 11:58	15.30	4.93	92.00	86	94	95	93	
1003045-12	05-Mar-2010, 12:00	76.10	0.85	418.00	413	418	419	421	
1003045-13	05-Mar-2010, 12:02	79.70	0.13	437.00	437	437	438	436	
1003045-16	05-Mar-2010, 12:03	100.00	1.63	547.00	535	545	552	555	
1003045-17	05-Mar-2010, 12:05	39.50	0.86	222.00	219	222	224	222	
1003045-18	05-Mar-2010, 12:07	2.84	22.50	25.20	21	26	24	30	
CCV	05-Mar-2010, 12:08	2020.00	1.23	10800.00	10651	10793	10885	10961	
CCB	05-Mar-2010, 12:10	0.17	254.00	10.90	8	11	13	11	
1003045-19	05-Mar-2010, 12:11	9.44	3.04	60.60	59	62	61	61	
1003045-21	05-Mar-2010, 12:13	121.00	0.62	657.00	653	654	659	661	
1003045-23	05-Mar-2010, 12:15	25.50	1.90	146.00	144	150	145	147	
CRA	05-Mar-2010, 12:16	211.00	0.43	1140.00	1132	1140	1141	1144	
CCV	05-Mar-2010, 12:18	2050.00	0.53	11000.00	10934	11008	11017	11076	
CCB	05-Mar-2010, 12:19	1.65	115.00	18.90	28	23	20	4	

Miscellaneous

METALS DIGESTION WORKSHEET

ALS Laboratory Group

Digestion Date 3/4/10 | HCl Lot No. H1903I | Method: 3005 | Beaker Lot No. 9256577 | Initial Prep fm | Final Prep fm

Digestion Batch IP100304-3 | HNO_3 Lot No. H14024 | SOP/Rev: 806rev14 | Avg. Beaker Wt. (g) 7.6 | Prep Start Time 1310 | Prep End Time 1620

Water Bath Temp 95 °C | Peroxide Lot No. N/A | Balance(s): #30 | Pipet(s): M-51 | Digestate Wt. (g) 51.18

Form 805r18.xls (3/13/09)

Note: Each Page is copied as completed and included with the workorder/run documentation; reviewed subsequently

QC Grp	Lab Sample ID	Instrument	Init Vol/Wt (mL/g)	Final Vol (mL)	Final Wt. (g)	pH	Texture	Before color	Before clarity	After color	After clarity	Comments, including metals list	LIMS QCA
1	1003045-1	Fn	50.0	50.0	58.8	<2	N/A	colorless	clear	colorless	clear	TAL	1
	-3												
	-6												
	-7								cloudy		cloudy		
	-14												
	-15												
	-20								clear		clear		
	-22								cloudy				
	-24										cloudy		
	-25												

ICP	Lab Sample ID	Init Vol/Wt. (mL/g)	Final Vol. (mL)	Final Wt. (g)
~~LCS~~				
LCS 2				
ICP MS				
~~LCS~~	IP100304-3MS			
LCS 2	IP100304-3LCS	50.0	50.0	58.8
PB	-3MB			
#1 D	1003045-1D			
S	-1MS			
DS	-1MSD			

Lab Sample ID				
~~#2 D~~				
S				
~~DS~~				
#3 D				
S				
DS				
#4 D				
S				
DS				

Spiking Information

QC	Amount
ST100208-2(C)	0.5mL
ST100302-16(Z)	1.0mL
ST100108-2(cation)	1.0mL

20000537

390603

METALS DIGESTION WORKSHEET

ALS Laboratory Group

Digestion Date 3/4/10 | HCl Lot No. H19031 | Method: 3050 | Beaker Lot No. 9114754 | Initial Prep PM | Final Prep PM

Digestion Batch 1P100304-4 | HNO_3 Lot No. H14024 | SOP/Rev: 806 rev 14 | Avg. Beaker Wt. (g) 15.7 | Prep Start Time 1355 | Prep End Time 1725

Water Bath Temp 95 °C | Peroxide Lot No. H12J04 | Balance(s): #30 | Pipet(s): M-51 | Digestate Wt. (g) 105.11

Form 805r18.xls (3/13/09)

Note: Each Page is copied as completed and included with the workorder/run documentation; reviewed subsequently

QC Grp	Lab Sample ID	Instrument	Init Vol/Wt (mL/g)	Final Vol (mL)	Final Wt. (g)	pH	Texture	Before color	Before clarity	After color	After clarity	Comments, including metals list	LIMS QCA
	1003045-2	TR	SEE LIMS PREP BATCH	100	121.8	N/A	MUD	Brown	N/A	TAN	CLOUDY	TAL	
	-4						MEDIUM			YELLOW			
	-5						MUD			TAN			
	-8						COARSE						
	-9						MUD			YELLOW			
	-10						COARSE						
	-11						MUD						
	-12									GREEN			
	-13												
	-16												
	-17						MEDIUM			YELLOW			
	-18												
	-19												
	-21						MUD			GREEN			
	-23									YELLOW			

3/4/10 PM

ICP					
~~LCS~~					
LCS 2					
ICP MS					
~~LCS~~	~~1P100304-4AVS~~	~~TR~~		~~100~~	~~121.8~~
LCS 2	1P100304-4LCS	TR	SEE LIMS PREP BATCH	100	121.8
PB	-4MB				
#1 D	1003045-4D				
S	-4MS				
DS	-4MSD				

3/4/10 PM

	Lab Sample ID	Init Vol/Wt. (mL/g)	Final Vol. (mL)	Final Wt. (g)
#2 D				
S				
DS				
#3 D				
S				
DS				
#4 D				
S				
DS				

3/4/10 PM

Spiking Information

QC	Amount
ST100208-20(C)	1.0mL
ST100302-16(Z)	2.0mL
ST100108-2(CATION)	2.0mL

20000538

390604

ALS Laboratory Group - Fort Collins

MERCURY DIGESTION - WATER/TCLP

Method 7470 SOP 812/Rev 14 Date Analyzed 3/5/10 File 100305001** SL 3.5.10 Init. ~~AA~~ (prep.) ~~AA~~ (analysis)

Digestion Date 3/4/10 Spike Witness N/A Time Start 1330 Time Finish 1530 Bath Temp 95 °C

Tube #	Solution ID	Spike * Solution	Spike Volume (mL)	Final ** Volume (mL)	Comments
STD 1	0 ppb	-	-	20.0	
2	0.2 ppb	A	0.04	20.0	
3	0.5 ppb	A	0.1	20.0	
4	1.0 ppb	A	0.2	20.0	
5	2.0 ppb	A	0.4	20.0	
6	5.0 ppb	A	1.0	20.0	
	ICV	B	0.2	20.0	
	ICB	-	-	20.0	
	CRA-0.2 ppb	A	0.04	20.0	
	IPC (245.1 only)	A	0.04	20.0	
	SAMPLES -- **Prep. Batch ID(s)** HG100304-4				(see LIMs Prep. Batch report for sample info. (IDs. Aliquots, etc.)
	CCVs	A	0.4	20.0	___ # prepared
	CCBs	-	-	20.0	___ # prepared

*** See run report for run log information.

** Laboratory DI water used to make-up to final volume.

*A: 100 ppb Hg solution made from 100x dilution (1 mL/100 mL) of ST100112-7 ID

*B: 100 ppb Hg solution made from 100x dilution (1 mL/100 mL) of ST100112-4 ID (2nd source)

See run header for maintenance performed.

Digestion Cups: 940 CC

Reagents: H_2SO_4 49425 HNO_3 H14024 $KMnO_4$-RG100225-1 $K_2S_2O_8$-RG100211-3

SnCl-RG100225-2 Hydroxylamine RG100211-1

Balance(s) Used: 29

Pipet(s) Used: M57 M61

Note: Each page is copied as completed and included with the workorder/run documentation; reviewed subsequently.

ALS – Fort Collins

MERCURY DIGESTION - SOIL

Method 7471 SOP 812/Rev 14 Date Analyzed 3/5/10 File 10030502 *** Init. ~~AL~~ (prep.) ~~AL~~ (analysis)

Digestion Date 3/4/10 Spike Witness N/A Time Start 1440 Time Finish 1510 Bath Temp ~~AL~~ °C 95 SL 3.5.10

Tube #	Solution ID	Spike * Solution	Spike Volume (mL)	Sample **** Aliquot (g)	Final ** Volume (mL)	Comments
STD 1	0 ppb	-	-	-	100.0	
2	0.2 ppb	A	0.2	-	100.0	
3	0.5 ppb	A	0.5	-	100.0	
4	1.0 ppb	A	1.0	-	100.0	
5	2.0 ppb	A	2.0	-	100.0	
6	5.0 ppb	A	5.0	-	100.0	
	ICV	B	1.0	-	100.0	
	ICB	-	-	-	100.0	
	CRA-0.2 ppb	A	0.2	-	100.0	
	SAMPLES – **Prep. Batch ID(s)** HG100304-5					(see LIMs Prep. Batch report for sample info. (IDs, Aliquots, etc.)
	CCVs	A	2.0	-	100.0	2 # prepared
	CCBs	-	-	-	100.0	2 # prepared

**** Automated balance entry into LIMS.

*** See run report for run log information.

** Laboratory DI water used to make-up to final volume.

*A: 100 ppb Hg solution made from 100x dilution (1 mL/100 mL) of ST100112-7 ID

*B: 100 ppb Hg solution made from 100x dilution (1 mL/100 mL) of ST100112-4 ID (2nd source)

See run header for maintenance performed.

Digestion Cups: 9231322

Reagents: HNO_3 H140214 HCl H19031 SnCl-R6100225-2 $KMnO_4$-R6100225-1 Hydroxylamine R6100211-1

Balance(s) Used: 29

Pipet(s) Used: M-57 M-61 M1010

05000540

Reviewed by _____ **Date** _____

388604

Percent Moisture

Method SOP642 Revision 8

Lab Name: ALS Laboratory Group -- FC

Date Extracted: 03/05/2010
Date Analyzed: 03/05/2010
Analyst: Mike Lundgreen

Balance ID: 31
Oven ID: 17
In Oven: 3/4/2010 @ 2:30:00 PM
Out of Oven: 3/5/2010 @ 10:05:00 AM

Validated By: mtl
Validation Date: 03/05/2010
Validation Time: 11:27:02 AM

Run ID	Prep Batch ID	QC Batch ID	Lab ID	QC Type	Dish Wt	Wet Wt	Dry Wt	Dry Wt-Dish Wt	Percent Moisture	Percent Solids	RPD
EX100304-4A	EX100304-4	EX100304-4-1	1003045-10	SMP	1.303	10.09	9.693	8.39	16.9	83.1	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-11	SMP	1.306	10.14	9.266	7.96	21.5	78.5	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-12	SMP	1.301	10.66	8.807	7.51	29.6	70.4	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-13	SMP	1.295	10.31	7.918	6.62	35.8	64.2	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-16	SMP	1.295	10.56	7.615	6.32	40.2	59.8	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-17	DUP	1.292	10.16	10.96	9.67	4.8	95.2	5
EX100304-4A	EX100304-4	EX100304-4-2	1003045-17	SMP	1.294	10.22	11.00	9.71	5.1	94.9	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-18	SMP	1.308	10.79	9.949	8.64	19.9	80.1	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-19	SMP	1.31	10.29	9.59	8.28	19.5	80.5	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-2	SMP	1.295	10.09	7.817	6.52	35.4	64.6	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-21	SMP	1.298	10.30	7.541	6.24	39.4	60.6	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-23	SMP	1.296	11.05	9.822	8.53	22.8	77.2	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-4	DUP	1.292	10.07	10.55	9.26	8.1	91.9	1
EX100304-4A	EX100304-4	EX100304-4-1	1003045-4	SMP	1.31	10.65	11.12	9.81	8.0	92.0	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-5	SMP	1.311	10.23	8.552	7.24	29.2	70.8	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-8	SMP	1.293	10.36	8.983	7.69	25.8	74.2	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-9	SMP	1.295	10.83	10.35	9.05	16.4	83.6	
EX100304-4A	EX100304-4	EX100304-4-1	EX100304-4	MB	1.286	1.286	1.285	0.00	100.1	-0.1	
EX100304-4A	EX100304-4	EX100304-4-2	EX100304-4	MB	1.286	1.286	1.285	0.00	100.1	-0.1	

QC Types

CAR	Carrier reference sample
LCS	Laboratory Control Sample
MB	Method Blank
MSD	Laboratory Matrix Spike Duplicate
RVS	Reporting Level Verification Standar
SYS	Sample Yield Spike

DUP	Laboratory Duplicate
LCSD	Laboratory Control Sample Duplicat
MS	Laboratory Matrix Spike
REP	Sample replicate
SMP	Field Sample

Comments:

DUP = Sample Duplicate
Wet Wt = Sample Wet Wt - Dish Wt
Dry Wt = Sample Dry Wt + Dish Wt
Dry Wt - Dish Wt = Sample Dry Wt - Dish Wt
All weight values shown above are expressed in grams.

$$RPD = \frac{(\text{Sample Value} - \text{Duplicate Value})}{2} \times 100$$

$$\%\ \text{Solids} = \frac{\text{Dry Weight}}{\text{Wet Weight}} \times 100$$

$$\%\ \text{Moisture} = \frac{(\text{Wet Weight} - \text{Dry Weight})}{\text{Wet Weight}} \times 100$$

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Monday, March 08, 2010

20000541

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division
Fort Collins, Colorado

Total Uranium

Case Narrative

Weston Solutions, Inc.

Paguate -- TO0019100202

Work Order Number: 1003045

1. This report consists of the analytical results and supporting documentation for 15 sediment samples and 10 water samples received by ALS on 03/04/2010.

2. The sediment samples were prepared according to procedures SOP773R10 and SOP778R13. The water samples were prepared according to procedures SOP776R11 and SOP778R13. Due to potential matrix interference, the sediment samples were prepared at a reduced aliquot of ~1 gram.

3. The samples were analyzed for the presence of isotopic and total uranium according to procedure SOP714R11. The analyses were completed on 03/06/2010.

4. The total uranium results were determined by converting standard activity units to a mass basis, and adding these results to create an analyte called 'URANIUM, TOTAL' for each sample. The MDC equation cannot accommodate the different specific activities of each nuclide. Therefore, the MDC is not evaluated for the 'URANIUM, TOTAL' analyte.

5. The analysis results for the sediment samples are reported on a 'Dry Weight' basis in units of ug/gram. The analysis results for the associated batch QC are reported on an 'As Received' basis in units of ug/gram.

6. The analysis results for the water samples are reported on a mass basis in units of ug/L. The water samples were not filtered prior to analysis.

7. This analytical method quantifies U-235 alpha activity in a specific region of interest corresponding to emission energies between those of U-234 and U-238. A potential limitation of this method is that measurable amounts of U-234 in the sample may cause a small amount of characteristic activity in the U-235 region of interest due to poorly resolved alpha activity at the boundary between the two regions. To minimize the potential for a high bias in the U-235 analytical results, the U-235 region of interest has been narrowed and limited to a lower energy region. An 85.1% abundance correction has been made to the final U-235 results.

8. ALS follows the convention outlined in ANSI N42.23 for reporting significant digits in the TPU and MDC results. ANSI N42.23 states that the TPU result should be rounded to two significant digits and that the MDC result should be rounded to the same decimal place as the TPU result. In practice, this could result in an MDC result with a reported value of 0 for samples with significant activity, including the batch laboratory control sample.

9. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Jean Anderson
Radiochemistry Primary Data Reviewer

3/11/10
Date

Radiochemistry Final Data Reviewer

3/11/10
Date

Section 1

CHAIN OF CUSTODY

ALS Laboratory Group -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1003045
Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Rinsate 030210	1003045-1		WATER	02-Mar-10	18:20
RM-SED-BG	1003045-2		SEDIMEN	02-Mar-10	10:12
RM-SW-BG	1003045-3		WATER	02-Mar-10	10:12
RSJ-SED-03	1003045-4		SEDIMEN	02-Mar-10	10:37
RSJ-SED-BG	1003045-5		SEDIMEN	02-Mar-10	11:46
RSJ-SW-03	1003045-6		WATER	02-Mar-10	10:37
RSJ-SW-BG	1003045-7		WATER	02-Mar-10	11:46
MD-SED-0-2'	1003045-8		SEDIMEN	02-Mar-10	16:45
MD-SED-2-4'	1003045-9		SEDIMEN	02-Mar-10	17:00
MD-SED-4-6'	1003045-10		SEDIMEN	02-Mar-10	17:15
PR-SED-01	1003045-11		SEDIMEN	02-Mar-10	15:30
RP-SED-BG	1003045-12		SEDIMEN	02-Mar-10	9:29
RP-SED-BGD	1003045-13		SEDIMEN	02-Mar-10	9:29
RP-SW-BG	1003045-14		WATER	02-Mar-10	9:29
RP-SW-BGD	1003045-15		WATER	02-Mar-10	9:29
RSJ-SED-02	1003045-16		SEDIMEN	02-Mar-10	15:15
WR-SED-0-2'	1003045-17		SEDIMEN	02-Mar-10	11:03
WR-SED-3'	1003045-18		SEDIMEN	02-Mar-10	11:10
WR-SED-5.5'	1003045-19		SEDIMEN	02-Mar-10	11:15
PR-SW-01	1003045-20		WATER	02-Mar-10	15:26
RP-SED-03	1003045-21		SEDIMEN	02-Mar-10	17:10
RP-SW-03	1003045-22		WATER	02-Mar-10	17:10
RSJ-SED-01	1003045-23		SEDIMEN	02-Mar-10	16:13
RSJ-SW-01	1003045-24		WATER	02-Mar-10	16:13
RSJ-SW-02	1003045-25		WATER	02-Mar-10	15:15

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0005

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
1	Rinsate 030210	TAL Metals + Mercury	3	Days	Water	3/2/2010	18:20	1	1 L poly	HNO3 pH<2		
	Rinsate 030210	Total Cyanide	3	Days	Water	3/2/2010	18:20	1	250 mL	NaOH		
	Rinsate 030210	Isotopic Uranium	3	Days	Water	3/2/2010	18:20	1	1 L poly	HNO3 pH<2		
2	RM-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	10:12	1	16 oz	4 C	24uR/hr	
3	RM-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	10:12	1	1 L poly	HNO3 pH<2	24 uR/hr	
	RM-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	10:12	1	250 mL	NaOH	24 uR/hr	
	RM-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	10:12	1	1 L poly	HNO3 pH<2	24 uR/hr	
4	RSJ-SED-03	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	10:37	1	16 oz	4 C	8 uR/hr	
5	RSJ-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:46	1	16 oz	4 C	23 uR/hr	
6	RSJ-SW-03	TAL Metals + Mercury	3	Days	Water	3/2/2010	10:37	1	1 L poly	HNO3 pH<2	8 uR/hr	
	RSJ-SW-03	Total Cyanide	3	Days	Water	3/2/2010	10:37	1	250 mL	NaOH	8 uR/hr	
	RSJ-SW-03	Isotopic Uranium	3	Days	Water	3/2/2010	10:37	1	1 L poly	HNO3 pH<2	8 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trumble	3-4-10	755						

20000546

5

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0005

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
7	RSJ-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	11:46	1	1 L poly	HNO3 pH<2	23 uR/hr	
↓	RSJ-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	11:46	1	250 mL	NaOH	23 uR/hr	
	RSJ-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	11:46	1	1 L poly	HNO3 pH<2	23 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trumble	3.4.10	755						

20000547

6

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0004

Site #: TO0019100202

Contact Name: Weston Solutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832.444.7976.

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
8	MD-SED-0-2'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	16:45	1	16 oz	4 C	20 uR/hr	
9	MD-SED-2-4'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:00	1	16 oz	4 C	17 uR/hr	
10	MD-SED-4-6'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:15	1	16 oz	4 C	18 uR/hr	
11	PR-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	15:30	1	16 oz	4 C	9 uR/hr	
12	RP-SED-BG	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	09:29	1	16 oz	4 C	20 uR/hr	
13	RP-SED-BGD	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	09:29	1	16 oz	4 C	20 uR/hr	
14	RP-SW-BG	TAL Metals + Mercury	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
	RP-SW-BG	Total Cyanide	3	Days	Water	3/2/2010	09:29	1	250 mL	NaOH	20 uR/hr	
	RP-SW-BG	Isotopic Uranium	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
15	RP-SW-BGD	TAL Metals + Mercury	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
	RP-SW-BGD	Total Cyanide	3	Days	Water	3/2/2010	09:29	1	250 mL	NaOH	20 uR/hr	
	RP-SW-BGD	Isotopic Uranium	3	Days	Water	3/2/2010	09:29	1	1 L poly	HNO3 pH<2	20 uR/hr	
16	RSJ-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	15:15	1	16 oz	4 C	28 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	Cheryl Trumble	3-4-10			755						

20000548

7

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/03/10-0004

Site #: TO0019100202

Contact Name: Weston Solutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832.444.7976.

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
17	WR-SED-0-2'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:03	1	16 oz	4 C	9.5 uR/hr	
18	WR-SED-3'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:10	1	16 oz	4 C	8 uR/hr	
19	WR-SED-5.5'	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	11:15	1	16 oz	4 C	9 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trimble	3-4-10	755						

20000549

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/02/10-0001

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
20	PR-SW-01	TAL Metals + Mercury	3	Days	Water	3/2/2010	15:26	1	1 L poly	HNO3 pH<2	9 uR/hr	
	PR-SW-01	Total Cyanide	3	Days	Water	3/2/2010	15:26	1	250 mL	NaOH	9 uR/hr	
	PR-SW-01	Isotopic Uranium	3	Days	Water	3/2/2010	15:26	1	1 L poly	HNO3 pH<2	9 uR/hr	
21	RP-SED-03	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	17:10	1	16 oz	4 C	22 uR/hr	
22	RP-SW-03	TAL Metals + Mercury	3	Days	Water	3/2/2010	17:10	1	1 L poly	HNO3 pH<2	22 uR/hr	
	RP-SW-03	Total Cyanide	3	Days	Water	3/2/2010	17:10	1	250 mL	NaOH	22 uR/hr	
	RP-SW-03	Isotopic Uranium	3	Days	Water	3/2/2010	17:10	1	1 L poly	HNO3 pH<2	22 uR/hr	
23	RSJ-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/2/2010	16:13	1	16 oz	4 C	16 uR/hr	
24	RSJ-SW-01	TAL Metals + Mercury	3	Days	Water	3/2/2010	16:13	1	1 L poly	HNO3 pH<2	23 uR/hr	
	RSJ-SW-01	Total Cyanide	3	Days	Water	3/2/2010	16:13	1	250 mL	NaOH	23 uR/hr	
	RSJ-SW-01	Isotopic Uranium	3	Days	Water	3/2/2010	16:13	1	1 L poly	HNO3 pH<2	23 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trumble	3-4-10	755						

20000550

1003045

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/02/10-0001

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
29	RSJ-SW-02	TAL Metals + Mercury	3	Days	Water	3/2/2010	15:15	1	1 L poly	HNO3 pH<2	28 uR/hr	
	RSJ-SW-02	Total Cyanide	3	Days	Water	3/2/2010	15:15	1	250 mL	NaOH	28 uR/hr	
	RSJ-SW-02	Isotopic Uranium	3	Days	Water	3/2/2010	15:15	1	1 L poly	HNO3 pH<2	28 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Cheryl Trumble	3-4-10	755						

20000551

ALS Laboratory Group - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003045

Project Manager: LS Initials: COT Date: 3-4-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	N/A	(YES)	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	N/A	(YES)	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		(YES)	NO
18. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 (#4)	RAD ONLY	(YES)	NO

Cooler #:	1	2	3					
Temperature (°C):	3.2	3.8	4.8					
No. of custody seals on cooler:	2	2	2					
DOT Survey/ Acceptance Information — External µR/hr reading:	12	13	13					
Background µR/hr reading:	11							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

Samples RP-SED-BGD + RP-SW-BGD had 0931 as the time on the label. (13) 0929 on COC.

If applicable, was the client contacted? (YES) / NO / NA Contact: Kristie w/ Michelle B Date/Time: 3/4

Project Manager Signature / Date: 3/4/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway Suite 850

Dallas, TX 75254

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

13
2-
4.8°

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

1 of 3

TRK# 0201 7984 3972 8917

THU - 04 MAR A2
FIRST OVERNIGHT

MASTER

80524
CO-US
DEN

X1 FTCA

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com.FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim.Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic valueof the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss.Maximum for items of extraordinary value is $500, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

20000553

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

3.20 12 2-

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

3 of 3

MPS# 0263 7984 3972 8972

Mstr# 7984 3972 8917 0201

THU - 04 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
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From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

Ship Date: 03MAR10
ActWgt: 40.0 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

13
2-

SHIP TO: (970) 490-1511 **BILL SENDER**

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

2 of 3

MPS# |0263| 7984 3972 8939

Mstr# 7984 3972 8917 |0201

THU - 04 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

3.8

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

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Section 2

2

SAMPLE RESULTS SUMMARY

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: **ALS Laboratory Group -- FC**
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:32 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-1	Rinsate 030210	Sample	U-234	2E-06 +/- 4.3E-06	8E-06	ug/l	WATER	AS100304-2	3/5/2010	U
1003045-1	Rinsate 030210	Sample	U-235	0E+00 +/- 1E-02	1.6E-02	ug/l	WATER	AS100304-2	3/5/2010	U
1003045-1	Rinsate 030210	Sample	U-238	1.5E-02 +/- 5.5E-02	8.5E-02	ug/l	WATER	AS100304-2	3/5/2010	U
1003045-1	Rinsate 030210	Sample	URANIUM, TOTAL	1.5E-02 +/- 5.6E-02	NA	ug/l	WATER	AS100304-2	3/5/2010	
1003045-2	RM-SED-BG	Sample	U-234	1.62E-04 +/- 3.2E-05	8E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-2	RM-SED-BG	Sample	U-235	3.4E-02 +/- 2E-02	2.3E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	LT
1003045-2	RM-SED-BG	Sample	U-238	3.53E+00 +/- 6.8E-01	1.8E-01	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-2	RM-SED-BG	Sample	URANIUM, TOTAL	3.56E+00 +/- 6.8E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-3	RM-SW-BG	Sample	U-234	3.41E-04 +/- 6E-05	6E-06	ug/l	WATER	AS100304-2	3/5/2010	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000557
16
20000557

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: **ALS Laboratory Group -- FC**
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:32 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-3	RM-SW-BG	Sample	U-235	3E-02 +/- 1.7E-02	6E-03	ug/l	WATER	AS100304-2	3/5/2010	LT
1003045-3	RM-SW-BG	Sample	U-238	3.81E+00 +/- 7.2E-01	1E-01	ug/l	WATER	AS100304-2	3/5/2010	
1003045-3	RM-SW-BG	Sample	URANIUM, TOTAL	3.84E+00 +/- 7.2E-01	NA	ug/l	WATER	AS100304-2	3/5/2010	
1003045-4	RSJ-SED-03	Sample	U-234	5E-05 +/- 1.3E-05	1E-05	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-4	RSJ-SED-03	Sample	U-235	1.5E-02 +/- 1.3E-02	1.8E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	U
1003045-4	RSJ-SED-03	Sample	U-238	8.5E-01 +/- 2.2E-01	1.2E-01	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-4	RSJ-SED-03	Sample	URANIUM, TOTAL	8.6E-01 +/- 2.2E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-5	RSJ-SED-BG	Sample	U-234	6.9E-05 +/- 1.6E-05	6E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-5	RSJ-SED-BG	Sample	U-235	1.4E-02 +/- 1.4E-02	2E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	U

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000558
17
20000558

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: **ALS Laboratory Group -- FC**
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:32 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-5	RSJ-SED-BG	Sample	U-238	1.42E+00 +/- 3.2E-01	1.1E-01	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-5	RSJ-SED-BG	Sample	URANIUM, TOTAL	1.44E+00 +/- 3.2E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-6	RSJ-SW-03	Sample	U-234	4.61E-04 +/- 7.9E-05	8E-06	ug/l	WATER	AS100304-2	3/5/2010	
1003045-6	RSJ-SW-03	Sample	U-235	3.3E-02 +/- 2.2E-02	2.7E-02	ug/l	WATER	AS100304-2	3/5/2010	LT
1003045-6	RSJ-SW-03	Sample	U-238	4.15E+00 +/- 7.9E-01	1.3E-01	ug/l	WATER	AS100304-2	3/5/2010	
1003045-6	RSJ-SW-03	Sample	URANIUM, TOTAL	4.18E+00 +/- 7.9E-01	NA	ug/l	WATER	AS100304-2	3/5/2010	
1003045-7	RSJ-SW-BG	Sample	U-234	4.74E-04 +/- 8.1E-05	2E-06	ug/l	WATER	AS100304-2	3/5/2010	
1003045-7	RSJ-SW-BG	Sample	U-235	4.8E-02 +/- 2.2E-02	6E-03	ug/l	WATER	AS100304-2	3/5/2010	LT
1003045-7	RSJ-SW-BG	Sample	U-238	3.7E+00 +/- 7.1E-01	1.1E-01	ug/l	WATER	AS100304-2	3/5/2010	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

18 20000559 20000559

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:32 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-7	RSJ-SW-BG	Sample	URANIUM, TOTAL	3.75E+00 +/- 7.1E-01	NA	ug/l	WATER	AS100304-2	3/5/2010	
1003045-8	MD-SED-0-2'	Sample	U-234	2.02E-04 +/- 3.7E-05	6E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-8	MD-SED-0-2'	Sample	U-235	3.3E-02 +/- 1.6E-02	1.2E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	LT
1003045-8	MD-SED-0-2'	Sample	U-238	3.88E+00 +/- 7.1E-01	9E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-8	MD-SED-0-2'	Sample	URANIUM, TOTAL	3.92E+00 +/- 7.1E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-9	MD-SED-2-4'	Sample	U-234	7.1E-05 +/- 1.5E-05	3E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-9	MD-SED-2-4'	Sample	U-235	1.8E-02 +/- 1E-02	4E-03	ug/g	SEDIMENT	AS100304-1	3/5/2010	LT
1003045-9	MD-SED-2-4'	Sample	U-238	1.18E+00 +/- 2.6E-01	8E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-9	MD-SED-2-4'	Sample	URANIUM, TOTAL	1.2E+00 +/- 2.6E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000560
19
20000560

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: **ALS Laboratory Group -- FC**
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:32 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-10	MD-SED-4-6'	Sample	U-234	7.5E-05 +/- 1.6E-05	5E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-10	MD-SED-4-6'	Sample	U-235	1.34E-02 +/- 9.1E-03	4E-03	ug/g	SEDIMENT	AS100304-1	3/5/2010	LT
1003045-10	MD-SED-4-6'	Sample	U-238	1.48E+00 +/- 3.2E-01	1.3E-01	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-10	MD-SED-4-6'	Sample	URANIUM, TOTAL	1.49E+00 +/- 3.2E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-11	PR-SED-01	Sample	U-234	1.3E-04 +/- 2.5E-05	5E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-11	PR-SED-01	Sample	U-235	2.6E-02 +/- 1.4E-02	1E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	LT
1003045-11	PR-SED-01	Sample	U-238	2.28E+00 +/- 4.5E-01	7E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-11	PR-SED-01	Sample	URANIUM, TOTAL	2.31E+00 +/- 4.5E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-12	RP-SED-BG	Sample	U-234	1.59E-04 +/- 3E-05	4E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000561
20

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: **ALS Laboratory Group -- FC**
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:33 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-12	RP-SED-BG	Sample	U-235	2.8E-02 +/- 1.4E-02	4E-03	ug/g	SEDIMENT	AS100304-1	3/5/2010	LT
1003045-12	RP-SED-BG	Sample	U-238	2.52E+00 +/- 4.9E-01	6E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-12	RP-SED-BG	Sample	URANIUM, TOTAL	2.55E+00 +/- 4.9E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-13	RP-SED-BGD	Sample	U-234	1.56E-04 +/- 3E-05	6E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-13	RP-SED-BGD	Sample	U-235	2.8E-02 +/- 1.6E-02	1.6E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	LT
1003045-13	RP-SED-BGD	Sample	U-238	2.84E+00 +/- 5.5E-01	9E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-13	RP-SED-BGD	Sample	URANIUM, TOTAL	2.86E+00 +/- 5.5E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-14	RP-SW-BG	Sample	U-234	2.31E-04 +/- 4.4E-05	7E-06	ug/l	WATER	AS100304-2	3/5/2010	
1003045-14	RP-SW-BG	Sample	U-235	1.6E-02 +/- 1.4E-02	1.6E-02	ug/l	WATER	AS100304-2	3/5/2010	LT

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000562
21
20000562

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:33 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-14	RP-SW-BG	Sample	U-238	1.78E+00 +/- 4.1E-01	1.1E-01	ug/l	WATER	AS100304-2	3/5/2010	
1003045-14	RP-SW-BG	Sample	URANIUM, TOTAL	1.8E+00 +/- 4.1E-01	NA	ug/l	WATER	AS100304-2	3/5/2010	
1003045-15	RP-SW-BGD	Sample	U-234	2.56E-04 +/- 4.8E-05	8E-06	ug/l	WATER	AS100304-2	3/5/2010	
1003045-15	RP-SW-BGD	Sample	U-235	2.8E-02 +/- 2E-02	2.6E-02	ug/l	WATER	AS100304-2	3/5/2010	LT
1003045-15	RP-SW-BGD	Sample	U-238	1.97E+00 +/- 4.4E-01	9E-02	ug/l	WATER	AS100304-2	3/5/2010	
1003045-15	RP-SW-BGD	Sample	URANIUM, TOTAL	2E+00 +/- 4.4E-01	NA	ug/l	WATER	AS100304-2	3/5/2010	
1003045-16	RSJ-SED-02	Sample	U-234	1.4E-04 +/- 2.8E-05	7E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-16	RSJ-SED-02	Sample	U-235	2.6E-02 +/- 1.4E-02	5E-03	ug/g	SEDIMENT	AS100304-1	3/5/2010	LT
1003045-16	RSJ-SED-02	Sample	U-238	2.46E+00 +/- 5E-01	1.2E-01	ug/g	SEDIMENT	AS100304-1	3/5/2010	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000563
22
20000563

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:33 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-16	RSJ-SED-02	Sample	URANIUM, TOTAL	2.49E+00 +/- 5E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-17	WR-SED-0-2'	Sample	U-234	7.5E-05 +/- 1.6E-05	5E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-17	WR-SED-0-2'	Sample	U-235	8.1E-03 +/- 7.8E-03	1.08E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	U
1003045-17	WR-SED-0-2'	Sample	U-238	1.38E+00 +/- 2.9E-01	9E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-17	WR-SED-0-2'	Sample	URANIUM, TOTAL	1.38E+00 +/- 2.9E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-18	WR-SED-3'	Sample	U-234	3.17E-05 +/- 8.7E-06	4E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-18	WR-SED-3'	Sample	U-235	5.5E-03 +/- 6.7E-03	1.04E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	U
1003045-18	WR-SED-3'	Sample	U-238	5.9E-01 +/- 1.6E-01	9E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-18	WR-SED-3'	Sample	URANIUM, TOTAL	5.9E-01 +/- 1.6E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000564
20000564
23

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: **ALS Laboratory Group -- FC**
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:33 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-19	WR-SED-5.5'	Sample	U-234	2.46E-05 +/- 7.7E-06	4.6E-06	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-19	WR-SED-5.5'	Sample	U-235	-1.4E-03 +/- 7.1E-03	1.71E-02	ug/g	SEDIMENT	AS100304-1	3/5/2010	U
1003045-19	WR-SED-5.5'	Sample	U-238	4.3E-01 +/- 1.4E-01	1E-01	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-19	WR-SED-5.5'	Sample	URANIUM, TOTAL	4.3E-01 +/- 1.4E-01	NA	ug/g	SEDIMENT	AS100304-1	3/5/2010	
1003045-20	PR-SW-01	Sample	U-234	1.39E-02 +/- 2.2E-03	0E+00	ug/l	WATER	AS100304-2	3/5/2010	
1003045-20	PR-SW-01	Sample	U-235	1.75E+00 +/- 3E-01	3E-02	ug/l	WATER	AS100304-2	3/5/2010	
1003045-20	PR-SW-01	Sample	U-238	2.24E+02 +/- 3.5E+01	0E+00	ug/l	WATER	AS100304-2	3/5/2010	
1003045-20	PR-SW-01	Sample	URANIUM, TOTAL	2.26E+02 +/- 3.5E+01	NA	ug/l	WATER	AS100304-2	3/5/2010	
1003045-21	RP-SED-03	Sample	U-234	3.86E-04 +/- 6.7E-05	7E-06	ug/g	SEDIMENT	AS100304-1	3/6/2010	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

200000565
24
200000565

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:33 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-21	RP-SED-03	Sample	U-235	4.5E-02 +/- 2.1E-02	1.4E-02	ug/g	SEDIMENT	AS100304-1	3/6/2010	LT
1003045-21	RP-SED-03	Sample	U-238	7.5E+00 +/- 1.3E+00	1E-01	ug/g	SEDIMENT	AS100304-1	3/6/2010	
1003045-21	RP-SED-03	Sample	URANIUM, TOTAL	7.6E+00 +/- 1.3E+00	NA	ug/g	SEDIMENT	AS100304-1	3/6/2010	
1003045-22	RP-SW-03	Sample	U-234	3.47E-03 +/- 5.5E-04	1E-05	ug/l	WATER	AS100304-2	3/5/2010	
1003045-22	RP-SW-03	Sample	U-235	4.19E-01 +/- 9.1E-02	1.7E-02	ug/l	WATER	AS100304-2	3/5/2010	
1003045-22	RP-SW-03	Sample	U-238	5.66E+01 +/- 8.9E+00	1E-01	ug/l	WATER	AS100304-2	3/5/2010	
1003045-22	RP-SW-03	Sample	URANIUM, TOTAL	5.71E+01 +/- 8.9E+00	NA	ug/l	WATER	AS100304-2	3/5/2010	
1003045-23	RSJ-SED-01	Sample	U-234	3.9E-05 +/- 1E-05	4E-06	ug/g	SEDIMENT	AS100304-1	3/6/2010	
1003045-23	RSJ-SED-01	Sample	U-235	4.4E-03 +/- 6.5E-03	3.9E-03	ug/g	SEDIMENT	AS100304-1	3/6/2010	LT

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000566
25
20000566

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:33 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-23	RSJ-SED-01	Sample	U-238	7.4E-01 +/- 1.9E-01	7E-02	ug/g	SEDIMENT	AS100304-1	3/6/2010	
1003045-23	RSJ-SED-01	Sample	URANIUM, TOTAL	7.4E-01 +/- 1.9E-01	NA	ug/g	SEDIMENT	AS100304-1	3/6/2010	
1003045-24	RSJ-SW-01	Sample	U-234	4.66E-04 +/- 8.1E-05	9E-06	ug/l	WATER	AS100304-2	3/5/2010	
1003045-24	RSJ-SW-01	Sample	U-235	2.2E-02 +/- 1.8E-02	2.5E-02	ug/l	WATER	AS100304-2	3/5/2010	U
1003045-24	RSJ-SW-01	Sample	U-238	4.28E+00 +/- 8.2E-01	1.6E-01	ug/l	WATER	AS100304-2	3/5/2010	
1003045-24	RSJ-SW-01	Sample	URANIUM, TOTAL	4.3E+00 +/- 8.2E-01	NA	ug/l	WATER	AS100304-2	3/5/2010	
1003045-25	RSJ-SW-02	Sample	U-234	5E-04 +/- 8.7E-05	1.1E-05	ug/l	WATER	AS100304-2	3/5/2010	
1003045-25	RSJ-SW-02	Sample	U-235	5.8E-02 +/- 2.7E-02	2.2E-02	ug/l	WATER	AS100304-2	3/5/2010	LT
1003045-25	RSJ-SW-02	Sample	U-238	4.43E+00 +/- 8.5E-01	1E-01	ug/l	WATER	AS100304-2	3/5/2010	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000567
26
20000567

Total Uranium by Alpha Spectroscopy Sample Results Summary

Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202

Laboratory Name: **ALS Laboratory Group -- FC**
PAI Work Order: 1003045

Reported on: Thursday, March 11, 2010 11:28:33 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1003045-25	RSJ-SW-02	Sample	URANIUM, TOTAL	4.49E+00 +/- 8.5E-01	NA	ug/l	WATER	AS100304-2	3/5/2010	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

20000568
20000568
27

Section 3

QC RESULTS SUMMARY 3

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Method Blank Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: AS100304-1MB

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 04-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 06-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes

Final Aliquot: 1.03 g
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	2.6E-06 +/- 2.6E-06	3.9E-06	1.6E-05	U
15117-96-1	U-235	-4.2E-03 +/- 4.9E-03	1.42E-02	4.63E-02	U
7440-61-1	U-238	1.7E-02 +/- 3.5E-02	6.6E-02	2.98E-01	U
7440-61-1	URANIUM, TOTAL	1.3E-02 +/- 3.6E-02	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.020E-07	1.72E-07	ug/g	85.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Method Blank Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: AS100304-2MB

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 04-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes

Final Aliquot: 500 ml
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	5E-07 +/- 5.4E-06	1.11E-05	3.21E-05	U
15117-96-1	U-235	1E-03 +/- 1.2E-02	2.2E-02	9.3E-02	U
7440-61-1	U-238	-7.4E-02 +/- 8E-02	2.17E-01	5.95E-01	U
7440-61-1	URANIUM, TOTAL	-7.3E-02 +/- 8.1E-02	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.43E-07	ug/l	82.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: AS100304-1LCS

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 04-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 06-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes

Final Aliquot: 1.03 g
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	6.9E-04 +/- 1.1E-04	0E+00	6.750E-04	103	82 - 122	P
15117-96-1	U-235	8.3E-02 +/- 2.5E-02	4E-03	9.310E-02	89.1	NA	
7440-61-1	U-238	1.32E+01 +/- 2.1E+00	1E-01	1.300E+01	101	82 - 122	P
7440-61-1	URANIUM, TOTAL	1.33E+01 +/- 2.1E+00	NA	1.310E+01	101	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.020E-07	1.47E-07	ug/g	72.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: AS100304-2LCS

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 04-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes

Final Aliquot: 500 ml
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	1.41E-03 +/- 2.3E-04	1E-05	1.390E-03	101	82 - 122	P
15117-96-1	U-235	2.22E-01 +/- 6E-02	2.1E-02	1.920E-01	116	NA	
7440-61-1	U-238	2.74E+01 +/- 4.4E+00	2E-01	2.680E+01	102	82 - 122	P
7440-61-1	URANIUM, TOTAL	2.76E+01 +/- 4.4E+00	NA	2.700E+01	102	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.44E-07	ug/l	82.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: MD-SED-2-4'
Lab ID: 1003045-9DUP

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.05 g
Prep Basis: As Received
Moisture(%): 16.448
Result Units: ug/g
File Name: Spectrum #1

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		
13966-29-5	U-234	7.1E-05 +/- 1.5E-05	3E-06		8E-05 +/- 1.7E-05	3E-06		0.417	2.13
15117-96-1	U-235	1.8E-02 +/- 1E-02	4E-03	LT	5.8E-03 +/- 6.6E-03	9.5E-03	U	1.02	2.13
7440-61-1	U-238	1.18E+00 +/- 2.6E-01	8E-02		1.39E+00 +/- 3E-01	6E-02		0.527	2.13
7440-61-1	URANIUM, TOTAL	1.2E+00 +/- 2.6E-01	#Error		1.39E+00 +/- 3E-01	#Error		0.99	

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:
TPU - Total Propagated Uncertainty
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-02
Lab ID: 1003045-16DUP

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.05 g
Prep Basis: As Received
Moisture(%): 40.152
Result Units: ug/g
File Name: Spectrum #1

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		
13966-29-5	U-234	1.4E-04 +/- 2.8E-05	7E-06		1.23E-04 +/- 2.5E-05	8E-06		0.468	2.13
15117-96-1	U-235	2.6E-02 +/- 1.4E-02	5E-03	LT	2.1E-02 +/- 1.4E-02	1.3E-02	LT	0.247	2.13
7440-61-1	U-238	2.46E+00 +/- 5E-01	1.2E-01		2.77E+00 +/- 5.5E-01	1.2E-01		0.423	2.13
7440-61-1	URANIUM, TOTAL	2.49E+00 +/- 5E-01	#Error		2.8E+00 +/- 5.5E-01	#Error		0.832	

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

LT - Result is less than Request MDC, greater than sample specific MDC

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-03
Lab ID: 1003045-22DUP

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		
13966-29-5	U-234	3.47E-03 +/- 5.5E-04	1E-05		3.29E-03 +/- 5.2E-04	1E-05		0.229	2.13
15117-96-1	U-235	4.19E-01 +/- 9.1E-02	1.7E-02		5E-01 +/- 1E-01	2E-02		0.6	2.13
7440-61-1	U-238	5.66E+01 +/- 8.9E+00	1E-01		5.62E+01 +/- 8.9E+00	1E-01		0.0322	2.13
7440-61-1	URANIUM, TOTAL	5.71E+01 +/- 8.9E+00	#Error		5.67E+01 +/- 8.9E+00	#Error		0.0513	

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

LT - Result is less than Request MDC, greater than sample specific MDC

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

Data Package ID: *UT1003045-1*

Section 4

INDIVIDUAL SAMPLE RESULTS

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: Rinsate 030210
Lab ID: 1003045-1

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	2E-06 +/- 4.3E-06	8E-06	3.21E-05	U
15117-96-1	U-235	0E+00 +/- 1E-02	1.6E-02	9.3E-02	U
7440-61-1	U-238	1.5E-02 +/- 5.5E-02	8.5E-02	5.95E-01	U
7440-61-1	URANIUM, TOTAL	1.5E-02 +/- 5.6E-02	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.64E-07	ug/l	87.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RM-SED-BG
Lab ID: 1003045-2

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.01 g
Prep Basis: As Received
Moisture(%): 35.375
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.62E-04 +/- 3.2E-05	8E-06	1.6E-05	
15117-96-1	U-235	3.4E-02 +/- 2E-02	2.3E-02	4.6E-02	LT
7440-61-1	U-238	3.53E+00 +/- 6.8E-01	1.8E-01	3E-01	
7440-61-1	URANIUM, TOTAL	3.56E+00 +/- 6.8E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	3.180E-07	2.48E-07	ug/g	77.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RM-SW-BG
Lab ID: 1003045-3

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	3.41E-04 +/- 6E-05	6E-06	3.2E-05	
15117-96-1	U-235	3E-02 +/- 1.7E-02	6E-03	9.3E-02	LT
7440-61-1	U-238	3.81E+00 +/- 7.2E-01	1E-01	5.9E-01	
7440-61-1	URANIUM, TOTAL	3.84E+00 +/- 7.2E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.82E-07	ug/l	91.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-03
Lab ID: 1003045-4

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.04 g
Prep Basis: As Received
Moisture(%): 7.951
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	5E-05 +/- 1.3E-05	1E-05	1.6E-05	
15117-96-1	U-235	1.5E-02 +/- 1.3E-02	1.8E-02	4.6E-02	U
7440-61-1	U-238	8.5E-01 +/- 2.2E-01	1.2E-01	3E-01	
7440-61-1	URANIUM, TOTAL	8.6E-01 +/- 2.2E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.180E-07	1.49E-07	ug/g	68.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-BG
Lab ID: 1003045-5

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.02 g
Prep Basis: As Received
Moisture(%): 29.218
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	6.9E-05 +/- 1.6E-05	6E-06	1.6E-05	
15117-96-1	U-235	1.4E-02 +/- 1.4E-02	2E-02	4.6E-02	U
7440-61-1	U-238	1.42E+00 +/- 3.2E-01	1.1E-01	3E-01	
7440-61-1	URANIUM, TOTAL	1.44E+00 +/- 3.2E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.890E-07	2.38E-07	ug/g	82.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SW-03
Lab ID: 1003045-6

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	4.61E-04 +/- 7.9E-05	8E-06	3.2E-05	
15117-96-1	U-235	3.3E-02 +/- 2.2E-02	2.7E-02	9.3E-02	LT
7440-61-1	U-238	4.15E+00 +/- 7.9E-01	1.3E-01	5.9E-01	
7440-61-1	URANIUM, TOTAL	4.18E+00 +/- 7.9E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.56E-07	ug/l	85.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SW-BG
Lab ID: 1003045-7

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	4.74E-04 +/- 8.1E-05	2E-06	3.2E-05	
15117-96-1	U-235	4.8E-02 +/- 2.2E-02	6E-03	9.3E-02	LT
7440-61-1	U-238	3.7E+00 +/- 7.1E-01	1.1E-01	5.9E-01	
7440-61-1	URANIUM, TOTAL	3.75E+00 +/- 7.1E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.68E-07	ug/l	88.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: MD-SED-0-2'
Lab ID: 1003045-8

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.01 g
Prep Basis: As Received
Moisture(%): 25.794
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	2.02E-04 +/- 3.7E-05	6E-06	1.6E-05	
15117-96-1	U-235	3.3E-02 +/- 1.6E-02	1.2E-02	4.6E-02	LT
7440-61-1	U-238	3.88E+00 +/- 7.1E-01	9E-02	3E-01	
7440-61-1	URANIUM, TOTAL	3.92E+00 +/- 7.1E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.790E-07	2.35E-07	ug/g	84.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: MD-SED-2-4'
Lab ID: 1003045-9

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.03 g
Prep Basis: As Received
Moisture(%): 16.448
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	7.1E-05 +/- 1.5E-05	3E-06	1.6E-05	
15117-96-1	U-235	1.8E-02 +/- 1E-02	4E-03	4.6E-02	LT
7440-61-1	U-238	1.18E+00 +/- 2.6E-01	8E-02	3E-01	
7440-61-1	URANIUM, TOTAL	1.2E+00 +/- 2.6E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.420E-07	2.2E-07	ug/g	91.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Duplicate Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: MD-SED-2-4'
Lab ID: 1003045-9DUP

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.05 g
Prep Basis: As Received
Moisture(%): 16.448
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	8E-05 +/- 1.7E-05	3E-06	1.6E-05	
15117-96-1	U-235	5.8E-03 +/- 6.6E-03	9.5E-03	4.63E-02	U
7440-61-1	U-238	1.39E+00 +/- 3E-01	6E-02	3E-01	
7440-61-1	URANIUM, TOTAL	1.39E+00 +/- 3E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.380E-07	2.14E-07	ug/g	89.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: MD-SED-4-6'
Lab ID: 1003045-10

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.00 g
Prep Basis: As Received
Moisture(%): 16.881
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	7.5E-05 +/- 1.6E-05	5E-06	1.6E-05	
15117-96-1	U-235	1.34E-02 +/- 9.1E-03	4E-03	4.63E-02	LT
7440-61-1	U-238	1.48E+00 +/- 3.2E-01	1.3E-01	3E-01	
7440-61-1	URANIUM, TOTAL	1.49E+00 +/- 3.2E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.510E-07	2.1E-07	ug/g	83.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: PR-SED-01
Lab ID: 1003045-11

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.06 g
Prep Basis: As Received
Moisture(%): 21.499
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.3E-04 +/- 2.5E-05	5E-06	1.6E-05	
15117-96-1	U-235	2.6E-02 +/- 1.4E-02	1E-02	4.6E-02	LT
7440-61-1	U-238	2.28E+00 +/- 4.5E-01	7E-02	3E-01	
7440-61-1	URANIUM, TOTAL	2.31E+00 +/- 4.5E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.500E-07	2.03E-07	ug/g	81.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-BG
Lab ID: 1003045-12

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.02 g
Prep Basis: As Received
Moisture(%): 29.614
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.59E-04 +/- 3E-05	4E-06	1.6E-05	
15117-96-1	U-235	2.8E-02 +/- 1.4E-02	4E-03	4.6E-02	LT
7440-61-1	U-238	2.52E+00 +/- 4.9E-01	6E-02	3E-01	
7440-61-1	URANIUM, TOTAL	2.55E+00 +/- 4.9E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.920E-07	2.51E-07	ug/g	86.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-BGD
Lab ID: 1003045-13

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.01 g
Prep Basis: As Received
Moisture(%): 35.786
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.56E-04 +/- 3E-05	6E-06	1.6E-05	
15117-96-1	U-235	2.8E-02 +/- 1.6E-02	1.6E-02	4.6E-02	LT
7440-61-1	U-238	2.84E+00 +/- 5.5E-01	9E-02	3E-01	
7440-61-1	URANIUM, TOTAL	2.86E+00 +/- 5.5E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	3.230E-07	2.71E-07	ug/g	83.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-BG
Lab ID: 1003045-14

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	2.31E-04 +/- 4.4E-05	7E-06	3.2E-05	
15117-96-1	U-235	1.6E-02 +/- 1.4E-02	1.6E-02	9.3E-02	LT
7440-61-1	U-238	1.78E+00 +/- 4.1E-01	1.1E-01	5.9E-01	
7440-61-1	URANIUM, TOTAL	1.8E+00 +/- 4.1E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.58E-07	ug/l	85.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-BGD
Lab ID: 1003045-15

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	2.56E-04 +/- 4.8E-05	8E-06	3.2E-05	
15117-96-1	U-235	2.8E-02 +/- 2E-02	2.6E-02	9.3E-02	LT
7440-61-1	U-238	1.97E+00 +/- 4.4E-01	9E-02	5.9E-01	
7440-61-1	URANIUM, TOTAL	2E+00 +/- 4.4E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.6E-07	ug/l	86.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-02
Lab ID: 1003045-16

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.03 g
Prep Basis: As Received
Moisture(%): 40.152
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.4E-04 +/- 2.8E-05	7E-06	1.6E-05	
15117-96-1	U-235	2.6E-02 +/- 1.4E-02	5E-03	4.6E-02	LT
7440-61-1	U-238	2.46E+00 +/- 5E-01	1.2E-01	3E-01	
7440-61-1	URANIUM, TOTAL	2.49E+00 +/- 5E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	3.380E-07	2.89E-07	ug/g	85.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Duplicate Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-02
Lab ID: 1003045-16DUP

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.05 g
Prep Basis: As Received
Moisture(%): 40.152
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.23E-04 +/- 2.5E-05	8E-06	1.6E-05	
15117-96-1	U-235	2.1E-02 +/- 1.4E-02	1.3E-02	4.6E-02	LT
7440-61-1	U-238	2.77E+00 +/- 5.5E-01	1.2E-01	3E-01	
7440-61-1	URANIUM, TOTAL	2.8E+00 +/- 5.5E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	3.340E-07	2.88E-07	ug/g	86.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: WR-SED-0-2'
Lab ID: 1003045-17

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.02 g
Prep Basis: As Received
Moisture(%): 5.057
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	7.5E-05 +/- 1.6E-05	5E-06	1.6E-05	
15117-96-1	U-235	8.1E-03 +/- 7.8E-03	1.08E-02	4.63E-02	U
7440-61-1	U-238	1.38E+00 +/- 2.9E-01	9E-02	3E-01	
7440-61-1	URANIUM, TOTAL	1.38E+00 +/- 2.9E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.160E-07	1.82E-07	ug/g	84.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: WR-SED-3'
Lab ID: 1003045-18

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.08 g
Prep Basis: As Received
Moisture(%): 19.931
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	3.17E-05 +/- 8.7E-06	4E-06	1.6E-05	
15117-96-1	U-235	5.5E-03 +/- 6.7E-03	1.04E-02	4.63E-02	U
7440-61-1	U-238	5.9E-01 +/- 1.6E-01	9E-02	3E-01	
7440-61-1	URANIUM, TOTAL	5.9E-01 +/- 1.6E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.410E-07	2.1E-07	ug/g	87.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: WR-SED-5.5'
Lab ID: 1003045-19

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.08 g
Prep Basis: As Received
Moisture(%): 19.549
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	2.46E-05 +/- 7.7E-06	4.6E-06	1.6E-05	
15117-96-1	U-235	-1.4E-03 +/- 7.1E-03	1.71E-02	4.63E-02	U
7440-61-1	U-238	4.3E-01 +/- 1.4E-01	1E-01	3E-01	
7440-61-1	URANIUM, TOTAL	4.3E-01 +/- 1.4E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.400E-07	1.97E-07	ug/g	82.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: PR-SW-01
Lab ID: 1003045-20

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.39E-02 +/- 2.2E-03	0E+00	0E-05	
15117-96-1	U-235	1.75E+00 +/- 3E-01	3E-02	9E-02	
7440-61-1	U-238	2.24E+02 +/- 3.5E+01	0E+00	10E-01	
7440-61-1	URANIUM, TOTAL	2.26E+02 +/- 3.5E+01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.16E-07	ug/l	75.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-03
Lab ID: 1003045-21

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 06-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.01 g
Prep Basis: As Received
Moisture(%): 39.400
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	3.86E-04 +/- 6.7E-05	7E-06	1.6E-05	
15117-96-1	U-235	4.5E-02 +/- 2.1E-02	1.4E-02	4.6E-02	LT
7440-61-1	U-238	7.5E+00 +/- 1.3E+00	1E-01	3E-01	
7440-61-1	URANIUM, TOTAL	7.6E+00 +/- 1.3E+00	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	3.400E-07	2.71E-07	ug/g	79.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-03
Lab ID: 1003045-22

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	3.47E-03 +/- 5.5E-04	1E-05	3E-05	
15117-96-1	U-235	4.19E-01 +/- 9.1E-02	1.7E-02	9.3E-02	
7440-61-1	U-238	5.66E+01 +/- 8.9E+00	1E-01	6E-01	
7440-61-1	URANIUM, TOTAL	5.71E+01 +/- 8.9E+00	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.46E-07	ug/l	82.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Duplicate Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-03
Lab ID: 1003045-22DUP

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	3.29E-03 +/- 5.2E-04	1E-05	3E-05	
15117-96-1	U-235	5E-01 +/- 1E-01	2E-02	9.3E-02	
7440-61-1	U-238	5.62E+01 +/- 8.9E+00	1E-01	6E-01	
7440-61-1	URANIUM, TOTAL	5.67E+01 +/- 8.9E+00	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.47E-07	ug/l	83.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SED-01
Lab ID: 1003045-23

Sample Matrix: SEDIMENT
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 06-Mar-10

Prep Batch: AS100304-1
QCBatchID: AS100304-1-1
Run ID: AS100304-1A
Count Time: 800 minutes
Report Basis: Dry Weight

Final Aliquot: 1.01 g
Prep Basis: As Received
Moisture(%): 22.849
Result Units: ug/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	3.9E-05 +/- 1E-05	4E-06	1.6E-05	
15117-96-1	U-235	4.4E-03 +/- 6.5E-03	3.9E-03	4.63E-02	LT
7440-61-1	U-238	7.4E-01 +/- 1.9E-01	7E-02	3E-01	
7440-61-1	URANIUM, TOTAL	7.4E-01 +/- 1.9E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	2.680E-07	2.3E-07	ug/g	85.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SW-01
Lab ID: 1003045-24

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	4.66E-04 +/- 8.1E-05	9E-06	3.2E-05	
15117-96-1	U-235	2.2E-02 +/- 1.8E-02	2.5E-02	9.3E-02	U
7440-61-1	U-238	4.28E+00 +/- 8.2E-01	1.6E-01	5.9E-01	
7440-61-1	URANIUM, TOTAL	4.3E+00 +/- 8.2E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.49E-07	ug/l	83.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Total Uranium by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003045
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RSJ-SW-02
Lab ID: 1003045-25

Sample Matrix: WATER
Prep SOP: PAI 778 Rev 13
Date Collected: 02-Mar-10
Date Prepared: 04-Mar-10
Date Analyzed: 05-Mar-10

Prep Batch: AS100304-2
QCBatchID: AS100304-2-1
Run ID: AS100304-2A
Count Time: 800 minutes
Report Basis: Unfiltered

Final Aliquot: 500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: ug/l
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	5E-04 +/- 8.7E-05	1.1E-05	3.2E-05	
15117-96-1	U-235	5.8E-02 +/- 2.7E-02	2.2E-02	9.3E-02	LT
7440-61-1	U-238	4.43E+00 +/- 8.5E-01	1E-01	5.9E-01	
7440-61-1	URANIUM, TOTAL	4.49E+00 +/- 8.5E-01	NA		

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.170E-07	3.65E-07	ug/l	87.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UT1003045-1*

Section 5

RAW DATA

5

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 9:24:06 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1003045-1	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	2236.600	30.99%	800	3.64E-07	3E-09	ug/l	NA	
SMP	Tracer	6:20:00 PM	AS100304-2-1	NA	NA	NA	500 ml	9	Spectrum #1	8:24 PM	18.000	1000	87.3%	5.6E-08	NA	Unfiltered	NA	
1003045-1	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	3.000	30.99%	800	2E-06	8E-06	ug/l	NA	
SMP	Trg. Analyte	6:20:00 PM	AS100304-2-1	NA	NA	NA	500 ml	9	Spectrum #1	8:24 PM	5.000	1000	87.3%	4.3E-06	NA	Unfiltered	NA	U
1003045-1	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	0.200	30.99%	800	0E+00	1.6E-02	ug/l	NA	
SMP	Trg. Analyte	6:20:00 PM	AS100304-2-1	NA	NA	NA	500 ml	9	Spectrum #1	8:24 PM	1.000	1000	87.3%	1E-02	NA	Unfiltered	NA	U
1003045-1	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	1.200	30.99%	800	1.5E-02	8.5E-02	ug/l	NA	
SMP	Trg. Analyte	6:20:00 PM	AS100304-2-1	NA	NA	NA	500 ml	9	Spectrum #1	8:24 PM	1.000	1000	87.3%	5.5E-02	NA	Unfiltered	NA	U
1003045-1	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	4.400	30.99%	800	1.5E-02		ug/l	NA	
SMP	Trg. Analyte	6:20:00 PM	AS100304-2-1	NA	NA	NA	500 ml	9	Spectrum #1	8:24 PM	7.000	1000	87.3%	5.6E-02	NA	Unfiltered	NA	
1003045-2	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	1888.600	29.36%	800	2.48E-07	3E-09	ug/g	NA	
SMP	Tracer	10:12:00 AM	AS100304-1-1	NA	NA	35.3746	1.01* g	25	Spectrum #1	8:43 PM	28.000	1000	77.9%	3.9E-08	NA	Dry Weight	NA	
1003045-2	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	269.200	29.36%	800	1.62E-04	8E-06	ug/g	NA	
SMP	Trg. Analyte	10:12:00 AM	AS100304-1-1	NA	NA	35.3746	1.01* g	25	Spectrum #1	8:43 PM	6.000	1000	77.9%	3.2E-05	NA	Dry Weight	NA	
1003045-2	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	16.800	29.36%	800	3.4E-02	2.3E-02	ug/g	NA	
SMP	Trg. Analyte	10:12:00 AM	AS100304-1-1	NA	NA	35.3746	1.01* g	25	Spectrum #1	8:43 PM	4.000	1000	77.9%	2E-02	NA	Dry Weight	NA	LT
1003045-2	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	315.200	29.36%	800	3.53E+00	1.8E-01	ug/g	NA	
SMP	Trg. Analyte	10:12:00 AM	AS100304-1-1	NA	NA	35.3746	1.01* g	25	Spectrum #1	8:43 PM	11.000	1000	77.9%	6.8E-01	NA	Dry Weight	NA	
1003045-2	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	601.200	29.36%	800	3.56E+00		ug/g	NA	
SMP	Trg. Analyte	10:12:00 AM	AS100304-1-1	NA	NA	35.3746	1.01* g	25	Spectrum #1	8:43 PM	21.000	1000	77.9%	6.8E-01	NA	Dry Weight	NA	
1003045-3	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	2385.600	31.56%	800	3.82E-07	3E-09	ug/l	NA	
SMP	Tracer	10:12:00 AM	AS100304-2-1	NA	NA	NA	500 ml	10a	Spectrum #1	8:24 PM	13.000	1000	91.5%	5.9E-08	NA	Unfiltered	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000607 99

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 9:24:06 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1003045-3	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	545.600	31.56%	800	3.41E-04	6E-06	ug/l	NA	
SMP	Trg. Analyte	10:12:00 AM	AS100304-2-1	NA	NA	NA	500 ml	10a	Spectrum #1	8:24 PM	3.000	1000	91.5%	6E-05	NA	Unfiltered	NA	
1003045-3	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	14.000	31.56%	800	3E-02	6E-03	ug/l	NA	
SMP	Trg. Analyte	10:12:00 AM	AS100304-2-1	NA	NA	NA	500 ml	10a	Spectrum #1	8:24 PM	0.000	1000	91.5%	1.7E-02	NA	Unfiltered	NA	LT
1003045-3	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	328.400	31.56%	800	3.81E+00	1E-01	ug/l	NA	
SMP	Trg. Analyte	10:12:00 AM	AS100304-2-1	NA	NA	NA	500 ml	10a	Spectrum #1	8:24 PM	2.000	1000	91.5%	7.2E-01	NA	Unfiltered	NA	
1003045-3	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	888.000	31.56%	800	3.84E+00		ug/l	NA	
SMP	Trg. Analyte	10:12:00 AM	AS100304-2-1	NA	NA	NA	500 ml	10a	Spectrum #1	8:24 PM	5.000	1000	91.5%	7.2E-01	NA	Unfiltered	NA	
1003045-4	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.04* g	AlphaSpec2	AS100304-1A	3/5/2010	1752.754	31.01%	800	1.49E-07	2E-09	ug/g	NA	
SMP	Tracer	10:37:00 AM	AS100304-1-1	NA	NA	7.9508	1.04* g	26	Spectrum #1	8:43 PM	26.801	1000	68.4%	2.3E-08	NA	Dry Weight	NA	
1003045-4	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.04* g	AlphaSpec2	AS100304-1A	3/5/2010	112.361	31.01%	800	5E-05	1E-05	ug/g	NA	
SMP	Trg. Analyte	10:37:00 AM	AS100304-1-1	NA	NA	7.9508	1.04* g	26	Spectrum #1	8:43 PM	23.801	1000	68.4%	1.3E-05	NA	Dry Weight	NA	
1003045-4	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.04* g	AlphaSpec2	AS100304-1A	3/5/2010	10.239	31.01%	800	1.5E-02	1.8E-02	ug/g	NA	
SMP	Trg. Analyte	10:37:00 AM	AS100304-1-1	NA	NA	7.9508	1.04* g	26	Spectrum #1	8:43 PM	5.199	1000	68.4%	1.3E-02	NA	Dry Weight	NA	U
1003045-4	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.04* g	AlphaSpec2	AS100304-1A	3/5/2010	102.319	31.01%	800	8.5E-01	1.2E-01	ug/g	NA	
SMP	Trg. Analyte	10:37:00 AM	AS100304-1-1	NA	NA	7.9508	1.04* g	26	Spectrum #1	8:43 PM	8.601	1000	68.4%	2.2E-01	NA	Dry Weight	NA	
1003045-4	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.04* g	AlphaSpec2	AS100304-1A	3/5/2010	224.919	31.01%	800	8.6E-01		ug/g	NA	
SMP	Trg. Analyte	10:37:00 AM	AS100304-1-1	NA	NA	7.9508	1.04* g	26	Spectrum #1	8:43 PM	37.601	1000	68.4%	2.2E-01	NA	Dry Weight	NA	
1003045-5	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	2034.879	29.97%	800	2.38E-07	3E-09	ug/g	NA	
SMP	Tracer	11:46:00 AM	AS100304-1-1	NA	NA	29.218	1.02* g	27	Spectrum #1	8:43 PM	22.246	1000	82.2%	3.7E-08	NA	Dry Weight	NA	
1003045-5	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	136.754	29.97%	800	6.9E-05	6E-06	ug/g	NA	
SMP	Trg. Analyte	11:46:00 AM	AS100304-1-1	NA	NA	29.218	1.02* g	27	Spectrum #1	8:43 PM	5.000	1000	82.2%	1.6E-05	NA	Dry Weight	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000608
67
20000608

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 8:43:19 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1003045-5	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	8.181	29.97%	800	1.4E-02	2E-02	ug/g	NA	
SMP	Trg. Analyte	11:46:00 AM	AS100304-1-1	NA	NA	29.218	1.02* g	27	Spectrum #1	8:43 PM	4.754	1000	82.2%	1.4E-02	NA	Dry Weight	NA	U
1003045-5	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	151.000	29.97%	800	1.42E+00	1.1E-01	ug/g	NA	
SMP	Trg. Analyte	11:46:00 AM	AS100304-1-1	NA	NA	29.218	1.02* g	27	Spectrum #1	8:43 PM	5.000	1000	82.2%	3.2E-01	NA	Dry Weight	NA	
1003045-5	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	295.935	29.97%	800	1.44E+00		ug/g	NA	
SMP	Trg. Analyte	11:46:00 AM	AS100304-1-1	NA	NA	29.218	1.02* g	27	Spectrum #1	8:43 PM	14.754	1000	82.2%	3.2E-01	NA	Dry Weight	NA	
1003045-6	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	2236.753	31.76%	800	3.56E-07	3E-09	ug/l	NA	
SMP	Tracer	10:37:00 AM	AS100304-2-1	NA	NA	NA	500 ml	11	Spectrum #1	8:24 PM	11.000	1000	85.2%	5.5E-08	NA	Unfiltered	NA	
1003045-6	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	692.105	31.76%	800	4.61E-04	8E-06	ug/l	NA	
SMP	Trg. Analyte	10:37:00 AM	AS100304-2-1	NA	NA	NA	500 ml	11	Spectrum #1	8:24 PM	5.000	1000	85.2%	7.9E-05	NA	Unfiltered	NA	
1003045-6	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	14.447	31.76%	800	3.3E-02	2.7E-02	ug/l	NA	
SMP	Trg. Analyte	10:37:00 AM	AS100304-2-1	NA	NA	NA	500 ml	11	Spectrum #1	8:24 PM	5.000	1000	85.2%	2.2E-02	NA	Unfiltered	NA	LT
1003045-6	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	334.795	31.76%	800	4.15E+00	1.3E-01	ug/l	NA	
SMP	Trg. Analyte	10:37:00 AM	AS100304-2-1	NA	NA	NA	500 ml	11	Spectrum #1	8:24 PM	3.447	1000	85.2%	7.9E-01	NA	Unfiltered	NA	
1003045-6	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	1041.347	31.76%	800	4.18E+00		ug/l	NA	
SMP	Trg. Analyte	10:37:00 AM	AS100304-2-1	NA	NA	NA	500 ml	11	Spectrum #1	8:24 PM	13.447	1000	85.2%	7.9E-01	NA	Unfiltered	NA	
1003045-7	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	2235.800	30.64%	800	3.68E-07	3E-09	ug/l	NA	
SMP	Tracer	11:46:00 AM	AS100304-2-1	NA	NA	NA	500 ml	12	Spectrum #1	8:24 PM	9.000	1000	88.3%	5.7E-08	NA	Unfiltered	NA	
1003045-7	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	710.000	30.64%	800	4.74E-04	2E-06	ug/l	NA	
SMP	Trg. Analyte	11:46:00 AM	AS100304-2-1	NA	NA	NA	500 ml	12	Spectrum #1	8:24 PM	0.000	1000	88.3%	8.1E-05	NA	Unfiltered	NA	
1003045-7	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	21.000	30.64%	800	4.8E-02	6E-03	ug/l	NA	
SMP	Trg. Analyte	11:46:00 AM	AS100304-2-1	NA	NA	NA	500 ml	12	Spectrum #1	8:24 PM	0.000	1000	88.3%	2.2E-02	NA	Unfiltered	NA	LT

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

68
200000609
200000609

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 9:24:06 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1003045-7	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	298.400	30.64%	800	3.7E+00	1.1E-01	ug/l	NA	
SMP	Trg. Analyte	11:46:00 AM	AS100304-2-1	NA	NA	NA	500 ml	12	Spectrum #1	8:24 PM	2.000	1000	88.3%	7.1E-01	NA	Unfiltered	NA	
1003045-7	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	1029.400	30.64%	800	3.75E+00		ug/l	NA	
SMP	Trg. Analyte	11:46:00 AM	AS100304-2-1	NA	NA	NA	500 ml	12	Spectrum #1	8:24 PM	2.000	1000	88.3%	7.1E-01	NA	Unfiltered	NA	
1003045-8	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	2002.400	28.81%	800	2.35E-07	3E-09	ug/g	NA	
SMP	Tracer	4:45:00 PM	AS100304-1-1	NA	NA	25.7937	1.01* g	28	Spectrum #1	8:43 PM	22.000	1000	84.1%	3.6E-08	NA	Dry Weight	NA	
1003045-8	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	406.000	28.81%	800	2.02E-04	6E-06	ug/g	NA	
SMP	Trg. Analyte	4:45:00 PM	AS100304-1-1	NA	NA	25.7937	1.01* g	28	Spectrum #1	8:43 PM	5.000	1000	84.1%	3.7E-05	NA	Dry Weight	NA	
1003045-8	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	19.200	28.81%	800	3.3E-02	1.2E-02	ug/g	NA	
SMP	Trg. Analyte	4:45:00 PM	AS100304-1-1	NA	NA	25.7937	1.01* g	28	Spectrum #1	8:43 PM	1.000	1000	84.1%	1.6E-02	NA	Dry Weight	NA	LT
1003045-8	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	419.600	28.81%	800	3.88E+00	9E-02	ug/g	NA	
SMP	Trg. Analyte	4:45:00 PM	AS100304-1-1	NA	NA	25.7937	1.01* g	28	Spectrum #1	8:43 PM	3.000	1000	84.1%	7.1E-01	NA	Dry Weight	NA	
1003045-8	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	844.800	28.81%	800	3.92E+00		ug/g	NA	
SMP	Trg. Analyte	4:45:00 PM	AS100304-1-1	NA	NA	25.7937	1.01* g	28	Spectrum #1	8:43 PM	9.000	1000	84.1%	7.1E-01	NA	Dry Weight	NA	
1003045-9	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	2136.556	28.34%	800	2.2E-07	1E-09	ug/g	NA	
SMP	Tracer	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.03* g	29	Spectrum #1	8:44 PM	6.806	1000	91.2%	3.4E-08	NA	Dry Weight	NA	
1003045-9	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	175.199	28.34%	800	7.1E-05	3E-06	ug/g	NA	
SMP	Trg. Analyte	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.03* g	29	Spectrum #1	8:44 PM	2.000	1000	91.2%	1.5E-05	NA	Dry Weight	NA	
1003045-9	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	13.403	28.34%	800	1.8E-02	4E-03	ug/g	NA	
SMP	Trg. Analyte	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.03* g	29	Spectrum #1	8:44 PM	0.000	1000	91.2%	1E-02	NA	Dry Weight	NA	LT
1003045-9	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	156.807	28.34%	800	1.18E+00	8E-02	ug/g	NA	
SMP	Trg. Analyte	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.03* g	29	Spectrum #1	8:44 PM	4.000	1000	91.2%	2.6E-01	NA	Dry Weight	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000610
69
20000610

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 8:43:19 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1003045-9	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	345.408	28.34%	800	1.2E+00		ug/g	NA	
SMP	Trg. Analyte	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.03* g	29	Spectrum #1	8:44 PM	6.000	1000	91.2%	2.6E-01	NA	Dry Weight	NA	
1003045-9	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	2098.800	28.28%	800	2.14E-07	2E-09	ug/g	NA	
DUP	Tracer	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.05* g	30	Spectrum #1	8:44 PM	19.000	1000	89.8%	3.3E-08	NA	Dry Weight	NA	
1003045-9	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	198.400	28.28%	800	8E-05	3E-06	ug/g	0.42	
DUP	Trg. Analyte	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.05* g	30	Spectrum #1	8:44 PM	2.000	1000	89.8%	1.7E-05	NA	Dry Weight	NA	
1003045-9	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	4.200	28.28%	800	5.8E-03	9.5E-03	ug/g	1.02	
DUP	Trg. Analyte	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.05* g	30	Spectrum #1	8:44 PM	1.000	1000	89.8%	6.6E-03	NA	Dry Weight	NA	U
1003045-9	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	184.400	28.28%	800	1.39E+00	6E-02	ug/g	0.53	
DUP	Trg. Analyte	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.05* g	30	Spectrum #1	8:44 PM	2.000	1000	89.8%	3E-01	NA	Dry Weight	NA	
1003045-9	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	387.000	28.28%	800	1.39E+00		ug/g	0.99	
DUP	Trg. Analyte	5:00:00 PM	AS100304-1-1	NA	NA	16.4482	1.05* g	30	Spectrum #1	8:44 PM	5.000	1000	89.8%	3E-01	NA	Dry Weight	NA	
1003045-10	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1* g	AlphaSpec2	AS100304-1A	3/5/2010	2052.400	29.66%	800	2.1E-07	3E-09	ug/g	NA	
SMP	Tracer	5:15:00 PM	AS100304-1-1	NA	NA	16.8813	1* g	31	Spectrum #1	8:44 PM	37.000	1000	83.8%	3.3E-08	NA	Dry Weight	NA	
1003045-10	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1* g	AlphaSpec2	AS100304-1A	3/5/2010	171.800	29.66%	800	7.5E-05	5E-06	ug/g	NA	
SMP	Trg. Analyte	5:15:00 PM	AS100304-1-1	NA	NA	16.8813	1* g	31	Spectrum #1	8:44 PM	4.000	1000	83.8%	1.6E-05	NA	Dry Weight	NA	
1003045-10	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1* g	AlphaSpec2	AS100304-1A	3/5/2010	9.000	29.66%	800	1.34E-02	4E-03	ug/g	NA	
SMP	Trg. Analyte	5:15:00 PM	AS100304-1-1	NA	NA	16.8813	1* g	31	Spectrum #1	8:44 PM	0.000	1000	83.8%	9.1E-03	NA	Dry Weight	NA	LT
1003045-10	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1* g	AlphaSpec2	AS100304-1A	3/5/2010	182.000	29.66%	800	1.48E+00	1.3E-01	ug/g	NA	
SMP	Trg. Analyte	5:15:00 PM	AS100304-1-1	NA	NA	16.8813	1* g	31	Spectrum #1	8:44 PM	10.000	1000	83.8%	3.2E-01	NA	Dry Weight	NA	
1003045-10	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1* g	AlphaSpec2	AS100304-1A	3/5/2010	362.800	29.66%	800	1.49E+00		ug/g	NA	
SMP	Trg. Analyte	5:15:00 PM	AS100304-1-1	NA	NA	16.8813	1* g	31	Spectrum #1	8:44 PM	14.000	1000	83.8%	3.2E-01	NA	Dry Weight	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000611

70 20000611

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 8:43:19 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
1003045-11	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.06* g	AlphaSpec2	AS100304-1A	3/5/2010	1993.800	29.64%	800	2.03E-07	2E-09	ug/g	NA	
SMP	Tracer	3:30:00 PM	AS100304-1-1	NA	NA	21.499	1.06* g	32	Spectrum #1	8:44 PM	19.000	1000	81.4%	3.2E-08	NA	Dry Weight	NA	
1003045-11	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.06* g	AlphaSpec2	AS100304-1A	3/5/2010	291.000	29.64%	800	1.3E-04	5E-06	ug/g	NA	
SMP	Trg. Analyte	3:30:00 PM	AS100304-1-1	NA	NA	21.499	1.06* g	32	Spectrum #1	8:44 PM	5.000	1000	81.4%	2.5E-05	NA	Dry Weight	NA	
1003045-11	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.06* g	AlphaSpec2	AS100304-1A	3/5/2010	17.200	29.64%	800	2.6E-02	1E-02	ug/g	NA	
SMP	Trg. Analyte	3:30:00 PM	AS100304-1-1	NA	NA	21.499	1.06* g	32	Spectrum #1	8:44 PM	1.000	1000	81.4%	1.4E-02	NA	Dry Weight	NA	LT
1003045-11	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.06* g	AlphaSpec2	AS100304-1A	3/5/2010	274.400	29.64%	800	2.28E+00	7E-02	ug/g	NA	
SMP	Trg. Analyte	3:30:00 PM	AS100304-1-1	NA	NA	21.499	1.06* g	32	Spectrum #1	8:44 PM	2.000	1000	81.4%	4.5E-01	NA	Dry Weight	NA	
1003045-11	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.06* g	AlphaSpec2	AS100304-1A	3/5/2010	582.600	29.64%	800	2.31E+00		ug/g	NA	
SMP	Trg. Analyte	3:30:00 PM	AS100304-1-1	NA	NA	21.499	1.06* g	32	Spectrum #1	8:44 PM	8.000	1000	81.4%	4.5E-01	NA	Dry Weight	NA	
1003045-12	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	2180.000	30.63%	800	2.51E-07	1E-09	ug/g	NA	
SMP	Tracer	9:29:00 AM	AS100304-1-1	NA	NA	29.6137	1.02* g	57	Spectrum #1	8:43 PM	5.000	1000	86.1%	3.9E-08	NA	Dry Weight	NA	
1003045-12	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	333.400	30.63%	800	1.59E-04	4E-06	ug/g	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-1-1	NA	NA	29.6137	1.02* g	57	Spectrum #1	8:43 PM	2.000	1000	86.1%	3E-05	NA	Dry Weight	NA	
1003045-12	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	17.000	30.63%	800	2.8E-02	4E-03	ug/g	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-1-1	NA	NA	29.6137	1.02* g	57	Spectrum #1	8:43 PM	0.000	1000	86.1%	1.4E-02	NA	Dry Weight	NA	LT
1003045-12	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	284.200	30.63%	800	2.52E+00	6E-02	ug/g	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-1-1	NA	NA	29.6137	1.02* g	57	Spectrum #1	8:43 PM	1.000	1000	86.1%	4.9E-01	NA	Dry Weight	NA	
1003045-12	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	634.600	30.63%	800	2.55E+00		ug/g	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-1-1	NA	NA	29.6137	1.02* g	57	Spectrum #1	8:43 PM	3.000	1000	86.1%	4.9E-01	NA	Dry Weight	NA	
1003045-13	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	2143.000	30.96%	800	2.71E-07	2E-09	ug/g	NA	
SMP	Tracer	9:29:00 AM	AS100304-1-1	NA	NA	35.7863	1.01* g	58	Spectrum #1	8:43 PM	5.000	1000	83.8%	4.2E-08	NA	Dry Weight	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000612
71
20000612

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 8:43:19 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
1003045-13	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	288.800	30.96%	800	1.56E-04	6E-06	ug/g	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-1-1	NA	NA	35.7863	1.01* g	58	Spectrum #1	8:43 PM	4.000	1000	83.8%	3E-05	NA	Dry Weight	NA	
1003045-13	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	15.400	30.96%	800	2.8E-02	1.6E-02	ug/g	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-1-1	NA	NA	35.7863	1.01* g	58	Spectrum #1	8:43 PM	2.000	1000	83.8%	1.6E-02	NA	Dry Weight	NA	LT
1003045-13	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	283.400	30.96%	800	2.84E+00	9E-02	ug/g	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-1-1	NA	NA	35.7863	1.01* g	58	Spectrum #1	8:43 PM	2.000	1000	83.8%	5.5E-01	NA	Dry Weight	NA	
1003045-13	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/5/2010	587.600	30.96%	800	2.86E+00		ug/g	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-1-1	NA	NA	35.7863	1.01* g	58	Spectrum #1	8:43 PM	8.000	1000	83.8%	5.5E-01	NA	Dry Weight	NA	
1003045-14	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	2242.000	31.64%	800	3.58E-07	3E-09	ug/l	NA	
SMP	Tracer	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	13	Spectrum #1	8:24 PM	10.000	1000	85.7%	5.5E-08	NA	Unfiltered	NA	
1003045-14	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	347.800	31.64%	800	2.31E-04	7E-06	ug/l	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	13	Spectrum #1	8:24 PM	4.000	1000	85.7%	4.4E-05	NA	Unfiltered	NA	
1003045-14	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	7.200	31.64%	800	1.6E-02	1.6E-02	ug/l	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	13	Spectrum #1	8:24 PM	1.000	1000	85.7%	1.4E-02	NA	Unfiltered	NA	LT
1003045-14	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	144.400	31.64%	800	1.78E+00	1.1E-01	ug/l	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	13	Spectrum #1	8:24 PM	2.000	1000	85.7%	4.1E-01	NA	Unfiltered	NA	
1003045-14	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	499.400	31.64%	800	1.8E+00		ug/l	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	13	Spectrum #1	8:24 PM	7.000	1000	85.7%	4.1E-01	NA	Unfiltered	NA	
1003045-15	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	2156.400	30.21%	800	3.6E-07	2E-09	ug/l	NA	
SMP	Tracer	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	14	Spectrum #1	8:24 PM	7.000	1000	86.4%	5.6E-08	NA	Unfiltered	NA	
1003045-15	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	370.000	30.21%	800	2.56E-04	8E-06	ug/l	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	14	Spectrum #1	8:24 PM	5.000	1000	86.4%	4.8E-05	NA	Unfiltered	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

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- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000613
72
20000613

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 9:24:06 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1003045-15	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	11.800	30.21%	800	2.8E-02	2.6E-02	ug/l	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	14	Spectrum #1	8:24 PM	4.000	1000	86.4%	2E-02	NA	Unfiltered	NA	LT
1003045-15	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	153.200	30.21%	800	1.97E+00	9E-02	ug/l	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	14	Spectrum #1	8:24 PM	1.000	1000	86.4%	4.4E-01	NA	Unfiltered	NA	
1003045-15	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	535.000	30.21%	800	2E+00		ug/l	NA	
SMP	Trg. Analyte	9:29:00 AM	AS100304-2-1	NA	NA	NA	500 ml	14	Spectrum #1	8:24 PM	10.000	1000	86.4%	4.4E-01	NA	Unfiltered	NA	
1003045-16	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	2219.734	31.43%	800	2.89E-07	3E-09	ug/g	NA	
SMP	Tracer	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.03* g	59	Spectrum #1	8:43 PM	16.000	1000	85.5%	4.5E-08	NA	Dry Weight	NA	
1003045-16	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	257.986	31.43%	800	1.4E-04	7E-06	ug/g	NA	
SMP	Trg. Analyte	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.03* g	59	Spectrum #1	8:43 PM	6.267	1000	85.5%	2.8E-05	NA	Dry Weight	NA	
1003045-16	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	14.000	31.43%	800	2.6E-02	5E-03	ug/g	NA	
SMP	Trg. Analyte	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.03* g	59	Spectrum #1	8:43 PM	0.000	1000	85.5%	1.4E-02	NA	Dry Weight	NA	LT
1003045-16	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	243.519	31.43%	800	2.46E+00	1.2E-01	ug/g	NA	
SMP	Trg. Analyte	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.03* g	59	Spectrum #1	8:43 PM	5.267	1000	85.5%	5E-01	NA	Dry Weight	NA	
1003045-16	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.03* g	AlphaSpec2	AS100304-1A	3/5/2010	515.506	31.43%	800	2.49E+00		ug/g	NA	
SMP	Trg. Analyte	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.03* g	59	Spectrum #1	8:43 PM	11.534	1000	85.5%	5E-01	NA	Dry Weight	NA	
1003045-16	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	2162.400	30.31%	800	2.88E-07	3E-09	ug/g	NA	
DUP	Tracer	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.05* g	60	Spectrum #1	8:43 PM	22.000	1000	86.3%	4.4E-08	NA	Dry Weight	NA	
1003045-16	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	222.600	30.31%	800	1.23E-04	8E-06	ug/g	0.47	
DUP	Trg. Analyte	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.05* g	60	Spectrum #1	8:43 PM	8.000	1000	86.3%	2.5E-05	NA	Dry Weight	NA	
1003045-16	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	11.200	30.31%	800	2.1E-02	1.3E-02	ug/g	0.25	
DUP	Trg. Analyte	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.05* g	60	Spectrum #1	8:43 PM	1.000	1000	86.3%	1.4E-02	NA	Dry Weight	NA	LT

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000614
73
20000614

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 8:43:19 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1003045-16	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	271.000	30.31%	800	2.77E+00	1.2E-01	ug/g	0.42	
DUP	Trg. Analyte	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.05* g	60	Spectrum #1	8:43 PM	5.000	1000	86.3%	5.5E-01	NA	Dry Weight	NA	
1003045-16	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.05* g	AlphaSpec2	AS100304-1A	3/5/2010	504.800	30.31%	800	2.8E+00		ug/g	0.83	
DUP	Trg. Analyte	3:15:00 PM	AS100304-1-1	NA	NA	40.1515	1.05* g	60	Spectrum #1	8:43 PM	14.000	1000	86.3%	5.5E-01	NA	Dry Weight	NA	
1003045-17	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	2081.200	29.98%	800	1.82E-07	2E-09	ug/g	NA	
SMP	Tracer	11:03:00 AM	AS100304-1-1	NA	NA	5.0567	1.02* g	62	Spectrum #1	8:43 PM	16.000	1000	84.0%	2.8E-08	NA	Dry Weight	NA	
1003045-17	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	203.200	29.98%	800	7.5E-05	5E-06	ug/g	NA	
SMP	Trg. Analyte	11:03:00 AM	AS100304-1-1	NA	NA	5.0567	1.02* g	62	Spectrum #1	8:43 PM	6.000	1000	84.0%	1.6E-05	NA	Dry Weight	NA	
1003045-17	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	6.400	29.98%	800	8.1E-03	1.08E-02	ug/g	NA	
SMP	Trg. Analyte	11:03:00 AM	AS100304-1-1	NA	NA	5.0567	1.02* g	62	Spectrum #1	8:43 PM	2.000	1000	84.0%	7.8E-03	NA	Dry Weight	NA	U
1003045-17	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	199.400	29.98%	800	1.38E+00	9E-02	ug/g	NA	
SMP	Trg. Analyte	11:03:00 AM	AS100304-1-1	NA	NA	5.0567	1.02* g	62	Spectrum #1	8:43 PM	7.000	1000	84.0%	2.9E-01	NA	Dry Weight	NA	
1003045-17	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.02* g	AlphaSpec2	AS100304-1A	3/5/2010	409.000	29.98%	800	1.38E+00		ug/g	NA	
SMP	Trg. Analyte	11:03:00 AM	AS100304-1-1	NA	NA	5.0567	1.02* g	62	Spectrum #1	8:43 PM	15.000	1000	84.0%	2.9E-01	NA	Dry Weight	NA	
1003045-18	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	2236.730	31.04%	800	2.1E-07	2E-09	ug/g	NA	
SMP	Tracer	11:10:00 AM	AS100304-1-1	NA	NA	19.9314	1.08* g	63	Spectrum #1	8:43 PM	15.000	1000	87.2%	3.2E-08	NA	Dry Weight	NA	
1003045-18	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	82.254	31.04%	800	3.17E-05	4E-06	ug/g	NA	
SMP	Trg. Analyte	11:10:00 AM	AS100304-1-1	NA	NA	19.9314	1.08* g	63	Spectrum #1	8:43 PM	3.433	1000	87.2%	8.7E-06	NA	Dry Weight	NA	
1003045-18	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	4.179	31.04%	800	5.5E-03	1.04E-02	ug/g	NA	
SMP	Trg. Analyte	11:10:00 AM	AS100304-1-1	NA	NA	19.9314	1.08* g	63	Spectrum #1	8:43 PM	1.567	1000	87.2%	6.7E-03	NA	Dry Weight	NA	U
1003045-18	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	82.135	31.04%	800	5.9E-01	9E-02	ug/g	NA	
SMP	Trg. Analyte	11:10:00 AM	AS100304-1-1	NA	NA	19.9314	1.08* g	63	Spectrum #1	8:43 PM	5.000	1000	87.2%	1.6E-01	NA	Dry Weight	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000615
74
20000615

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010
8:43:19 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1003045-18	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	168.567	31.04%	800	5.9E-01		ug/g	NA	
SMP	Trg. Analyte	11:10:00 AM	AS100304-1-1	NA	NA	19.9314	1.08* g	63	Spectrum #1	8:43 PM	10.000	1000	87.2%	1.6E-01	NA	Dry Weight	NA	
1003045-19	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	2053.400	30.31%	800	1.97E-07	2E-09	ug/g	NA	
SMP	Tracer	11:15:00 AM	AS100304-1-1	NA	NA	19.5492	1.08* g	64	Spectrum #1	8:43 PM	17.000	1000	82.0%	3E-08	NA	Dry Weight	NA	
1003045-19	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	58.800	30.31%	800	2.46E-05	4.6E-06	ug/g	NA	
SMP	Trg. Analyte	11:15:00 AM	AS100304-1-1	NA	NA	19.5492	1.08* g	64	Spectrum #1	8:43 PM	4.000	1000	82.0%	7.7E-06	NA	Dry Weight	NA	
1003045-19	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	-1.000	30.31%	800	-1.4E-03	1.71E-02	ug/g	NA	
SMP	Trg. Analyte	11:15:00 AM	AS100304-1-1	NA	NA	19.5492	1.08* g	64	Spectrum #1	8:43 PM	5.000	1000	82.0%	7.1E-03	NA	Dry Weight	NA	U
1003045-19	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	55.200	30.31%	800	4.3E-01	1E-01	ug/g	NA	
SMP	Trg. Analyte	11:15:00 AM	AS100304-1-1	NA	NA	19.5492	1.08* g	64	Spectrum #1	8:43 PM	6.000	1000	82.0%	1.4E-01	NA	Dry Weight	NA	
1003045-19	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.08* g	AlphaSpec2	AS100304-1A	3/5/2010	113.000	30.31%	800	4.3E-01		ug/g	NA	
SMP	Trg. Analyte	11:15:00 AM	AS100304-1-1	NA	NA	19.5492	1.08* g	64	Spectrum #1	8:43 PM	15.000	1000	82.0%	1.4E-01	NA	Dry Weight	NA	
1003045-20	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	1915.767	30.65%	800	3.16E-07	2E-09	ug/l	NA	
SMP	Tracer	3:26:00 PM	AS100304-2-1	NA	NA	NA	500 ml	16	Spectrum #1	8:24 PM	6.810	1000	75.6%	4.9E-08	NA	Unfiltered	NA	
1003045-20	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	17849.110	30.65%	800	1.39E-02	0E+00	ug/l	NA	
SMP	Trg. Analyte	3:26:00 PM	AS100304-2-1	NA	NA	NA	500 ml	16	Spectrum #1	8:24 PM	4.000	1000	75.6%	2.2E-03	NA	Unfiltered	NA	
1003045-20	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	659.727	30.65%	800	1.75E+00	3E-02	ug/l	NA	
SMP	Trg. Analyte	3:26:00 PM	AS100304-2-1	NA	NA	NA	500 ml	16	Spectrum #1	8:24 PM	4.000	1000	75.6%	3E-01	NA	Unfiltered	NA	
1003045-20	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	15514.430	30.65%	800	2.24E+02	0E+00	ug/l	NA	
SMP	Trg. Analyte	3:26:00 PM	AS100304-2-1	NA	NA	NA	500 ml	16	Spectrum #1	8:24 PM	1.000	1000	75.6%	3.5E+01	NA	Unfiltered	NA	
1003045-20	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	34023.270	30.65%	800	2.26E+02		ug/l	NA	
SMP	Trg. Analyte	3:26:00 PM	AS100304-2-1	NA	NA	NA	500 ml	16	Spectrum #1	8:24 PM	9.000	1000	75.6%	3.5E+01	NA	Unfiltered	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000616

75
20000616

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 8:43:19 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
1003045-21	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	2041.800	30.99%	800	2.71E-07	2E-09	ug/g	NA	
SMP	Tracer	5:10:00 PM	AS100304-1-1	NA	NA	39.4001	1.01* g	9	Spectrum #1	4:28 PM	14.000	1000	79.7%	4.2E-08	NA	Dry Weight	NA	
1003045-21	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	648.000	30.99%	800	3.86E-04	7E-06	ug/g	NA	
SMP	Trg. Analyte	5:10:00 PM	AS100304-1-1	NA	NA	39.4001	1.01* g	9	Spectrum #1	4:28 PM	5.000	1000	79.7%	6.7E-05	NA	Dry Weight	NA	
1003045-21	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	22.200	30.99%	800	4.5E-02	1.4E-02	ug/g	NA	
SMP	Trg. Analyte	5:10:00 PM	AS100304-1-1	NA	NA	39.4001	1.01* g	9	Spectrum #1	4:28 PM	1.000	1000	79.7%	2.1E-02	NA	Dry Weight	NA	LT
1003045-21	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	681.200	30.99%	800	7.5E+00	1E-01	ug/g	NA	
SMP	Trg. Analyte	5:10:00 PM	AS100304-1-1	NA	NA	39.4001	1.01* g	9	Spectrum #1	4:28 PM	1.000	1000	79.7%	1.3E+00	NA	Dry Weight	NA	
1003045-21	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	1351.400	30.99%	800	7.6E+00		ug/g	NA	
SMP	Trg. Analyte	5:10:00 PM	AS100304-1-1	NA	NA	39.4001	1.01* g	9	Spectrum #1	4:28 PM	7.000	1000	79.7%	1.3E+00	NA	Dry Weight	NA	
1003045-22	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	2098.468	30.63%	800	3.46E-07	3E-09	ug/l	NA	
SMP	Tracer	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	17a	Spectrum #1	8:24 PM	14.723	1000	82.9%	5.4E-08	NA	Unfiltered	NA	
1003045-22	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	4877.249	30.63%	800	3.47E-03	1E-05	ug/l	NA	
SMP	Trg. Analyte	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	17a	Spectrum #1	8:24 PM	4.861	1000	82.9%	5.5E-04	NA	Unfiltered	NA	
1003045-22	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	173.674	30.63%	800	4.19E-01	1.7E-02	ug/l	NA	
SMP	Trg. Analyte	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	17a	Spectrum #1	8:24 PM	1.139	1000	82.9%	9.1E-02	NA	Unfiltered	NA	
1003045-22	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	4289.528	30.63%	800	5.66E+01	1E-01	ug/l	NA	
SMP	Trg. Analyte	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	17a	Spectrum #1	8:24 PM	1.861	1000	82.9%	8.9E+00	NA	Unfiltered	NA	
1003045-22	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	9340.450	30.63%	800	5.71E+01		ug/l	NA	
SMP	Trg. Analyte	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	17a	Spectrum #1	8:24 PM	7.861	1000	82.9%	8.9E+00	NA	Unfiltered	NA	
1003045-22	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	2089.000	30.38%	800	3.47E-07	4E-09	ug/l	NA	
DUP	Tracer	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	18	Spectrum #1	8:24 PM	25.000	1000	83.2%	5.4E-08	NA	Unfiltered	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000617
76
20000617

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 9:24:06 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
1003045-22	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	4613.600	30.38%	800	3.29E-03	1E-05	ug/l	0.23	
DUP	Trg. Analyte	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	18	Spectrum #1	8:24 PM	8.000	1000	83.2%	5.2E-04	NA	Unfiltered	NA	
1003045-22	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	207.200	30.38%	800	5E-01	2E-02	ug/l	0.60	
DUP	Trg. Analyte	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	18	Spectrum #1	8:24 PM	1.000	1000	83.2%	1E-01	NA	Unfiltered	NA	
1003045-22	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	4239.600	30.38%	800	5.62E+01	1E-01	ug/l	0.03	
DUP	Trg. Analyte	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	18	Spectrum #1	8:24 PM	3.000	1000	83.2%	8.9E+00	NA	Unfiltered	NA	
1003045-22	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	9060.400	30.38%	800	5.67E+01		ug/l	0.05	
DUP	Trg. Analyte	5:10:00 PM	AS100304-2-1	NA	NA	NA	500 ml	18	Spectrum #1	8:24 PM	12.000	1000	83.2%	8.9E+00	NA	Unfiltered	NA	
1003045-23	U-232	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	2240.861	31.56%	800	2.3E-07	2E-09	ug/g	NA	
SMP	Tracer	4:13:00 PM	AS100304-1-1	NA	NA	22.8486	1.01* g	10a	Spectrum #1	4:28 PM	12.673	1000	85.9%	3.5E-08	NA	Dry Weight	NA	
1003045-23	U-234	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	91.709	31.56%	800	3.9E-05	4E-06	ug/g	NA	
SMP	Trg. Analyte	4:13:00 PM	AS100304-1-1	NA	NA	22.8486	1.01* g	10a	Spectrum #1	4:28 PM	3.000	1000	85.9%	1E-05	NA	Dry Weight	NA	
1003045-23	U-235	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	3.000	31.56%	800	4.4E-03	3.9E-03	ug/g	NA	
SMP	Trg. Analyte	4:13:00 PM	AS100304-1-1	NA	NA	22.8486	1.01* g	10a	Spectrum #1	4:28 PM	0.000	1000	85.9%	6.5E-03	NA	Dry Weight	NA	LT
1003045-23	U-238	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	93.291	31.56%	800	7.4E-01	7E-02	ug/g	NA	
SMP	Trg. Analyte	4:13:00 PM	AS100304-1-1	NA	NA	22.8486	1.01* g	10a	Spectrum #1	4:28 PM	2.000	1000	85.9%	1.9E-01	NA	Dry Weight	NA	
1003045-23	URANIUM, TOTAL	3/2/2010	AS100304-1	NA	NA	SEDIMENT	1.01* g	AlphaSpec2	AS100304-1A	3/6/2010	188.000	31.56%	800	7.4E-01		ug/g	NA	
SMP	Trg. Analyte	4:13:00 PM	AS100304-1-1	NA	NA	22.8486	1.01* g	10a	Spectrum #1	4:28 PM	5.000	1000	85.9%	1.9E-01	NA	Dry Weight	NA	
1003045-24	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	2021.000	29.27%	800	3.49E-07	3E-09	ug/l	NA	
SMP	Tracer	4:13:00 PM	AS100304-2-1	NA	NA	NA	500 ml	19	Spectrum #1	8:24 PM	15.000	1000	83.6%	5.4E-08	NA	Unfiltered	NA	
1003045-24	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	632.000	29.27%	800	4.66E-04	9E-06	ug/l	NA	
SMP	Trg. Analyte	4:13:00 PM	AS100304-2-1	NA	NA	NA	500 ml	19	Spectrum #1	8:24 PM	5.000	1000	83.6%	8.1E-05	NA	Unfiltered	NA	

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000618
77
20000618

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 9:24:06 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1003045-24	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	8.600	29.27%	800	2.2E-02	2.5E-02	ug/l	NA	
SMP	Trg. Analyte	4:13:00 PM	AS100304-2-1	NA	NA	NA	500 ml	19	Spectrum #1	8:24 PM	3.000	1000	83.6%	1.8E-02	NA	Unfiltered	NA	U
1003045-24	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	312.000	29.27%	800	4.28E+00	1.6E-01	ug/l	NA	
SMP	Trg. Analyte	4:13:00 PM	AS100304-2-1	NA	NA	NA	500 ml	19	Spectrum #1	8:24 PM	5.000	1000	83.6%	8.2E-01	NA	Unfiltered	NA	
1003045-24	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	952.600	29.27%	800	4.3E+00		ug/l	NA	
SMP	Trg. Analyte	4:13:00 PM	AS100304-2-1	NA	NA	NA	500 ml	19	Spectrum #1	8:24 PM	13.000	1000	83.6%	8.2E-01	NA	Unfiltered	NA	
1003045-25	U-232	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	1965.800	27.21%	800	3.65E-07	3E-09	ug/l	NA	
SMP	Tracer	3:15:00 PM	AS100304-2-1	NA	NA	NA	500 ml	22	Spectrum #1	8:24 PM	14.000	1000	87.4%	5.7E-08	NA	Unfiltered	NA	
1003045-25	U-234	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	659.600	27.21%	800	5E-04	1.1E-05	ug/l	NA	
SMP	Trg. Analyte	3:15:00 PM	AS100304-2-1	NA	NA	NA	500 ml	22	Spectrum #1	8:24 PM	8.000	1000	87.4%	8.7E-05	NA	Unfiltered	NA	
1003045-25	U-235	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	22.400	27.21%	800	5.8E-02	2.2E-02	ug/l	NA	
SMP	Trg. Analyte	3:15:00 PM	AS100304-2-1	NA	NA	NA	500 ml	22	Spectrum #1	8:24 PM	2.000	1000	87.4%	2.7E-02	NA	Unfiltered	NA	LT
1003045-25	U-238	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	314.200	27.21%	800	4.43E+00	1E-01	ug/l	NA	
SMP	Trg. Analyte	3:15:00 PM	AS100304-2-1	NA	NA	NA	500 ml	22	Spectrum #1	8:24 PM	1.000	1000	87.4%	8.5E-01	NA	Unfiltered	NA	
1003045-25	URANIUM, TOTAL	3/2/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	996.200	27.21%	800	4.49E+00		ug/l	NA	
SMP	Trg. Analyte	3:15:00 PM	AS100304-2-1	NA	NA	NA	500 ml	22	Spectrum #1	8:24 PM	11.000	1000	87.4%	8.5E-01	NA	Unfiltered	NA	
AS100304-1	U-232	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	2230.400	31.76%	800	1.72E-07	1E-09	ug/g	NA	
MB	Tracer	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	11	Spectrum #1	4:28 PM	12.000	1000	85.0%	2.7E-08	NA	As Received	NA	
AS100304-1	U-234	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	8.000	31.76%	800	2.6E-06	3.9E-06	ug/g	NA	
MB	Trg. Analyte	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	11	Spectrum #1	4:28 PM	5.000	1000	85.0%	2.6E-06	NA	As Received	NA	U
AS100304-1	U-235	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	-3.800	31.76%	800	-4.2E-03	1.42E-02	ug/g	NA	
MB	Trg. Analyte	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	11	Spectrum #1	4:28 PM	6.000	1000	85.0%	4.9E-03	NA	As Received	NA	U

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000619
78
20000619

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 8:43:19 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
AS100304-1	U-238	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	2.800	31.76%	800	1.7E-02	6.6E-02	ug/g	NA	
MB	Trg. Analyte	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	11	Spectrum #1	4:28 PM	4.000	1000	85.0%	3.5E-02	NA	As Received	NA	U
AS100304-1	URANIUM, TOTAL	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	7.000	31.76%	800	1.3E-02		ug/g	NA	
MB	Trg. Analyte	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	11	Spectrum #1	4:28 PM	15.000	1000	85.0%	3.6E-02	NA	As Received	NA	
AS100304-1	U-232	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	1835.732	30.64%	800	1.47E-07	1E-09	ug/g	NA	
LCS	Tracer	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	12	Spectrum #1	4:28 PM	8.661	1000	72.5%	2.3E-08	NA	As Received	NA	
AS100304-1	U-234	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	1755.714	30.64%	800	6.9E-04	0E+00	ug/g	NA	103
LCS	Trg. Analyte	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	12	Spectrum #1	4:28 PM	0.000	1000	72.5%	1.1E-04	NA	As Received	NA	P
AS100304-1	U-235	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	61.982	30.64%	800	8.3E-02	4E-03	ug/g	NA	89.1
LCS	Trg. Analyte	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	12	Spectrum #1	4:28 PM	0.000	1000	72.5%	2.5E-02	NA	As Received	NA	
AS100304-1	U-238	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	1802.114	30.64%	800	1.32E+01	1E-01	ug/g	NA	101
LCS	Trg. Analyte	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	12	Spectrum #1	4:28 PM	2.000	1000	72.5%	2.1E+00	NA	As Received	NA	P
AS100304-1	URANIUM, TOTAL	3/4/2010	AS100304-1	NA	NA	SEDIMENT	1.03 g	AlphaSpec2	AS100304-1A	3/6/2010	3619.811	30.64%	800	1.33E+01		ug/g	NA	101
LCS	Trg. Analyte	1:04:37 PM	AS100304-1-1	NA	NA	NA	1.03 g	12	Spectrum #1	4:28 PM	2.000	1000	72.5%	2.1E+00	NA	As Received	NA	P
AS100304-2	U-232	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	1938.600	28.56%	800	3.43E-07	4E-09	ug/l	NA	
MB	Tracer	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	23	Spectrum #1	8:24 PM	18.000	1000	82.1%	5.3E-08	NA	Unfiltered	NA	
AS100304-2	U-234	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	0.600	28.56%	800	5E-07	1.11E-05	ug/l	NA	
MB	Trg. Analyte	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	23	Spectrum #1	8:24 PM	8.000	1000	82.1%	5.4E-06	NA	Unfiltered	NA	U
AS100304-2	U-235	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	0.400	28.56%	800	1E-03	2.2E-02	ug/l	NA	
MB	Trg. Analyte	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	23	Spectrum #1	8:24 PM	2.000	1000	82.1%	1.2E-02	NA	Unfiltered	NA	U
AS100304-2	U-238	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	-5.200	28.56%	800	-7.4E-02	2.17E-01	ug/l	NA	
MB	Trg. Analyte	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	23	Spectrum #1	8:24 PM	9.000	1000	82.1%	8E-02	NA	Unfiltered	NA	U

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000620

79

20000620

Total Uranium by Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 9:24:06 AM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
AS100304-2	URANIUM, TOTAL	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	-4.200	28.56%	800	-7.3E-02		ug/l	NA	
MB	Trg. Analyte	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	23	Spectrum #1	8:24 PM	19.000	1000	82.1%	8.1E-02	NA	Unfiltered	NA	
AS100304-2	U-232	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	1918.138	28.18%	800	3.44E-07	3E-09	ug/l	NA	
LCS	Tracer	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	24	Spectrum #1	8:24 PM	12.328	1000	82.4%	5.3E-08	NA	Unfiltered	NA	
AS100304-2	U-234	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	1808.072	28.18%	800	1.41E-03	1E-05	ug/l	NA	101
LCS	Trg. Analyte	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	24	Spectrum #1	8:24 PM	2.000	1000	82.4%	2.3E-04	NA	Unfiltered	NA	P
AS100304-2	U-235	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	84.006	28.18%	800	2.22E-01	2.1E-02	ug/l	NA	116
LCS	Trg. Analyte	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	24	Spectrum #1	8:24 PM	1.672	1000	82.4%	6E-02	NA	Unfiltered	NA	
AS100304-2	U-238	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	1895.535	28.18%	800	2.74E+01	2E-01	ug/l	NA	102
LCS	Trg. Analyte	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	24	Spectrum #1	8:24 PM	4.000	1000	82.4%	4.4E+00	NA	Unfiltered	NA	P
AS100304-2	URANIUM, TOTAL	3/4/2010	AS100304-2	NA	NA	WATER	500 ml	AlphaSpec2	AS100304-2A	3/5/2010	3787.614	28.18%	800	2.76E+01		ug/l	NA	102
LCS	Trg. Analyte	1:11:18 PM	AS100304-2-1	NA	NA	NA	500 ml	24	Spectrum #1	8:24 PM	7.672	1000	82.4%	4.4E+00	NA	Unfiltered	NA	P

Comments:

Data Package ID: *UT1003045-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

20000621
80
20000621

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-1
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 9
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:05PM
Live Time: 800.00 min.
Real Time: 800.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030209; Det: 9; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:30:06AM

Efficiency Calibration: C10030209

Efficiency: 30.99% +/- 0.20% TPU(2 sigma)

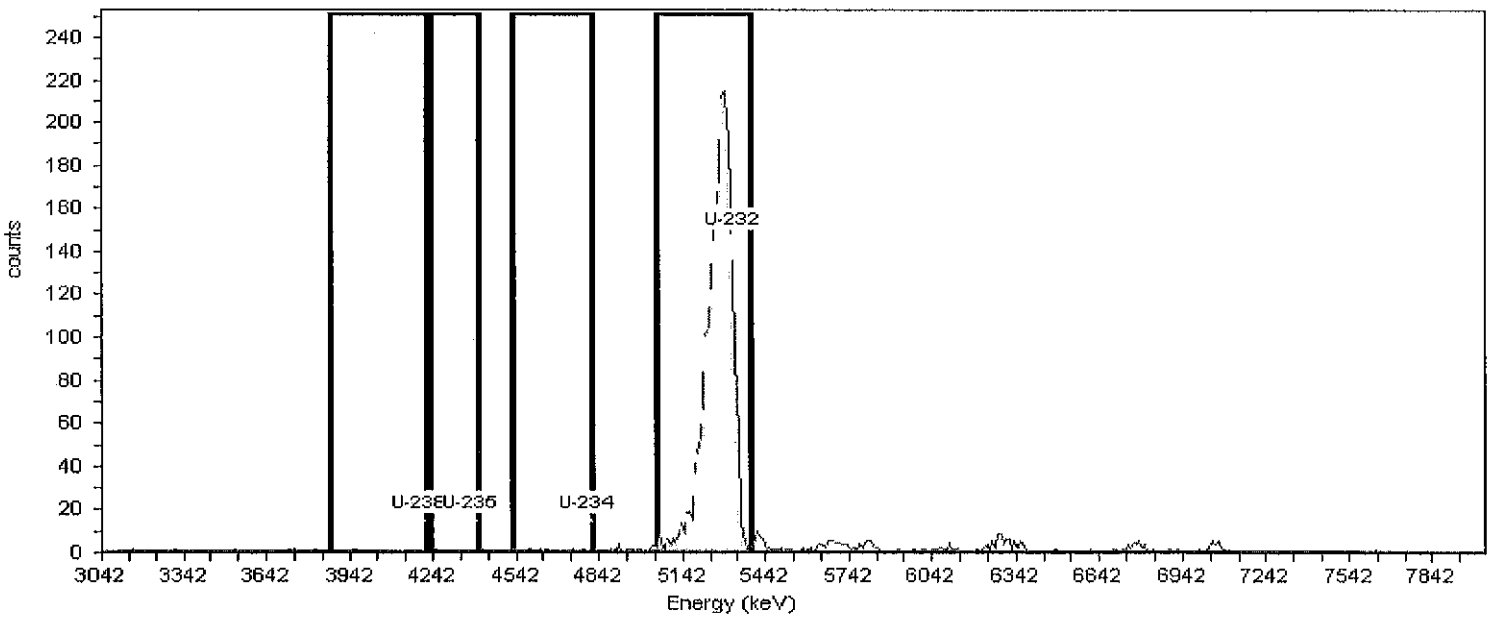
Energy Calibration: C10030209

Energy Cal: Gain = 9.7851 keV / Ch
Offset = 3,033.18 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 87.16%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4187.8	3864.9	4217.2	58.6	100.2	2.00	0.80	1.20	5.0E-003	1.4E-002	8.2E-003	2.8E-002
U-235	4373.7	4227.0	4403.1	26.8	99.7	1.00	0.80	0.20	8.4E-004	1.1E-002	2.8E-002	2.8E-002
U-234	4794.5	4530.3	4814.1	.0	100.0	7.00	4.00	3.00	1.3E-002	2.8E-002	1.8E-002	4.8E-002
U-232	5322.9	5048.9	5391.4	96.8	100.1	2,251.00	14.40	2,236.60	8.4E+000	3.6E-001	3.6E-002	8.3E-002

Reviewed By: GMC JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000622

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-2
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 25
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:57PM
Live Time: 800.00 min.
Real Time: 800.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030325; Det: 25; Spectrum #1; Mar-03-2010 14:43

Calibration Date: 3/3/2010 1:34:37PM

Efficiency Calibration: C10030325

Efficiency: 29.36% +/- 0.20% TPU(2 sigma)

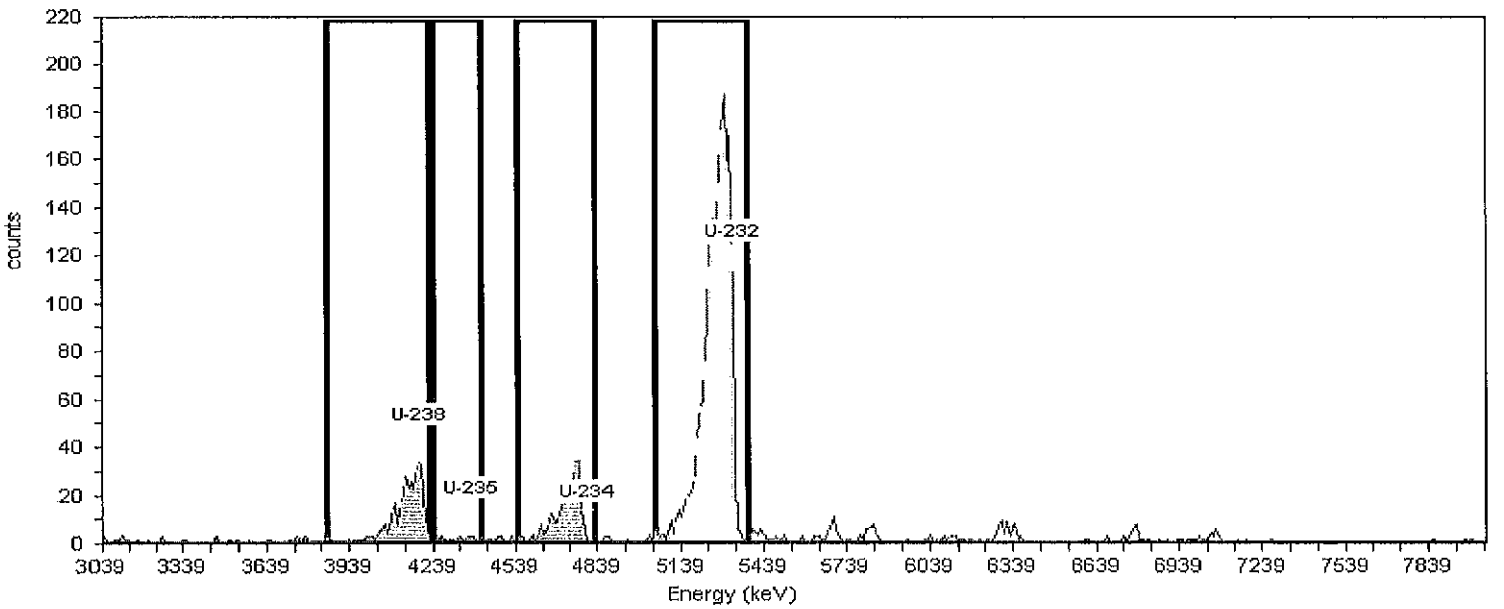
Energy Calibration: C10030325

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 77.69%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4188.4	3854.5	4227.7	36.7	100.2	324.00	8.80	315.20	7.8E-001	1.2E-001	1.6E-002	3.9E-002
U-235	4375.1	4237.6	4414.4	153.0	99.7	20.00	3.20	16.80	4.2E-002	2.4E-002	2.6E-002	2.6E-002
U-234	4797.4	4542.0	4826.9	69.0	100.0	274.00	4.80	269.20	6.6E-001	1.1E-001	1.2E-002	3.1E-002
U-232	5327.8	5043.0	5377.0	95.9	100.1	1,911.00	22.40	1,888.60	3.7E+000	1.8E-001	2.7E-002	6.0E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000623

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-3
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 10a
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:00PM
Live Time: 800.00 min.
Real Time: 800.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030210; Det: 10a; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:30:45AM

Efficiency Calibration: C10030210

Efficiency: 31.56% +/- 0.15% TPU(2 sigma)

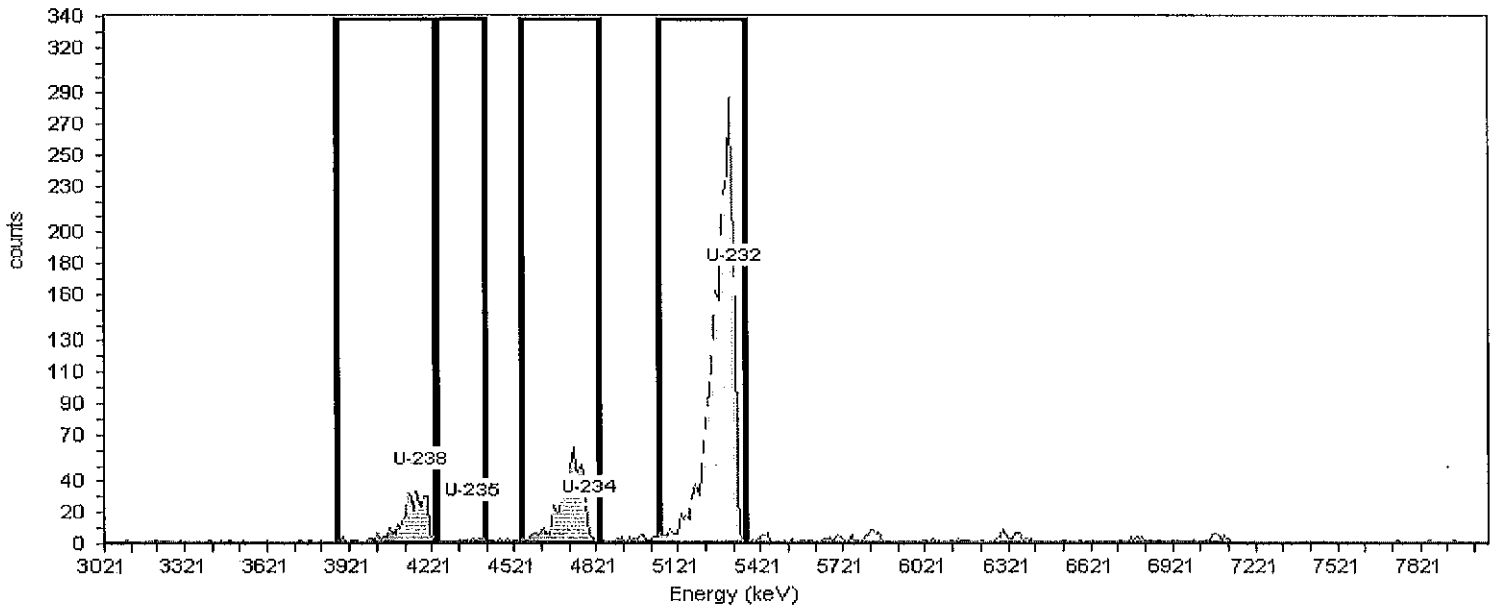
Energy Calibration: C10030210

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 91.28%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4159.8	3872.7	4229.1	79.2	100.2	330.00	1.60	328.40	1.3E+000	2.0E-001	1.1E-002	3.2E-002
U-235	4347.9	4239.0	4417.2	174.0	99.7	14.00	0.00	14.00	5.5E-002	3.1E-002	2.0E-002	1.1E-002
U-234	4773.6	4545.9	4833.0	86.2	100.0	548.00	2.40	545.60	2.1E+000	2.9E-001	1.3E-002	3.7E-002
U-232	5308.2	5050.8	5367.6	94.7	100.1	2,396.00	10.40	2,385.60	8.8E+000	3.6E-001	2.9E-002	6.8E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000624

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-4
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 26
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:58PM
Live Time: 800.00 min.
Real Time: 800.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030326; Det: 26; Spectrum #1; Mar-03-2010 14:43

Calibration Date: 3/3/2010 1:35:06PM

Efficiency Calibration: C10030326

Efficiency: 31.01% +/- 0.15% TPU(2 sigma)

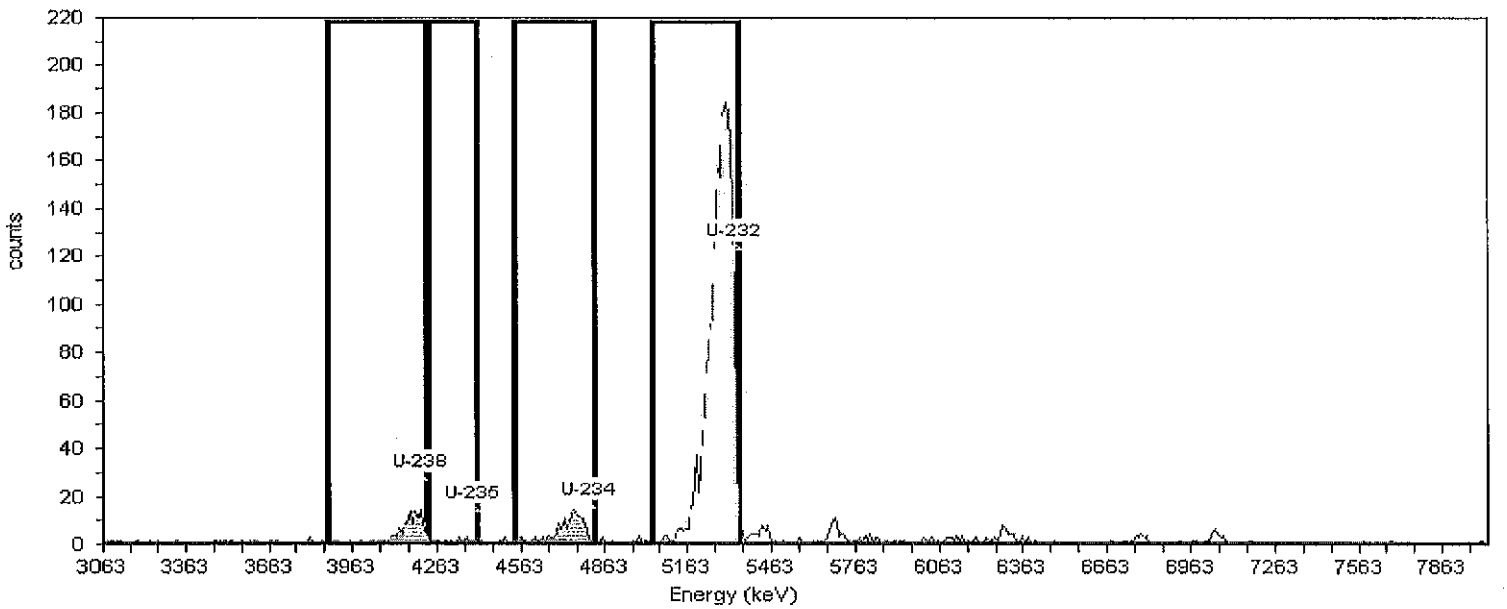
Energy Calibration: C10030326

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,053.57 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 68.25%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4170.4	3878.6	4228.8	76.3	100.2	109.20	6.88	102.32	2.7E-001	6.5E-002	1.5E-002	3.8E-002
U-235	4355.3	4238.5	4413.7	51.1	99.7	14.40	4.16	10.24	2.7E-002	2.3E-002	1.2E-002	3.1E-002
U-234	4773.6	4549.9	4832.0	93.8	100.0	131.40	19.04	112.36	3.0E-001	7.3E-002	2.6E-002	5.8E-002
U-232	5299.0	5046.0	5357.4	96.2	100.1	1,774.19	21.44	1,752.75	3.3E+000	1.6E-001	2.8E-002	6.3E-002

20000625

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-5
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 27
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:59PM
Live Time: 800.00 min.
Real Time: 800.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030327; Det: 27; Spectrum #1; Mar-03-2010 14:43

Calibration Date: 3/3/2010 1:35:27PM

Efficiency Calibration: C10030327

Efficiency: 29.97% +/- 0.16% TPU(2 sigma)

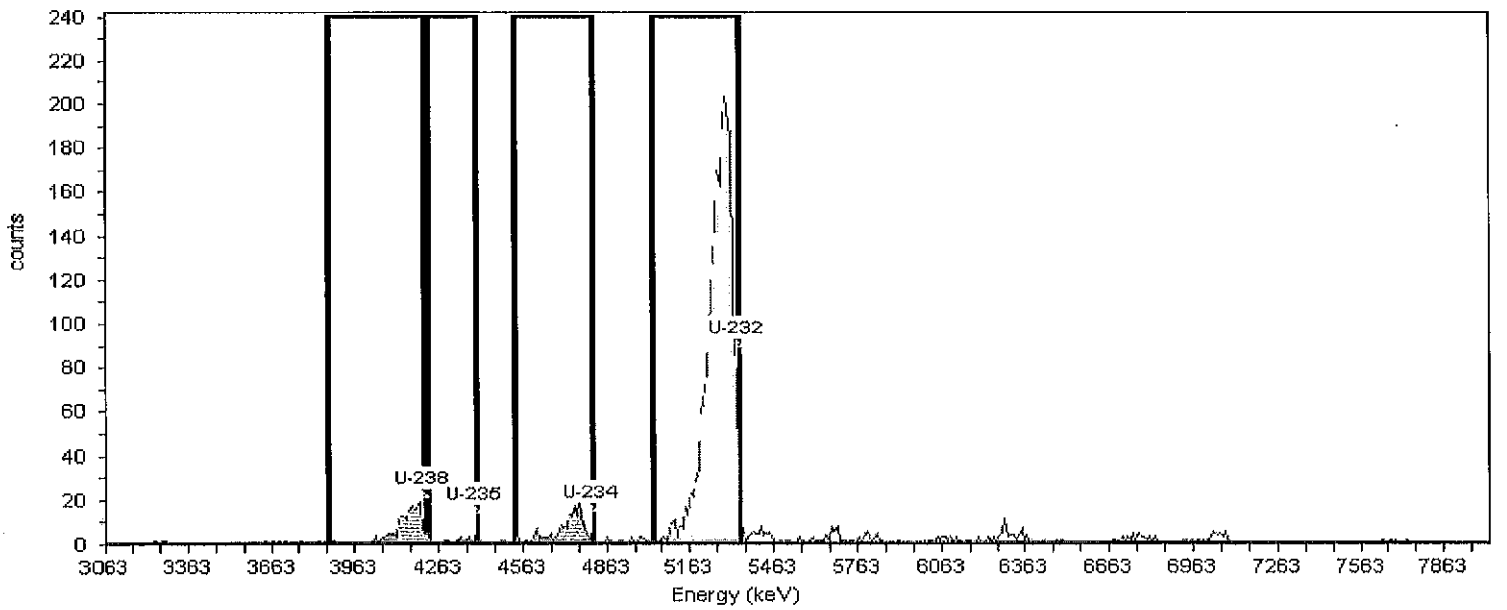
Energy Calibration: C10030327

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,053.57 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 82.00%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4160.3	3868.4	4218.6	102.9	100.2	155.00	4.00	151.00	3.5E-001	6.9E-002	1.0E-002	2.6E-002
U-235	4345.1	4228.4	4403.5	102.9	99.7	11.98	3.80	8.18	1.9E-002	1.8E-002	2.9E-002	2.6E-002
U-234	4763.5	4539.7	4821.8	63.4	100.0	140.75	4.00	136.75	3.1E-001	6.5E-002	1.0E-002	2.6E-002
U-232	5288.8	5035.9	5347.2	96.1	100.1	2,052.68	17.80	2,034.88	3.9E+000	1.8E-001	2.2E-002	5.0E-002

20000626

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000626

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-6
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 11
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:06PM
Live Time: 800.00 min.
Real Time: 800.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030211; Det: 11; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:31:10AM

Efficiency Calibration: C10030211

Efficiency: 31.76% +/- 0.17% TPU(2 sigma)

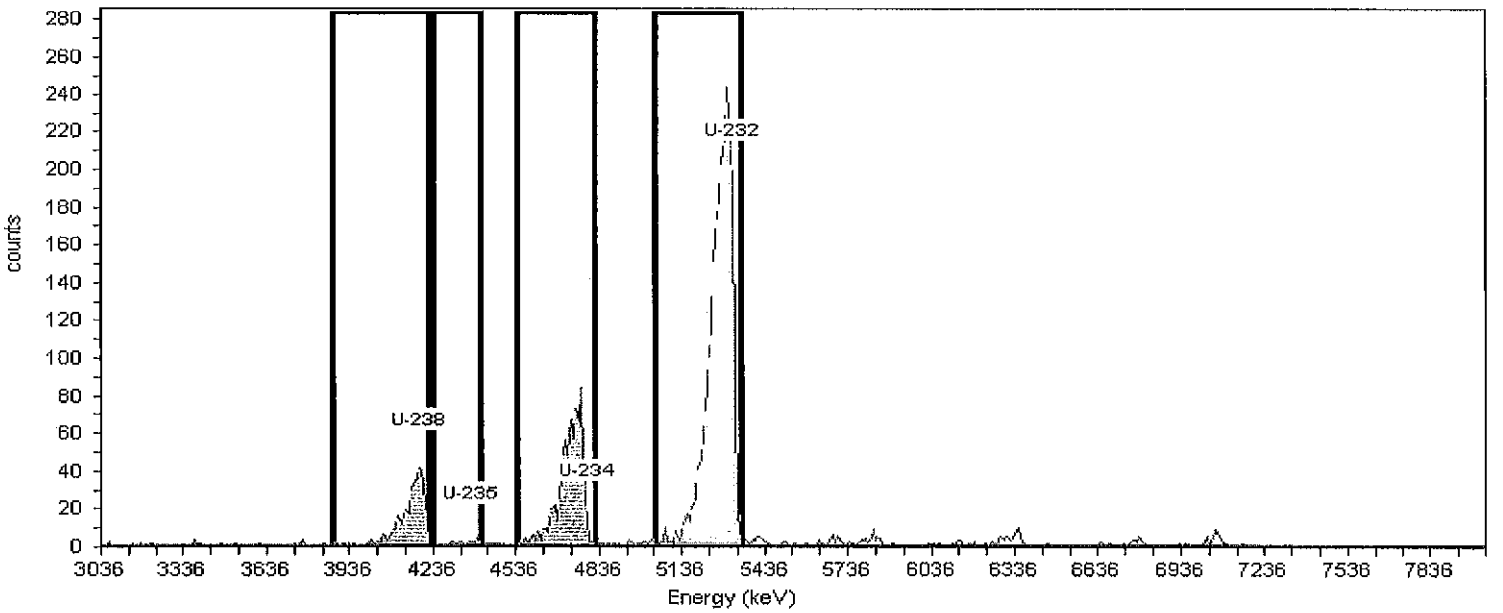
Energy Calibration: C10030211

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.04%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4159.2	3874.8	4227.8	70.5	100.2	337.55	2.76	334.79	1.4E+000	2.2E-001	1.5E-002	4.2E-002
U-235	4345.5	4237.6	4414.1	115.5	99.7	18.45	4.00	14.45	6.0E-002	4.0E-002	2.8E-002	4.8E-002
U-234	4767.1	4541.5	4825.9	85.0	100.0	696.11	4.00	692.11	2.9E+000	3.8E-001	1.8E-002	4.8E-002
U-232	5296.5	5041.6	5355.3	97.2	100.1	2,245.55	8.80	2,236.75	8.2E+000	3.5E-001	2.8E-002	6.8E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000627

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-7
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 12
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:07PM
Live Time: 800.00 min.
Real Time: 800.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030212; Det: 12; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:31:32AM

Efficiency Calibration: C10030212

Efficiency: 30.64% +/- 0.21% TPU(2 sigma)

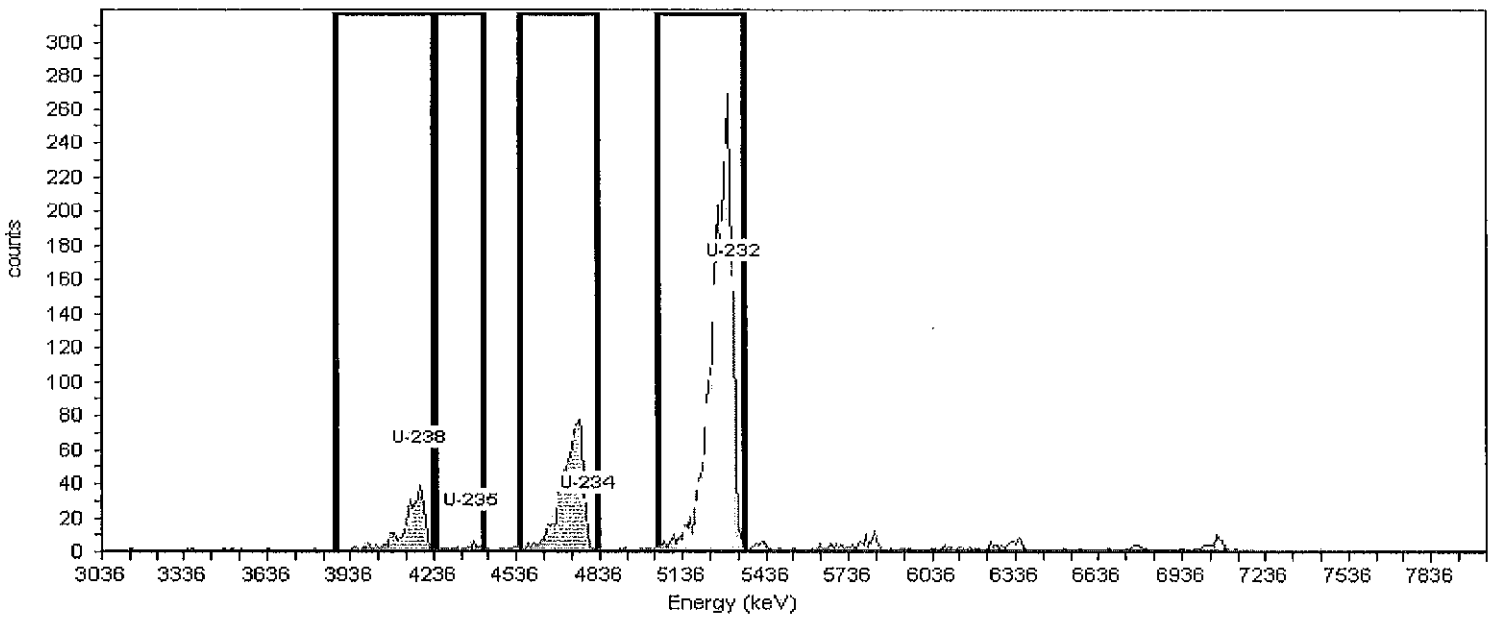
Energy Calibration: C10030212

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 88.12%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4163.6	3879.2	4232.2	74.0	100.2	300.00	1.60	298.40	1.2E+000	2.0E-001	1.2E-002	3.4E-002
U-235	4349.8	4242.0	4418.5	33.4	99.7	21.00	0.00	21.00	8.8E-002	4.0E-002	[illegible]	1.1E-002
U-234	4771.4	4545.9	4830.3	88.1	100.0	710.00	0.00	710.00	3.0E+000	3.9E-001	0.0E+000	1.1E-002
U-232	5300.9	5046.0	5359.7	96.7	100.1	2,243.00	7.20	2,235.80	8.5E+000	3.6E-001	2.5E-002	6.2E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000628

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-8
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 28
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:59PM
Live Time: 800.00 min.
Real Time: 800.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030328; Det: 28; Spectrum #1; Mar-03-2010 14:43

Calibration Date: 3/3/2010 1:36:02PM

Efficiency Calibration: C10030328

Efficiency: 28.81% +/- 0.20% TPU(2 sigma)

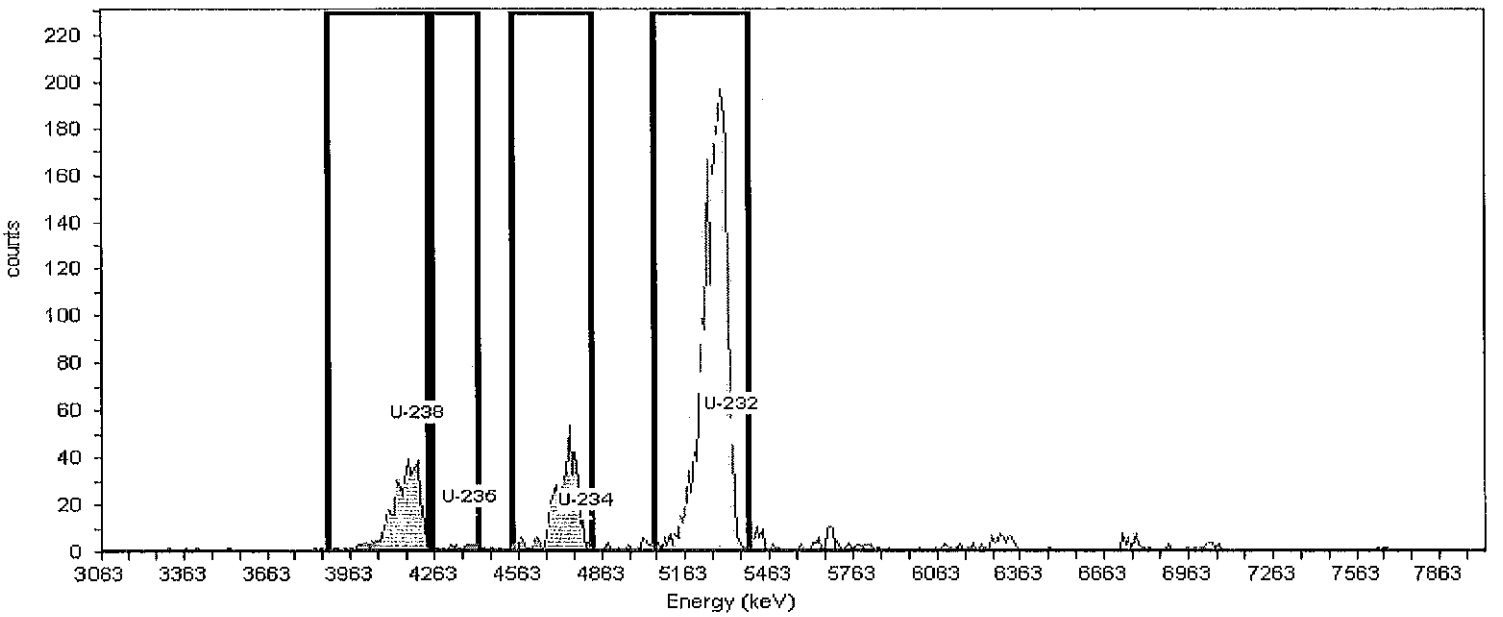
Energy Calibration: C10030328

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,053.57 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 83.93%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4201.6	3880.5	4240.5	32.4	100.2	422.00	2.40	419.60	9.7E-001	1.4E-001	7.9E-003	2.2E-002
U-235	4386.4	4250.2	4415.6	172.0	99.7	20.00	0.80	19.20	4.5E-002	2.2E-002	1.6E-002	1.6E-002
U-234	4804.8	4542.1	4824.2	100.5	100.0	410.00	4.00	406.00	9.4E-001	1.4E-001	1.0E-002	2.7E-002
U-232	5330.1	5048.0	5388.5	96.6	100.1	2,020.00	17.60	2,002.40	4.0E+000	1.8E-001	2.2E-002	5.1E-002

20000629

Reviewed By: JMC JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-9
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 29
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:44:00PM
Live Time: 800.00 min.
Real Time: 800.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030329; Det: 29; Spectrum #1; Mar-03-2010 14:43

Calibration Date: 3/3/2010 1:36:36PM

Efficiency Calibration: C10030329

Efficiency: 28.34% +/- 0.12% TPU(2 sigma)

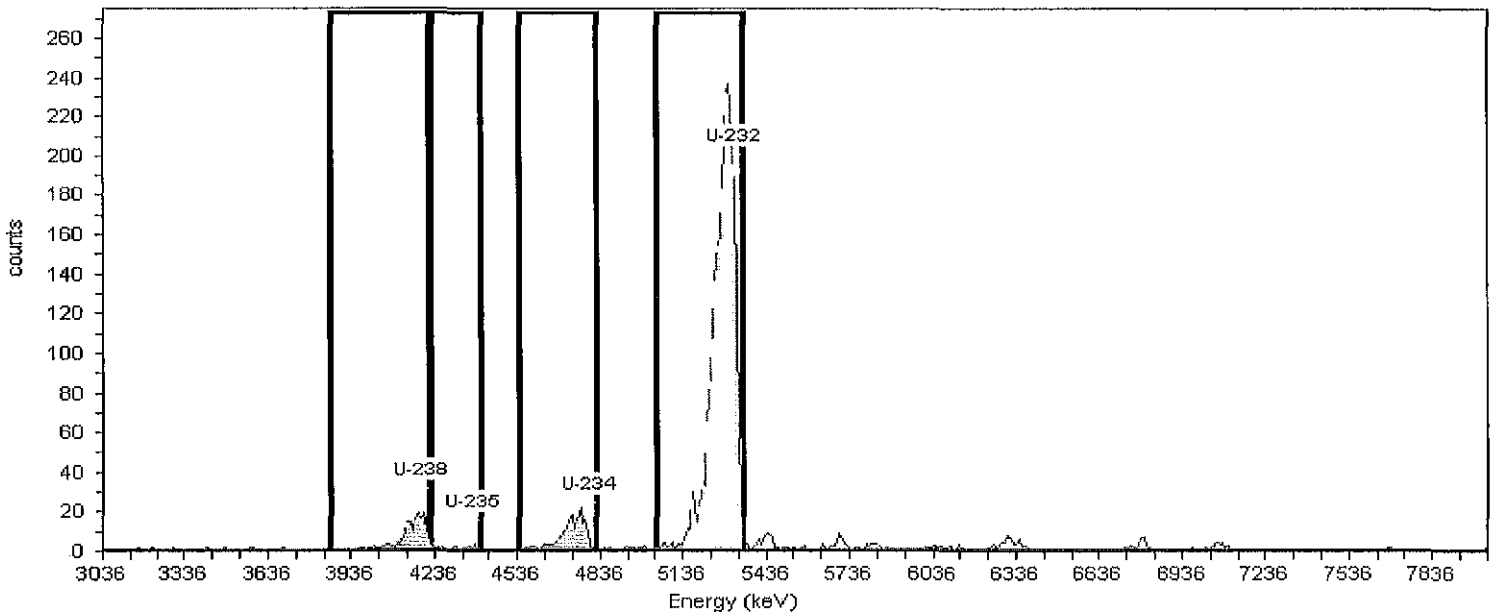
Energy Calibration: C10030329

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 91.03%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4161.6	3867.4	4220.4	43.4	100.2	160.01	3.20	156.81	3.4E-001	6.7E-002	8.6E-003	2.3E-002
U-235	4347.9	4230.2	4406.7	96.1	99.7	13.40	0.00	13.40	2.9E-002	1.7E-002	2.0E-003	5.9E-003
U-234	4769.5	4544.0	4828.3	90.0	100.0	176.80	1.60	175.20	3.8E-001	7.2E-002	6.1E-003	1.8E-002
U-232	5298.9	5044.0	5357.8	89.3	100.1	2,142.00	5.44	2,136.56	4.4E+000	1.9E-001	1.2E-002	2.9E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000630

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-9D
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 30
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:44:01PM
Live Time: 800.00 min.
Real Time: 800.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030330; Det: 30; Spectrum #1; Mar-03-2010 14:43

Calibration Date: 3/3/2010 1:36:59PM

Efficiency Calibration: C10030330

Efficiency: 28.28% +/- 0.15% TPU(2 sigma)

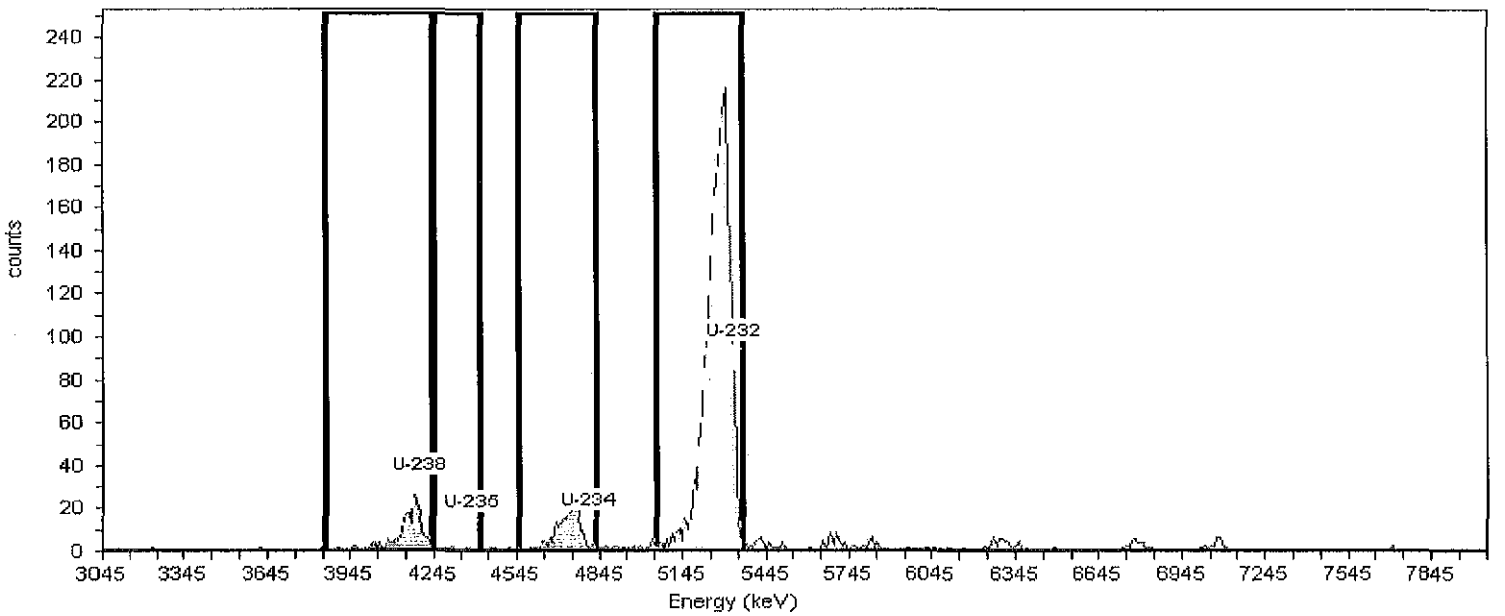
Energy Calibration: C10030330

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 89.62%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4193.0	3849.8	4232.2	43.2	100.2	186.00	1.60	184.40	4.1E-001	7.5E-002	6.2E-003	1.8E-002
U-235	4379.3	4242.0	4408.7	28.0	99.7	5.00	0.80	4.20	9.4E-003	1.1E-002	2.0E-003	1.5E-002
U-234	4800.9	4545.9	4830.3	81.2	100.0	200.00	1.60	198.40	4.4E-001	7.9E-002	6.2E-003	1.8E-002
U-232	5330.3	5046.0	5359.7	68.9	100.1	2,114.00	15.20	2,098.80	4.3E+000	1.9E-001	2.0E-002	4.5E-002

Reviewed By: JMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000631

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-10
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 31
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:44:02PM
Live Time: 800.00 min.
Real Time: 800.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030331; Det: 31; Spectrum #1; Mar-03-2010 14:43

Calibration Date: 3/3/2010 1:37:24PM

Efficiency Calibration: C10030331

Efficiency: 29.66% +/- 0.18% TPU(2 sigma)

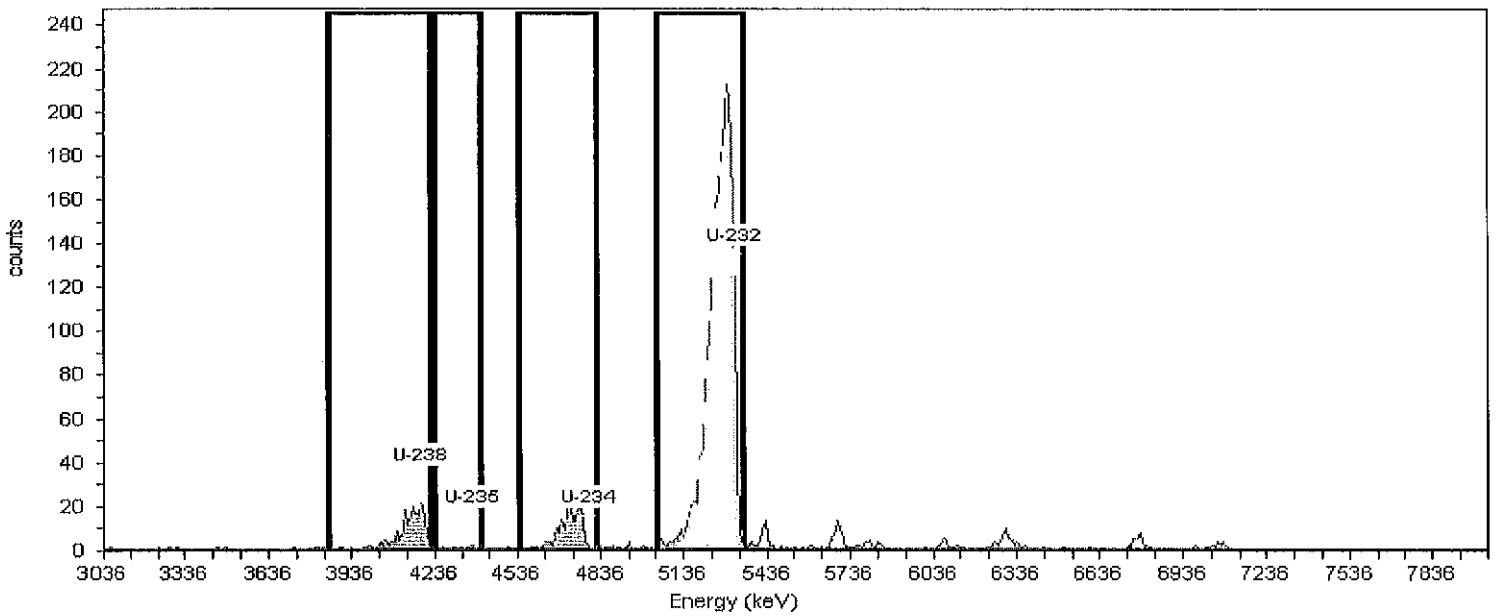
Energy Calibration: C10030331

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 83.58%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4183.2	3849.8	4222.4	37.8	100.2	190.00	8.00	182.00	4.1E-001	7.8E-002	1.4E-002	3.4E-002
U-235	4369.5	4232.2	4398.9	36.1	99.7	9.00	0.00	9.00	2.1E-002	1.5E-002	2.0E-003	6.2E-003
U-234	4791.1	4536.1	4820.5	95.2	100.0	175.00	3.20	171.80	3.9E-001	7.4E-002	9.0E-003	2.4E-002
U-232	5320.5	5036.2	5349.9	47.4	100.1	2,082.00	29.60	2,052.40	4.0E+000	1.8E-001	2.8E-002	6.2E-002

Reviewed By: 9MK JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000632

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-11
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 32
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:44:03PM
Live Time: 800.00 min.
Real Time: 800.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030332; Det: 32; Spectrum #1; Mar-03-2010 14:43

Calibration Date: 3/3/2010 1:37:46PM

Efficiency Calibration: C1003032

Efficiency: 29.64% +/- 0.12% TPU(2 sigma)

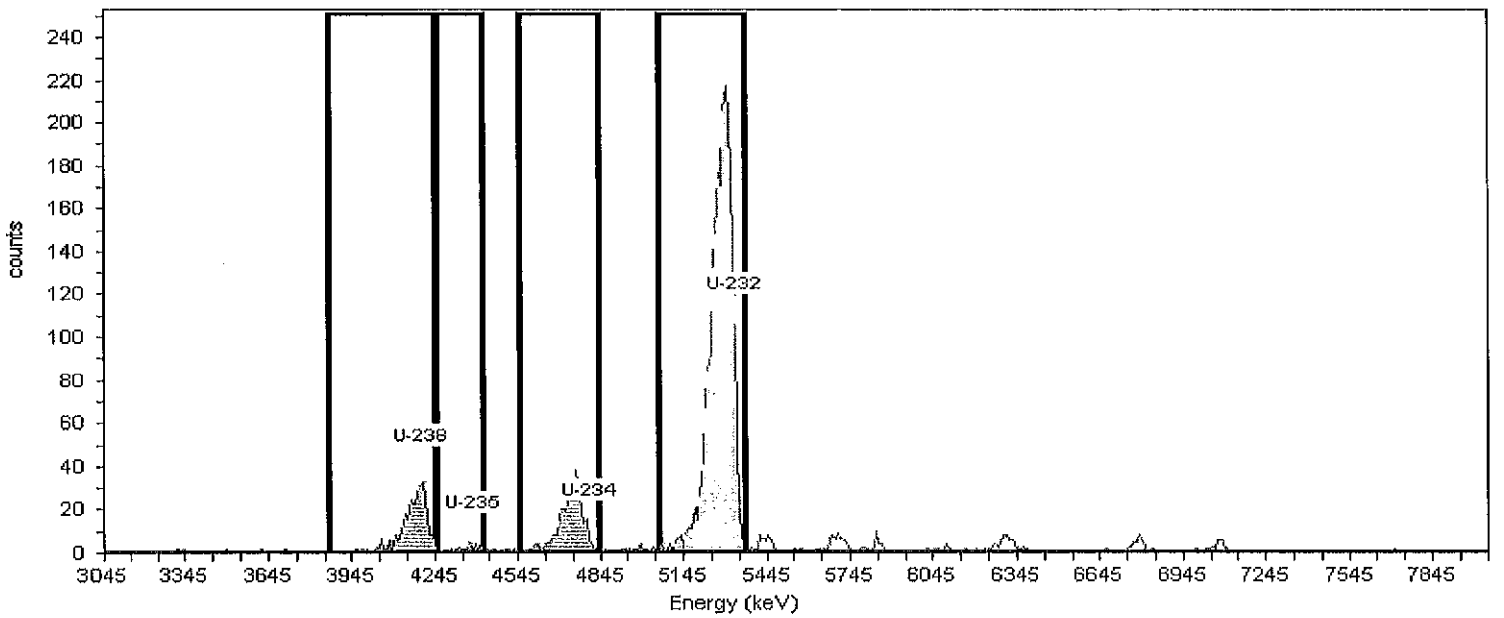
Energy Calibration: C1003032

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 81.24%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4193.0	3859.6	4242.0	30.0	100.2	276.00	1.60	274.40	6.4E-001	1.0E-001	6.5E-003	1.9E-002
U-235	4379.3	4251.8	4418.5	22.0	99.7	18.00	0.80	17.20	4.0E-002	2.1E-002	1.6E-002	1.6E-002
U-234	4800.9	4545.9	4840.1	76.4	100.0	295.00	4.00	291.00	6.8E-001	1.1E-001	1.0E-002	2.7E-002
U-232	5330.3	5055.8	5369.5	66.1	100.1	2,009.00	15.20	1,993.80	3.9E+000	1.8E-001	2.1E-002	4.8E-002

20000633

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000633

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-12
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 57
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:55PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030357; Det: 57; Spectrum #1; Mar-03-2010 14:44

Calibration Date: 3/3/2010 1:42:55PM

Efficiency Calibration: C10030357

Efficiency: 30.63% +/- 0.13% TPU(2 sigma)

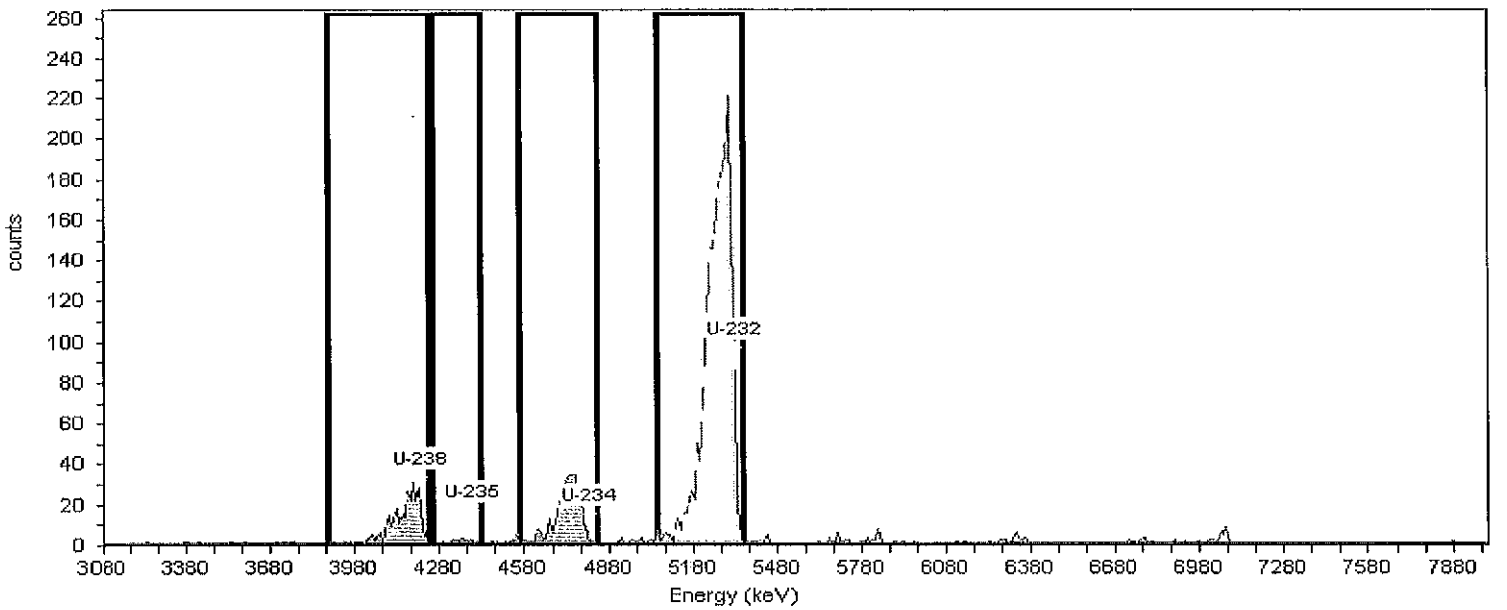
Energy Calibration: C10030357

Energy Cal: Gain = 9.6533 keV / Ch
Offset = 3,071.01 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.96%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4210.1	3881.9	4239.1	33.8	100.2	285.00	0.80	284.20	6.1E-001	9.8E-002	4.2E-003	1.4E-002
U-235	4393.5	4248.7	4422.5	68.1	99.7	17.00	0.00	17.00	3.6E-002	1.9E-002	2.0E-003	5.8E-003
U-234	4808.6	4557.6	4837.6	83.0	100.0	335.00	1.60	333.40	7.1E-001	1.1E-001	6.0E-003	1.8E-002
U-232	5329.9	5049.9	5358.8	44.2	100.1	2,184.00	4.00	2,180.00	4.1E+000	1.8E-001	9.7E-003	2.5E-002

20000634

Reviewed By: QMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000634

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-13
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 58
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:55PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030358; Det: 58; Spectrum #1; Mar-03-2010 14:44

Calibration Date: 3/3/2010 1:43:38PM

Efficiency Calibration: C10030358

Efficiency: 30.96% +/- 0.15% TPU(2 sigma)

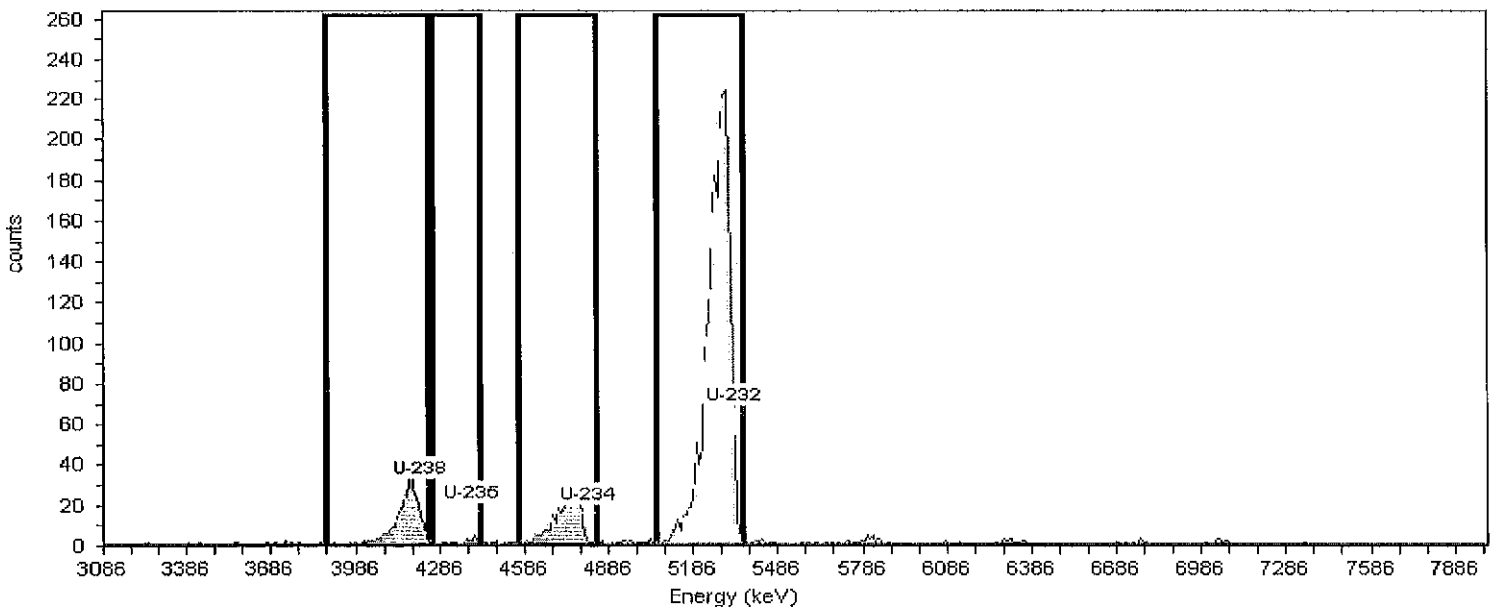
Energy Calibration: C10030358

Energy Cal: Gain = 9.6368 keV / Ch
Offset = 3,077.33 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 83.59%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4214.5	3877.2	4243.4	58.1	100.2	285.00	1.60	283.40	6.2E-001	1.0E-001	6.1E-003	1.8E-002
U-235	4397.6	4253.0	4426.5	17.0	99.7	17.00	1.60	15.40	3.4E-002	1.9E-002	6.1E-003	1.8E-002
U-234	4812.0	4561.4	4840.9	98.5	100.0	292.00	3.20	288.80	6.3E-001	1.0E-001	8.6E-003	2.3E-002
U-232	5332.3	5052.9	5361.2	66.0	100.1	2,147.00	4.00	2,143.00	4.0E+000	1.7E-001	9.9E-003	2.6E-002

20000635

Reviewed By: JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-14
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 13
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:07PM
Live Time: 800.00 min.
Real Time: 800.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030213; Det: 13; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:31:52AM

Efficiency Calibration: C10030213

Efficiency: 31.64% +/- 0.13% TPU(2 sigma)

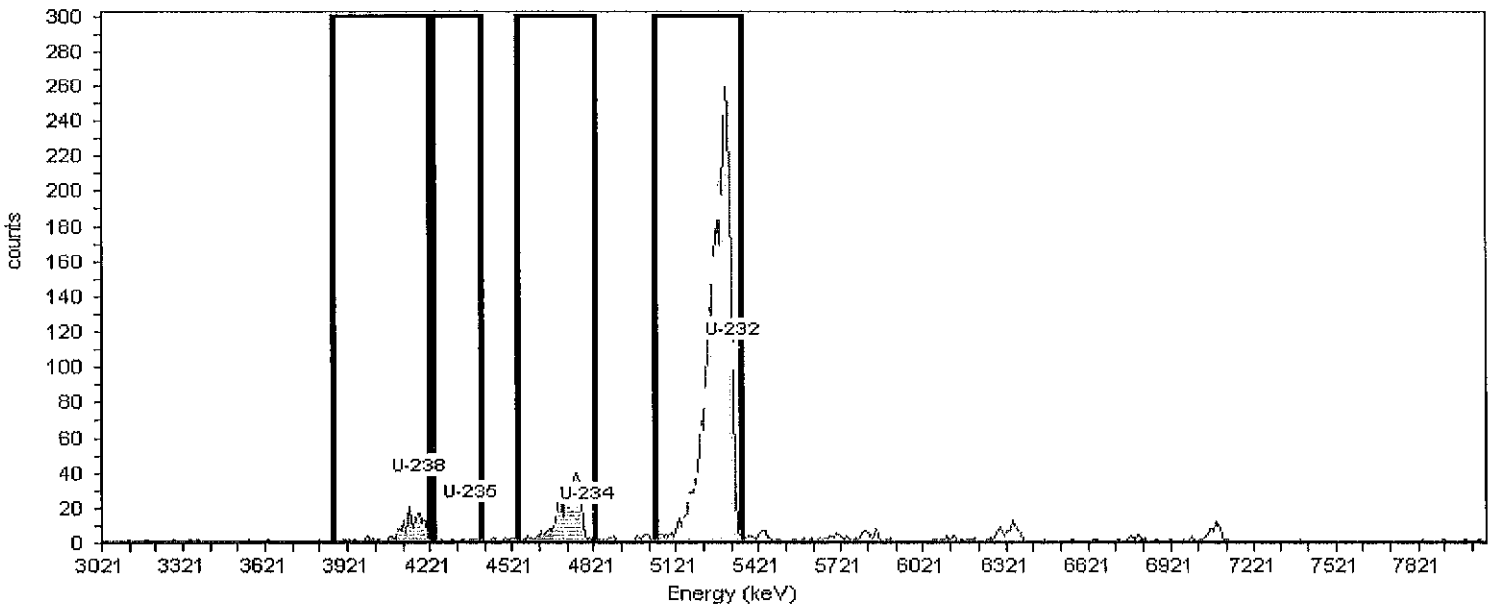
Energy Calibration: C10030213

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.57%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4149.9	3862.8	4219.2	79.5	100.2	146.00	1.60	144.40	6.0E-001	1.2E-001	1.2E-002	3.4E-002
U-235	4338.0	4229.1	4407.3	46.8	99.7	8.00	0.80	7.20	3.0E-002	2.5E-002	2.2E-003	2.8E-002
U-234	4763.7	4536.0	4823.1	94.5	100.0	351.00	3.20	347.80	1.4E+000	2.2E-001	1.6E-002	4.4E-002
U-232	5298.3	5040.9	5357.7	98.3	100.1	2,250.00	8.00	2,242.00	8.2E+000	3.5E-001	2.7E-002	6.5E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000636

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-15
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 14
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:08PM
Live Time: 800.00 min.
Real Time: 800.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030214; Det: 14; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:32:21AM

Efficiency Calibration: C10030214

Efficiency: 30.21% +/- 0.15% TPU(2 sigma)

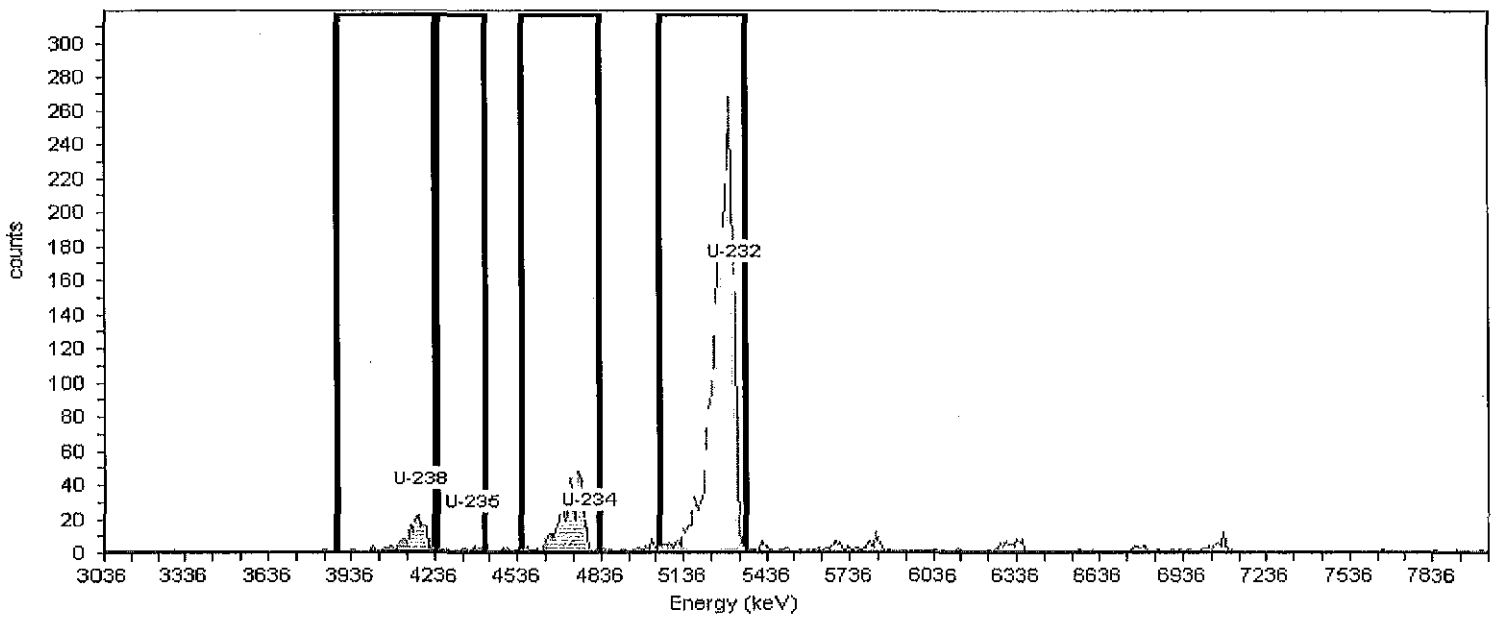
Energy Calibration: C10030214

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.21%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4163.6	3879.2	4232.2	64.6	100.2	154.00	0.80	153.20	6.6E-001	1.3E-001	8.5E-003	2.9E-002
U-235	4349.8	4242.0	4418.5	67.1	99.7	15.00	3.20	11.80	5.1E-002	3.7E-002	20000637	4.6E-002
U-234	4771.4	4545.9	4830.3	92.0	100.0	374.00	4.00	370.00	1.6E+000	2.4E-001	1.9E-002	5.0E-002
U-232	5300.9	5046.0	5359.7	94.5	100.1	2,162.00	5.60	2,156.40	8.3E+000	3.6E-001	2.3E-002	5.8E-002

Reviewed By: QMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000637

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-16
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 59
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:56PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030359; Det: 59; Spectrum #1; Mar-03-2010 14:44

Calibration Date: 3/3/2010 1:44:14PM

Efficiency Calibration: C10030359

Efficiency: 31.43% +/- 0.16% TPU(2 sigma)

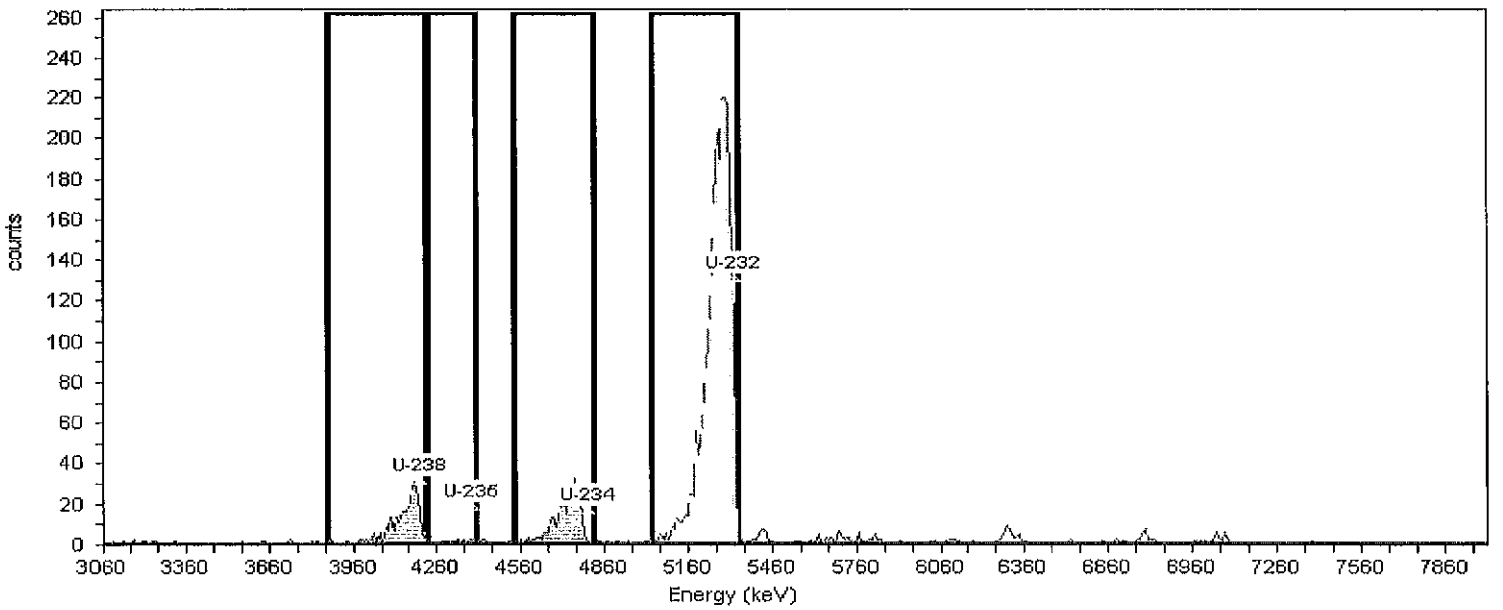
Energy Calibration: C10030359

Energy Cal: Gain = 9.7108 keV / Ch
Offset = 3,050.49 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.30%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4164.6	3873.3	4222.9	87.8	100.2	247.73	4.21	243.52	5.1E-001	8.7E-002	9.5E-003	2.5E-002
U-235	4349.1	4232.6	4407.4	19.6	99.7	14.00	0.00	14.00	2.9E-002	1.7E-002	9.0E-003	5.7E-003
U-234	4766.7	4543.4	4825.0	81.2	100.0	263.00	5.01	257.99	5.4E-001	9.1E-002	1.0E-002	2.6E-002
U-232	5291.1	5038.6	5349.4	88.1	100.1	2,232.53	12.80	2,219.73	4.1E+000	1.8E-001	1.7E-002	4.0E-002

20000638

Reviewed By: gwf JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-16D
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 60
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:56PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030360; Det: 60; Spectrum #1; Mar-03-2010 14:44

Calibration Date: 3/3/2010 1:44:44PM

Efficiency Calibration: C10030360

Efficiency: 30.31% +/- 0.21% TPU(2 sigma)

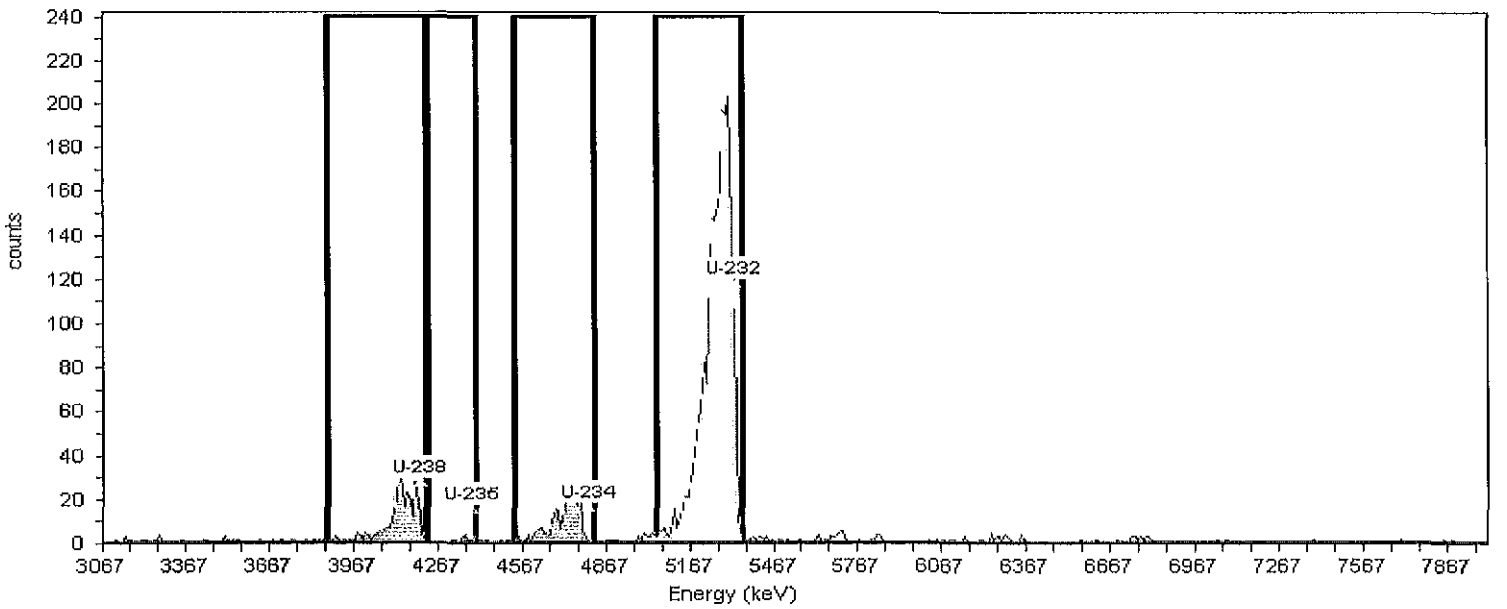
Energy Calibration: C10030360

Energy Cal: Gain = 9.6909 keV / Ch
Offset = 3,057.48 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.16%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4201.0	3871.5	4220.4	37.2	100.2	275.00	4.00	271.00	5.8E-001	9.6E-002	9.5E-003	2.5E-002
U-235	4385.1	4230.1	4404.5	.0	99.7	12.00	0.80	11.20	2.4E-002	1.6E-002	2.0E-003	1.4E-002
U-234	4801.8	4540.2	4821.2	103.5	100.0	229.00	6.40	222.60	4.8E-001	8.4E-002	1.2E-002	3.0E-002
U-232	5325.2	5044.1	5354.2	43.3	100.1	2,180.00	17.60	2,162.40	4.1E+000	1.8E-001	2.1E-002	4.7E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000639

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-17
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 62
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:57PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030362; Det: 62; Spectrum #1; Mar-03-2010 14:44

Calibration Date: 3/3/2010 1:45:29PM

Efficiency Calibration: C10030362

Efficiency: 29.98% +/- 0.15% TPU(2 sigma)

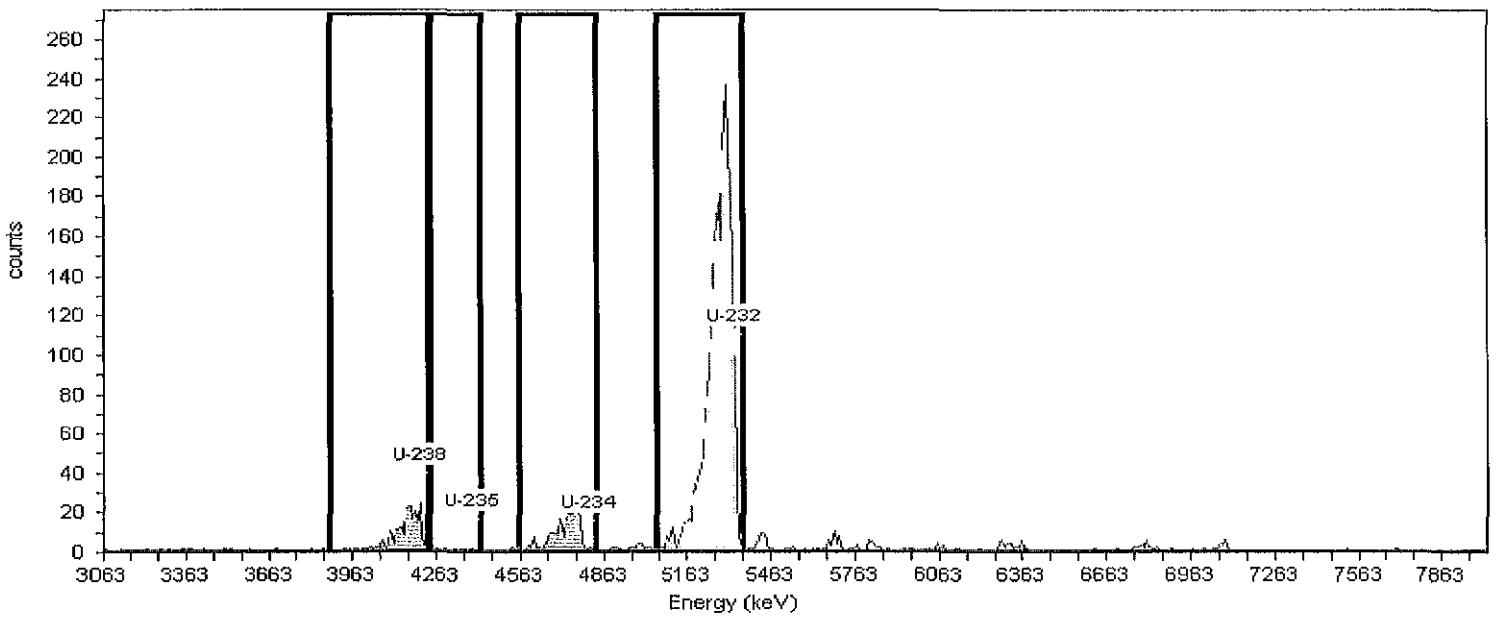
Energy Calibration: C10030362

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,053.57 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 83.83%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4172.4	3880.5	4230.8	97.0	100.2	205.00	5.60	199.40	4.5E-001	8.1E-002	1.2E-002	2.9E-002
U-235	4357.2	4240.5	4415.6	79.9	99.7	8.00	1.60	6.40	1.4E-002	1.4E-002	20000640	1.9E-002
U-234	4775.6	4551.8	4833.9	84.0	100.0	208.00	4.80	203.20	4.6E-001	8.2E-002	1.1E-002	2.8E-002
U-232	5300.9	5048.0	5359.3	94.3	100.1	2,094.00	12.80	2,081.20	4.0E+000	1.8E-001	1.8E-002	4.3E-002

Reviewed By: GMC JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000640

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-18
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 63
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:58PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030363; Det: 63; Spectrum #1; Mar-03-2010 14:44

Calibration Date: 3/3/2010 1:46:24PM

Efficiency Calibration: C10030363

Efficiency: 31.04% +/- 0.18% TPU(2 sigma)

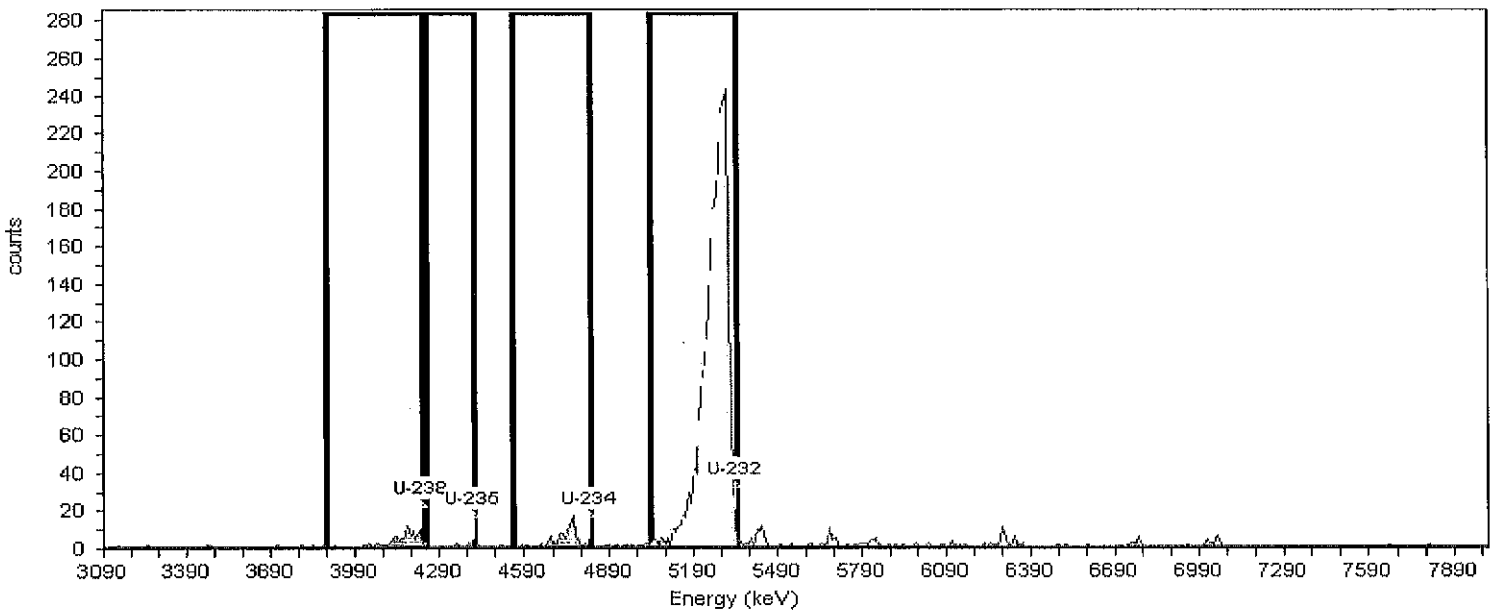
Energy Calibration: C10030363

Energy Cal: Gain = 9.6533 keV / Ch
Offset = 3,080.66 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 87.02%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4175.7	3886.1	4233.6	95.2	100.2	86.13	4.00	82.13	1.7E-001	4.4E-002	9.2E-003	2.4E-002
U-235	4359.1	4243.2	4417.0	23.4	99.7	5.43	1.25	4.18	8.7E-003	1.1E-002	20000641	1.6E-002
U-234	4774.2	4552.1	4832.1	33.0	100.0	85.00	2.75	82.25	1.7E-001	4.3E-002	7.6E-003	2.1E-002
U-232	5295.4	5044.5	5353.4	87.1	100.1	2,248.73	12.00	2,236.73	4.2E+000	1.8E-001	1.6E-002	3.9E-002

Reviewed By: GMC JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000641

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-19
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 64
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:43:59PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030364; Det: 64; Spectrum #1; Mar-03-2010 14:44

Calibration Date: 3/3/2010 1:46:48PM

Efficiency Calibration: C10030364

Efficiency: 30.31% +/- 0.12% TPU(2 sigma)

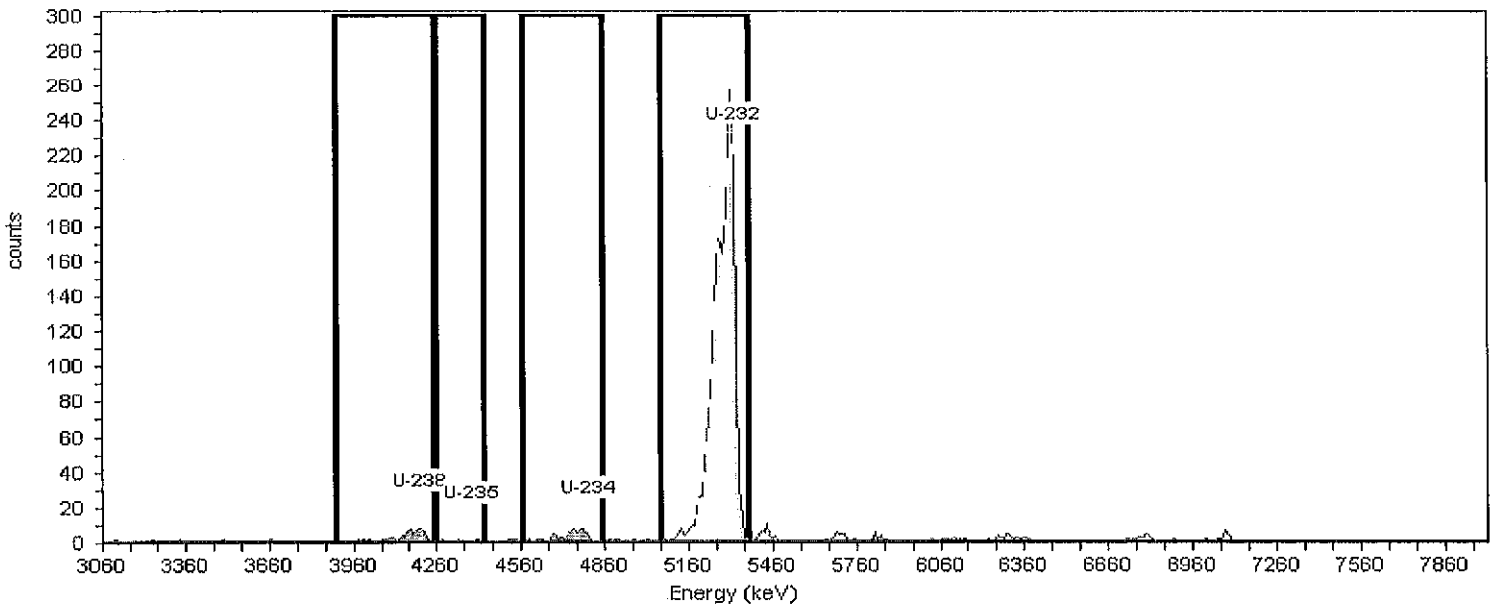
Energy Calibration: C10030364

Energy Cal: Gain = 9.7108 keV / Ch
Offset = 3,050.49 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 81.80%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4186.7	3895.3	4244.9	58.4	100.2	60.00	4.80	55.20	1.3E-001	3.9E-002	1.1E-002	2.8E-002
U-235	4371.2	4254.6	4429.4	16.5	99.7	3.00	4.00	-1.00	0.0E+000	1.2E-002	1.0E-002	2.6E-002
U-234	4788.7	4565.4	4847.0	69.7	100.0	62.00	3.20	58.80	1.3E-001	3.9E-002	9.0E-003	2.4E-002
U-232	5313.1	5060.6	5371.4	95.3	100.1	2,067.00	13.60	2,053.40	3.9E+000	1.7E-001	1.9E-002	4.4E-002

20000642

Reviewed By: GMC JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000642

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-20
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 16
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:09PM
Live Time: 800.00 min.
Real Time: 800.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030216; Det: 16; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:32:47AM

Efficiency Calibration: C10030216

Efficiency: 30.65% +/- 0.12% TPU(2 sigma)

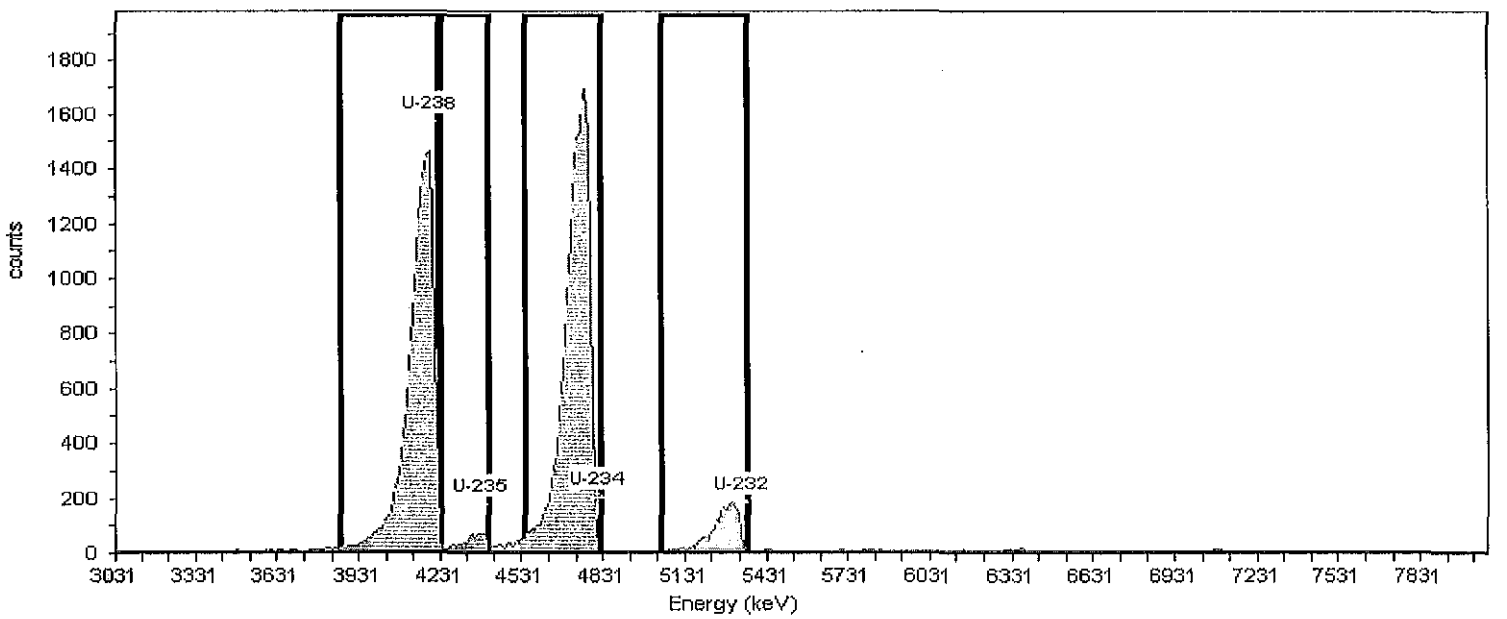
Energy Calibration: C10030216

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 75.48%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4153.9	3866.8	4223.2	102.3	100.2	15,515.23	0.80	15,514.43	7.5E+001	8.4E+000	9.6E-003	3.2E-002
U-235	4342.0	4233.1	4411.3	84.1	99.7	662.93	3.20	659.73	3.2E+000	4.4E-001	[illegible]	5.2E-002
U-234	4767.7	4540.0	4827.1	94.9	100.0	17,852.31	3.20	17,849.11	8.7E+001	9.7E+000	1.9E-002	5.2E-002
U-232	5302.4	5044.9	5361.8	96.0	100.1	1,921.21	5.45	1,915.77	7.2E+000	3.3E-001	2.6E-002	6.5E-002

Reviewed By: QMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000643

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-21
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 9
Batch Name: UAS100304-1_B
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/6/2010 4:28:14PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030209; Det: 9; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:30:06AM

Efficiency Calibration: C10030209

Efficiency: 30.99% +/- 0.20% TPU(2 sigma)

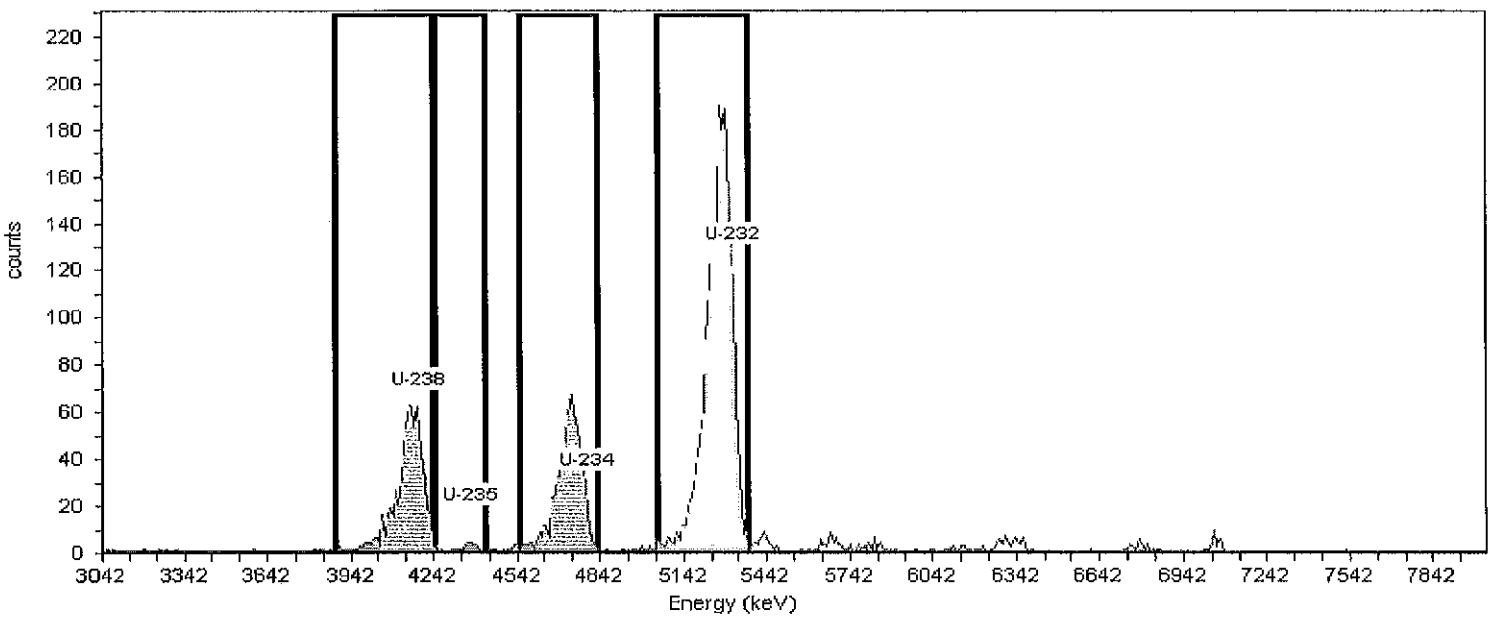
Energy Calibration: C10030209

Energy Cal: Gain = 9.7851 keV / Ch
Offset = 3,033.18 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 79.57%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4187.8	3884.5	4236.8	70.0	100.2	682.00	0.80	681.20	1.6E+000	2.1E-001	4.5E-003	1.5E-002
U-235	4373.7	4246.5	4422.7	38.4	99.7	23.00	0.80	22.20	5.1E-002	2.3E-002	2.0E-004	1.5E-002
U-234	4794.5	4549.9	4833.6	89.0	100.0	652.00	4.00	648.00	1.5E+000	2.0E-001	1.0E-002	2.6E-002
U-232	5322.9	5048.9	5371.8	98.1	100.1	2,053.00	11.20	2,041.80	3.8E+000	1.7E-001	1.7E-002	4.1E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000644

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-22
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 17a
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:01PM
Live Time: 800.00 min.
Real Time: 800.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030217; Det: 17a; Spectrum #1; Mar-02-2010 15:03

Calibration Date: 3/2/2010 11:33:19AM

Efficiency Calibration: C10030217

Efficiency: 30.63% +/- 0.20% TPU(2 sigma)

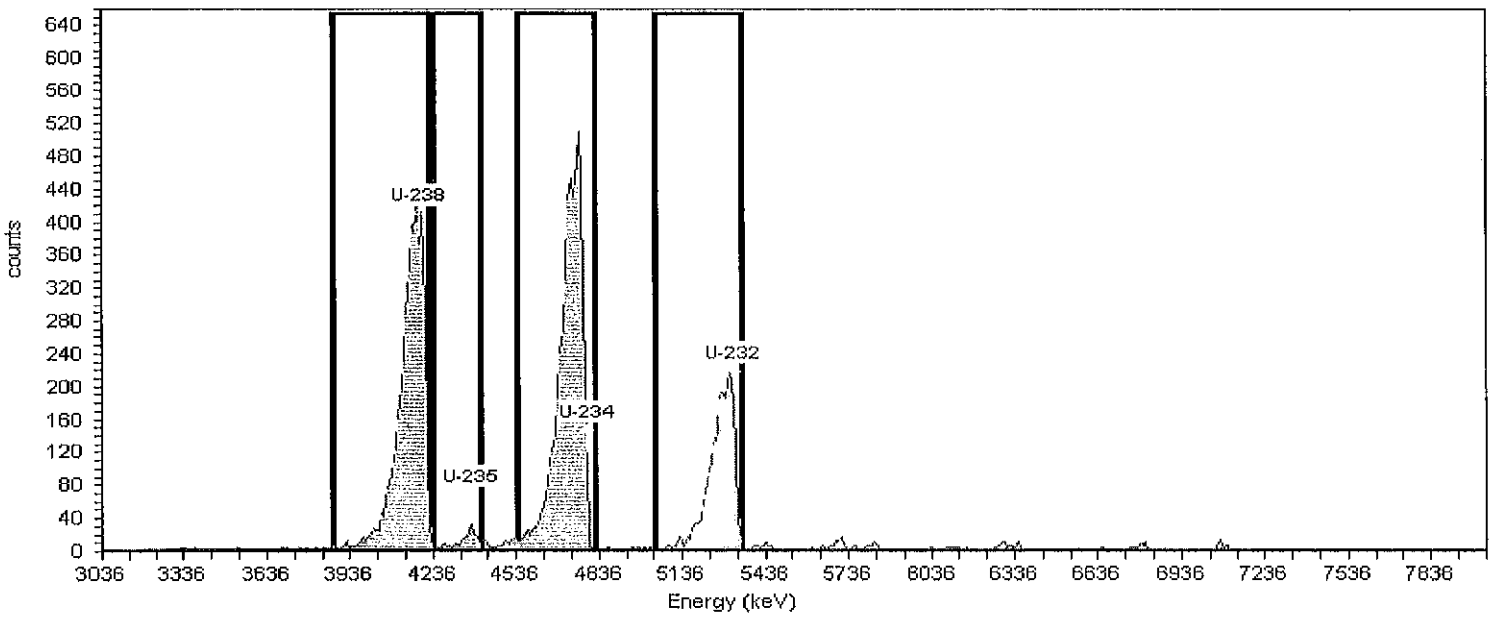
Energy Calibration: C10030217

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 82.72%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4162.2	3877.9	4230.8	83.2	100.2	4,291.02	1.49	4,289.53	1.9E+001	2.2E+000	1.2E-002	3.6E-002
U-235	4348.5	4240.6	4417.1	49.2	99.7	174.58	0.91	173.67	7.7E-001	1.5E-001	20000645	3.1E-002
U-234	4770.1	4544.6	4828.9	87.4	100.0	4,881.14	3.89	4,877.25	2.2E+001	2.5E+000	1.9E-002	5.1E-002
U-232	5299.5	5044.6	5358.4	95.7	100.1	2,110.25	11.78	2,098.47	7.9E+000	3.5E-001	3.5E-002	8.2E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000645

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-22D
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 18
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:10PM
Live Time: 800.00 min.
Real Time: 800.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030218; Det: 18; Spectrum #1; Mar-02-2010 15:03

Calibration Date: 3/2/2010 11:33:40AM

Efficiency Calibration: C10030218

Efficiency: 30.38% +/- 0.15% TPU(2 sigma)

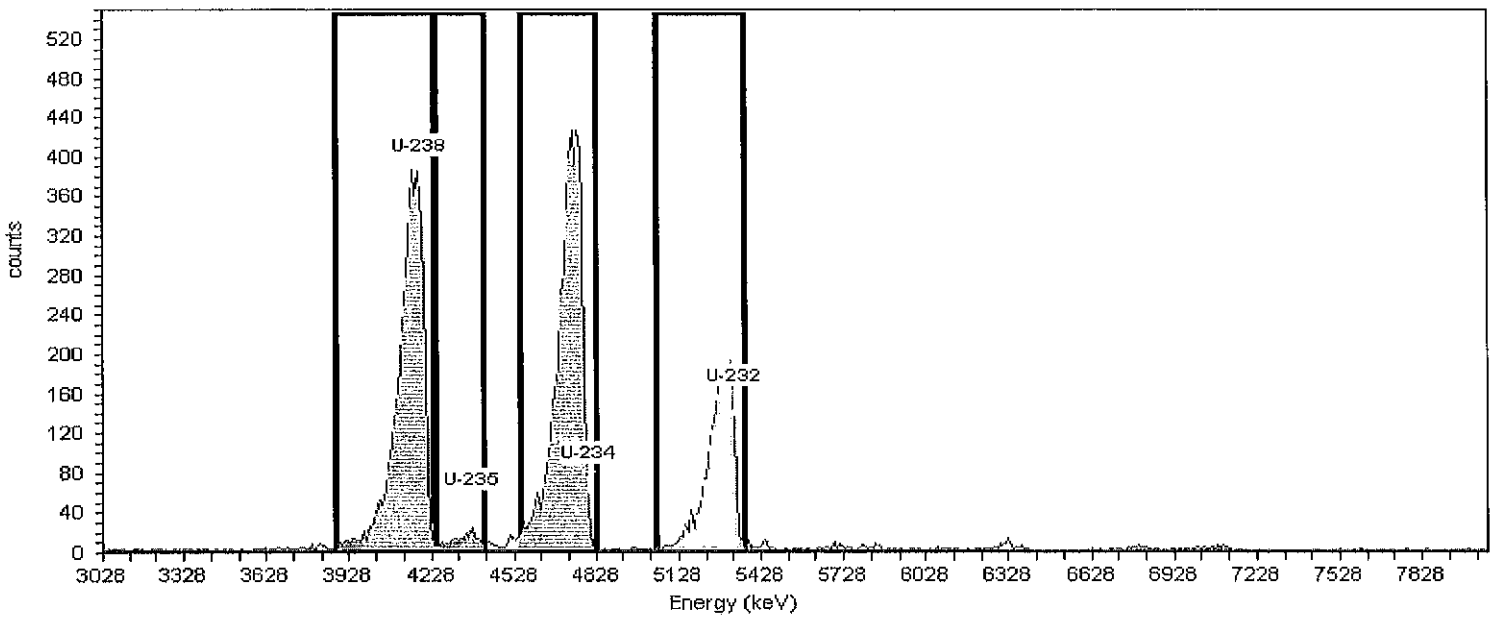
Energy Calibration: C10030218

Energy Cal: Gain = 9.8810 keV / Ch
Offset = 3,018.33 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 83.05%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4184.3	3878.0	4233.7	53.6	100.2	4,242.00	2.40	4,239.60	1.9E+001	2.1E+000	1.5E-002	4.3E-002
U-235	4372.0	4243.6	4421.4	131.2	99.7	208.00	0.80	207.20	9.3E-001	1.6E-001	2.0E-002	3.0E-002
U-234	4796.9	4549.9	4826.5	93.8	100.0	4,620.00	6.40	4,613.60	2.1E+001	2.3E+000	2.5E-002	6.2E-002
U-232	5330.5	5043.9	5370.0	58.1	100.1	2,109.00	20.00	2,089.00	8.0E+000	3.5E-001	4.5E-002	1.0E-001

Reviewed By: GMP JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000646

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-23
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 10a
Batch Name: UAS100304-1_B
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/6/2010 4:28:14PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030210; Det: 10a; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:30:45AM

Efficiency Calibration: C10030210

Efficiency: 31.56% +/- 0.15% TPU(2 sigma)

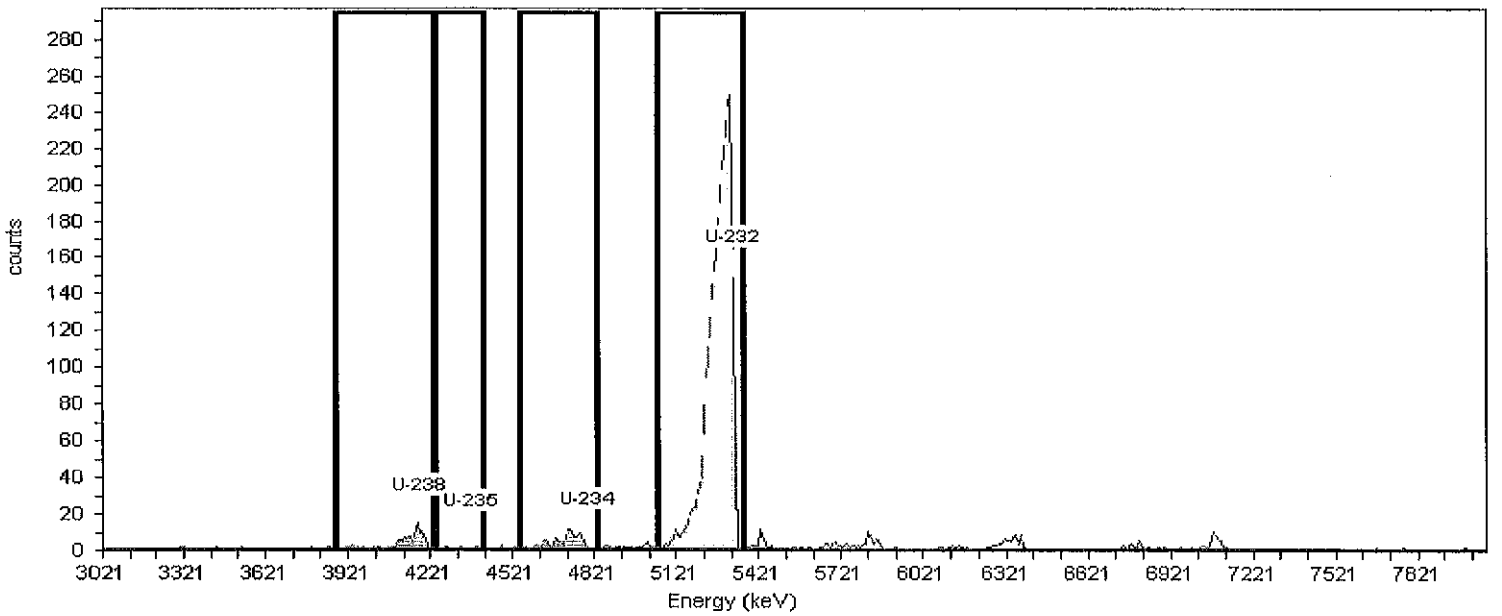
Energy Calibration: C10030210

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.74%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4160.9	3873.8	4230.2	76.4	100.2	94.89	1.60	93.29	1.9E-001	4.6E-002	5.8E-003	1.7E-002
U-235	4349.0	4240.1	4418.3	27.2	99.7	3.00	0.00	3.00	6.3E-003	8.4E-003	2.0E-003	5.6E-003
U-234	4774.7	4547.0	4834.1	101.4	100.0	94.11	2.40	91.71	1.9E-001	4.6E-002	7.1E-003	2.0E-002
U-232	5309.3	5051.9	5368.7	98.9	100.1	2,251.00	10.14	2,240.86	4.1E+000	1.8E-001	1.5E-002	3.6E-002

Reviewed By: JWC JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000647

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-24
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 19
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:10PM
Live Time: 800.00 min.
Real Time: 800.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030219; Det: 19; Spectrum #1; Mar-02-2010 15:03

Calibration Date: 3/2/2010 11:34:46AM

Efficiency Calibration: C10030219

Efficiency: 29.27% +/- 0.16% TPU(2 sigma)

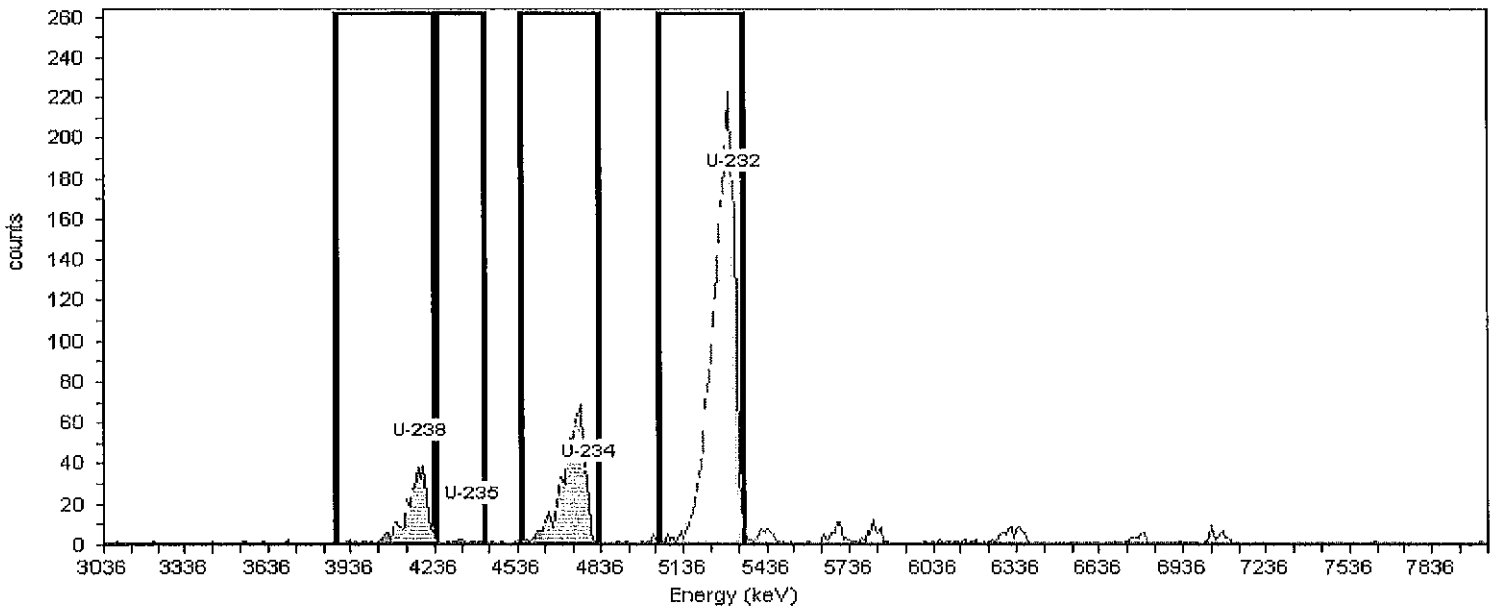
Energy Calibration: C10030219

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 83.38%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4183.2	3879.2	4232.2	34.2	100.2	316.00	4.00	312.00	1.4E+000	2.3E-001	2.0E-002	5.3E-002
U-235	4369.5	4242.0	4418.5	100.2	99.7	11.00	2.40	8.60	4.0E-002	3.4E-002	1.0E-002	4.4E-002
U-234	4791.1	4545.9	4830.3	81.9	100.0	636.00	4.00	632.00	2.9E+000	4.0E-001	2.0E-002	5.3E-002
U-232	5320.5	5046.0	5349.9	94.7	100.1	2,033.00	12.00	2,021.00	8.0E+000	3.6E-001	3.6E-002	8.5E-002

20000648

Reviewed By: JMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000648

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1003045-25
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 22
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:11PM
Live Time: 800.00 min.
Real Time: 800.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030222; Det: 22; Spectrum #1; Mar-02-2010 15:03

Calibration Date: 3/2/2010 11:35:09AM

Efficiency Calibration: C10030222

Efficiency: 27.21% +/- 0.14% TPU(2 sigma)

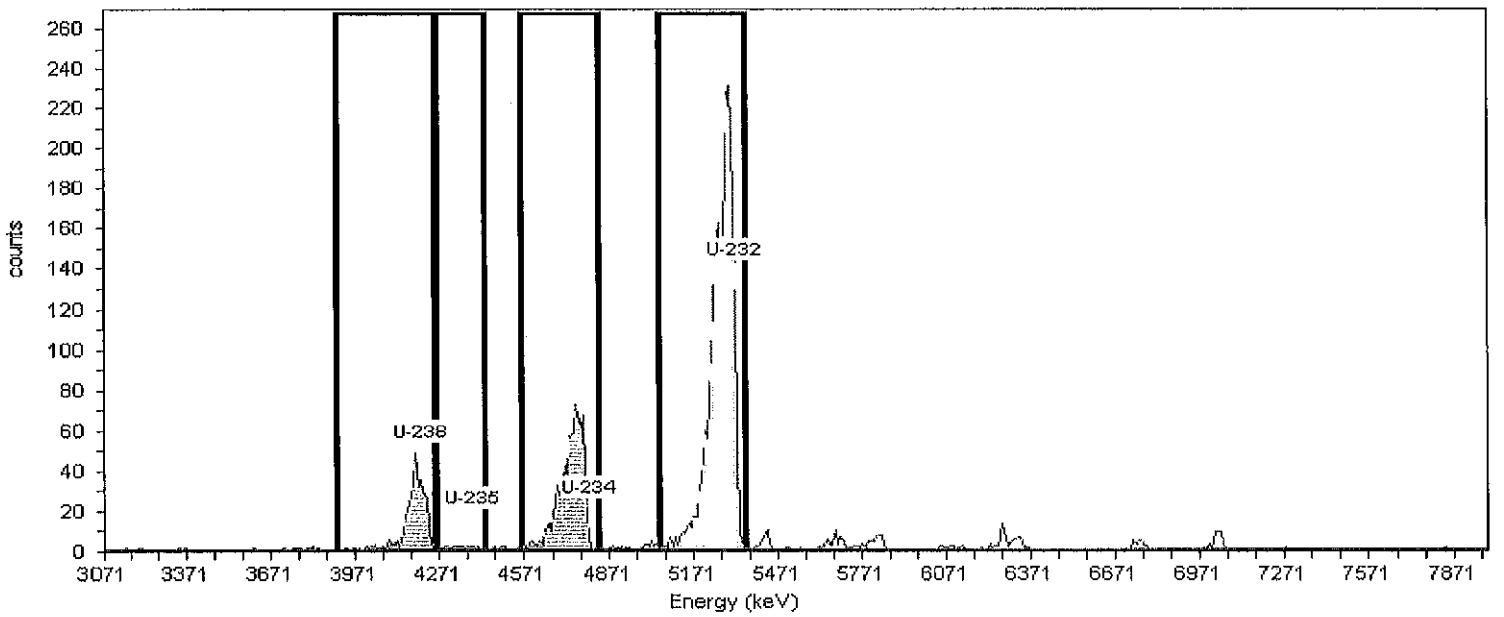
Energy Calibration: C10030222

Energy Cal: Gain = 9.6533 keV / Ch
Offset = 3,061.36 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 87.25%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4181.1	3901.2	4248.7	73.7	100.2	315.00	0.80	314.20	1.5E+000	2.3E-001	9.3E-003	3.1E-002
U-235	4364.6	4258.4	4432.1	118.9	99.7	24.00	1.60	22.40	1.1E-001	5.0E-002	2.0E-002	3.9E-002
U-234	4779.6	4557.6	4837.6	82.0	100.0	666.00	6.40	659.60	3.1E+000	4.2E-001	2.6E-002	6.6E-002
U-232	5300.9	5049.9	5358.8	97.0	100.1	1,977.00	11.20	1,965.80	8.4E+000	3.8E-001	3.6E-002	8.5E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000649

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS100304-1MB
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 11
Batch Name: UAS100304-1_B
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 3/6/2010 4:28:15PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030211; Det: 11; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:31:10AM

Efficiency Calibration: C10030211

Efficiency: 31.76% +/- 0.17% TPU(2 sigma)

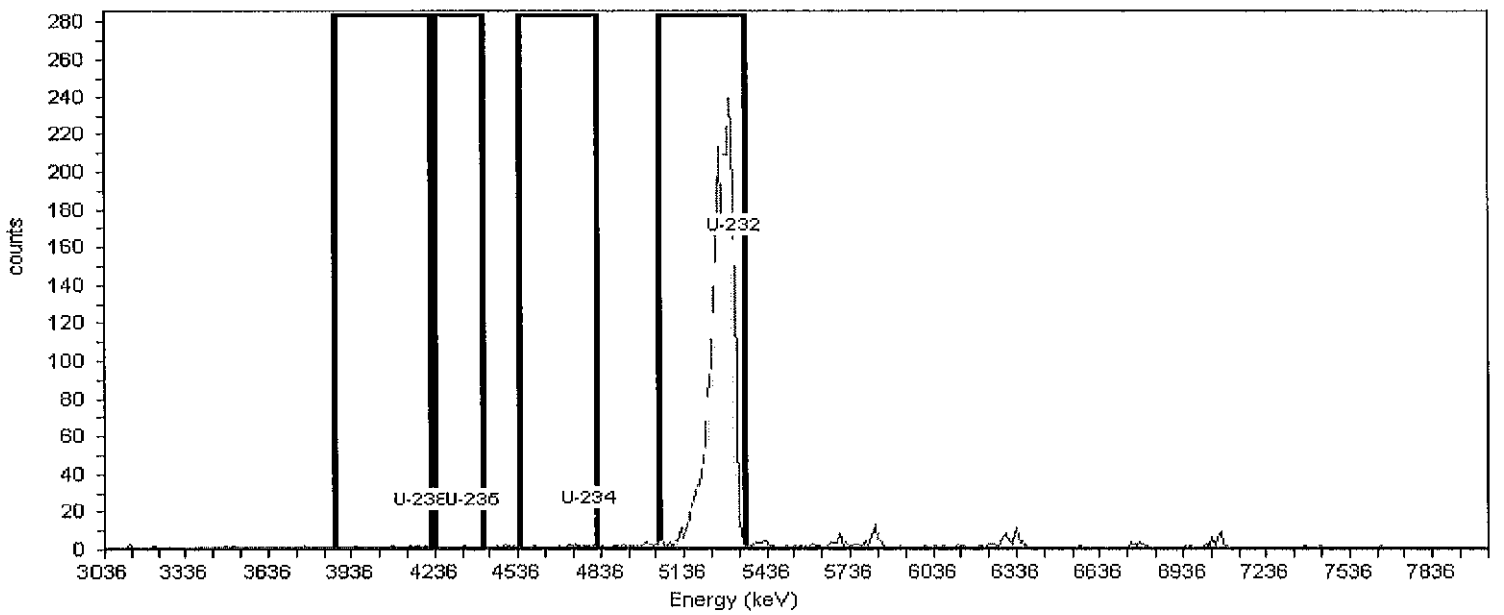
Energy Calibration: C10030211

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 84.80%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4183.2	3869.4	4222.4	15.7	100.2	6.00	3.20	2.80	5.8E-003	1.3E-002	8.2E-003	2.2E-002
U-235	4369.5	4232.2	4408.7	24.0	99.7	1.00	4.80	-3.80	-8.0E-003	1.0E-002	20000650	2.6E-002
U-234	4791.1	4536.1	4820.5	108.6	100.0	12.00	4.00	8.00	1.7E-002	1.7E-002	9.2E-003	2.4E-002
U-232	5320.5	5046.0	5359.7	57.6	100.1	2,240.00	9.60	2,230.40	4.1E+000	1.7E-001	1.5E-002	3.5E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

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ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS100304-1LCS
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 12
Batch Name: UAS100304-1_B
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/6/2010 4:28:16PM
Live Time: 800.00 min.
Real Time: 800.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030212; Det: 12; Spectrum #1; Mar-02-2010 15:02

Calibration Date: 3/2/2010 11:31:32AM

Efficiency Calibration: C10030212

Efficiency: 30.64% +/- 0.21% TPU(2 sigma)

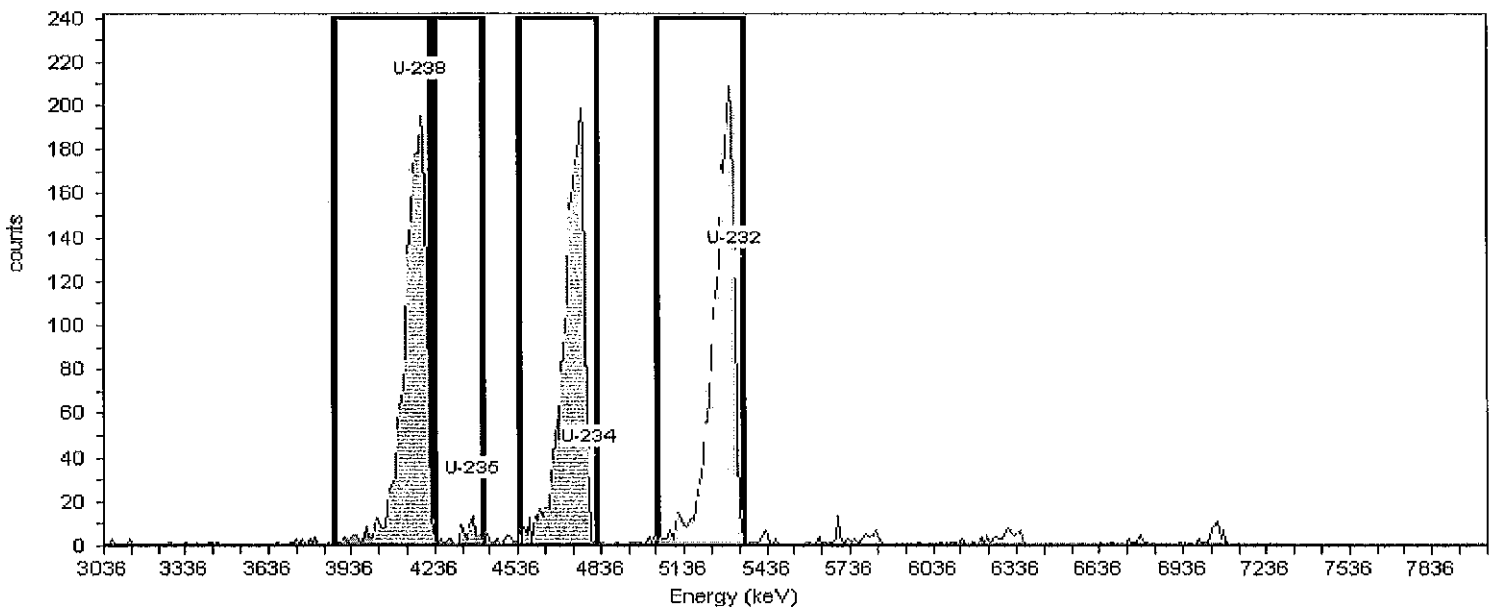
Energy Calibration: C10030212

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 72.35%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4160.2	3875.9	4228.9	82.3	100.2	1,803.71	1.60	1,802.11	4.6E+000	5.5E-001	7.1E-003	2.1E-002
U-235	4346.5	4238.7	4415.1	58.0	99.7	61.98	0.00	61.98	1.6E-001	4.4E-002	9.0E-000	6.9E-003
U-234	4768.1	4542.6	4826.9	77.1	100.0	1,755.71	0.00	1,755.71	4.5E+000	5.4E-001	0.0E+000	6.9E-003
U-232	5297.6	5042.7	5356.4	93.6	100.1	1,842.66	6.93	1,835.73	3.5E+000	1.6E-001	1.5E-002	3.7E-002

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Reviewed By: JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000651

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS100304-2MB
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 23
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:00PM
Live Time: 800.00 min.
Real Time: 800.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030223; Det: 23; Spectrum #1; Mar-02-2010 15:03

Calibration Date: 3/2/2010 11:35:40AM

Efficiency Calibration: C10030223

Efficiency: 28.56% +/- 0.18% TPU(2 sigma)

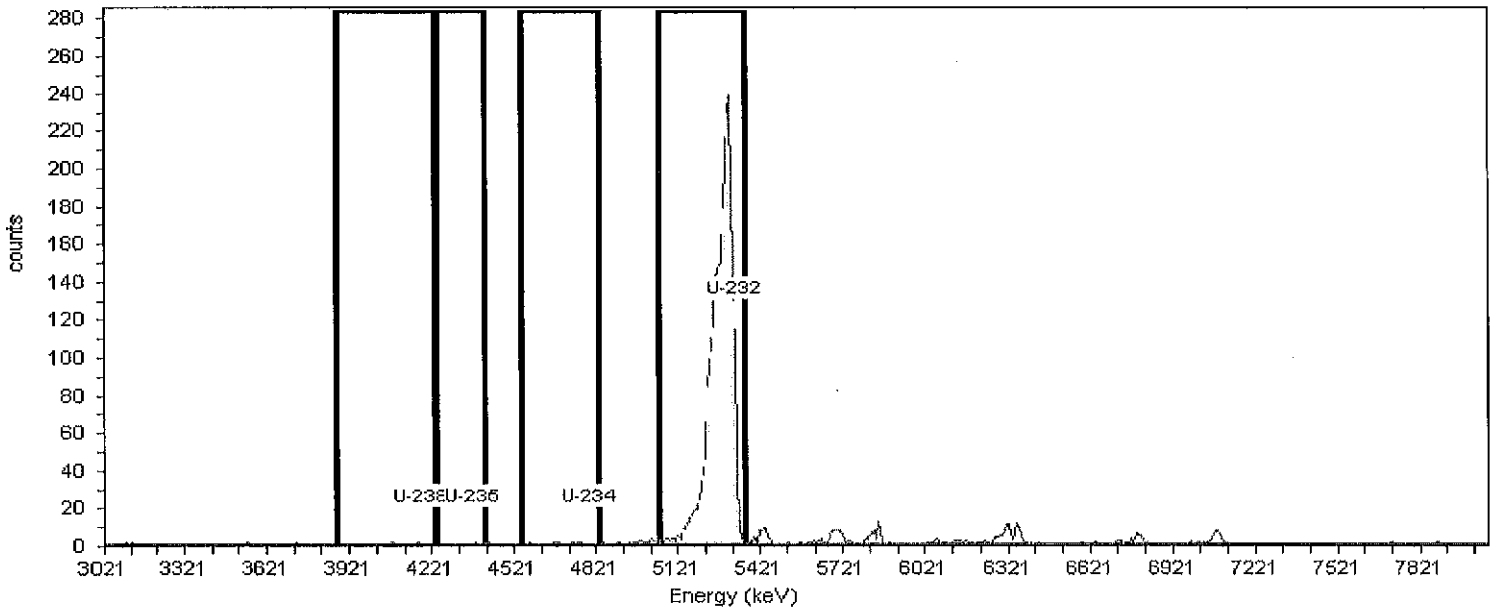
Energy Calibration: C10030223

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 81.96%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4159.8	3872.7	4229.1	59.0	100.2	2.00	7.20	-5.20	-2.5E-002	2.9E-002	2.8E-002	7.0E-002
U-235	4347.9	4239.0	4417.2	19.8	99.7	2.00	1.60	0.40	1.9E-003	1.8E-002	2.8E-002	4.0E-002
U-234	4773.6	4545.9	4833.0	184.1	100.0	7.00	6.40	0.60	2.9E-003	3.5E-002	2.7E-002	6.7E-002
U-232	5308.2	5050.8	5367.6	97.7	100.1	1,953.00	14.40	1,938.60	7.9E+000	3.6E-001	4.1E-002	9.6E-002

Reviewed By: JMC JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

20000652

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS100304-2LCS
Spectrum #1 Analysis #1

Sample Size : 0.50

Acquisition

Detector: 24
Batch Name: UAS100304-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 3/5/2010 8:24:01PM
Live Time: 800.00 min.
Real Time: 800.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B10030224; Det: 24; Spectrum #1; Mar-02-2010 15:03

Calibration Date: 3/2/2010 11:36:03AM

Efficiency Calibration: C10030224

Efficiency: 28.18% +/- 0.12% TPU(2 sigma)

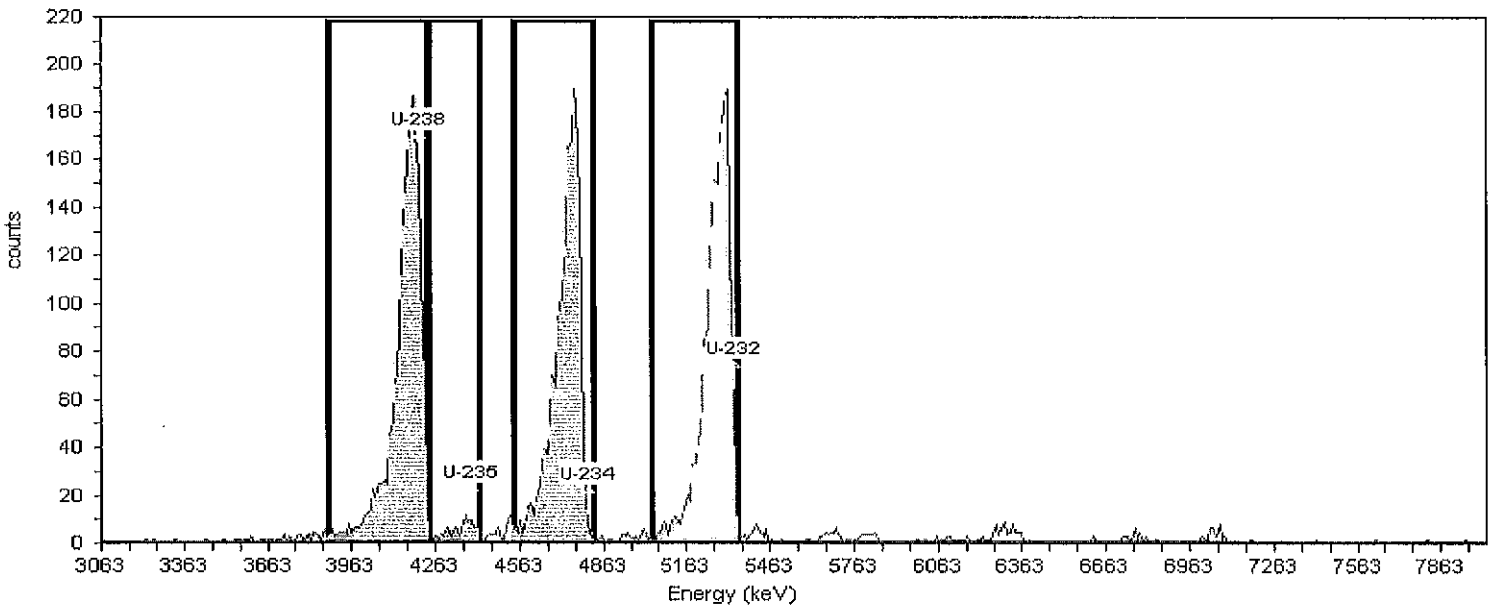
Energy Calibration: C10030224

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,053.57 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3610.32 U-232
Tracer Activity: 21.29 DPM/mL x (Vol.)0.50 mL = 10.65 DPM

Tracer Nuclide: U-232
Tracer Recovery: 82.20%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4165.8	3883.7	4233.9	100.7	100.2	1,898.74	3.20	1,895.54	9.2E+000	1.1E+000	1.9E-002	5.1E-002
U-235	4350.7	4243.7	4418.8	63.0	99.7	85.34	1.34	84.01	4.1E-001	1.0E-001	2.0E-002	3.8E-002
U-234	4769.0	4545.3	4827.4	82.3	100.0	1,809.67	1.60	1,808.07	8.8E+000	1.1E+000	1.4E-002	4.0E-002
U-232	5294.4	5041.4	5352.8	94.6	100.1	1,928.00	9.86	1,918.14	7.9E+000	3.6E-001	3.5E-002	8.3E-002

Reviewed By: GMF JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

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ALS Laboratory Group - Fort Collins

FORM 746r8.xls (10/2/07)

Alpha Spectrometer Instrument Run Log

Date: 3/5/10

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
25	VAS100304-1-A	1003045-2	U/S	800	EMF
26		4			
27		5			
28		8			
29		9			
30		9D			
31		10			
32		11			
57		12			
58		13			
59		16			
60		16D			
62		17			
63		18			
64		19			
9	VAS100304-2-A	1003045-1	U/W	800	
10		3			
11		6			
12		7			
13		14			
14		15			
16		20			
17		22			
18		22D			

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
19	VAS100304-2-A	1003045-2D	U/W	800	EMF
22		25			
23		EMF VAS100304-2-A 1003045-2 EMF			
24		LCS			

EMF 3/5/10

Notes:

* Batch ID entered as VAS100304-1-A. EMF 3/5/10

Reviewed by: EMF

Date: 3/5/10

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113

ALS Laboratory Group - Fort Collins

FORM 746r8.xls (10/2/07)

Alpha Spectrometer Instrument Run Log

Date: 3/16

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
32	VAS100305-2-A	1003063-4	V/W	800	EMF
57	↓	4D	↓	↓	↓
58		7R2			
59		10			
60		11			
62		15			
63		17			
64		18			
46	PAS100217-2-C	AS100217-2LCS	PW/F	800	
47	↓	↓ LCSD	↓	↓	
9	VAS100304-1-B	1003045-21	V/S	800	
10	↓	↓ 23	↓	↓	
11		AS100304-1MB			
12	↓	↓ LCS	↓	↓	
1	AAS100219-5-A	1002179-3	AM/F	800	
2	↓	4	↓	↓	
3		7			
4		9			
5		10			
6		11			
7		13			
49		14			
50		19			
51	↓	21	↓	↓	↓

EMF 3/16/10

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
52	AAS100219-5-A	1002179-22	AM/F	800	EMF
54	↓	23	↓	↓	↓
55		26			
56		27			
33		34			
34		36			
35		37			
36		38			
37		47			
39	↓	↓ 48			
40		AS100219-5MMB			
42	↓	PMB			
43		LCS			
45	↓	↓ LCSD	↓	↓	
13	VAS100305-1-A	1003063-1	V/S	800	
14	↓	2R2	↓	↓	
16		3			
17		5			
18		5D			
22		6			
23		6R2			
24		8			
25		9			
26	↓	12	↓	↓	↓

Notes:

Reviewed by: EMF
Date: 3/16/10

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Section 6

QUALITY ASSURANCE SUMMARY REPORTS

20000656

No *NON-CONFORMANCE REPORTS* or *QUALITY ASSURANCE SUMMARY SHEETS* are included in this data package.

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Section 7

LABORATORY BENCH SHEETS

7

20000658

Radiochemistry Instrument Worksheet

ALS Laboratory Group -- FC

Prep Batch: AS100304-1

Prep Procedure: UTOT EW

Analytical QASS / NCR? Y / (N) NA

Prep Num	LabID	QC Type	Init Alq	Adj Alq %Moist	Units	Report Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	1003045-2	SMP	1.0146	0.6557 35.375	g	ug/g	_30452	25	BMF	_30452			_30452			A
1	1003045-4	SMP	1.0385	0.9559 7.9508	g	ug/g	_30454	26		_30454			_30454			
1	1003045-5	SMP	1.0195	0.7216 29.218	g	ug/g	_30455	27		_30455			_30455			
1	1003045-8	SMP	1.007	0.747 25.794	g	ug/g	_30458	28		_30458			_30458			
1	1003045-9	SMP	1.0334	0.8634 16.448	g	ug/g	_30459	29		_30459			_30459			
1	1003045-9	DUP	1.0501	0.8774 16.448	g	ug/g	_30459D	30		_30459D			_30459D			
1	1003045-10	SMP	1.0013	0.8323 16.881	g	ug/g	_304510	31		_304510			_304510			
1	1003045-11	SMP	1.0644	0.8356 21.499	g	ug/g	_304511	32		_304511			_304511			
1	1003045-12	SMP	1.0171	0.7159 29.614	g	ug/g	_304512	57		_304512			_304512			
1	1003045-13	SMP	1.0057	0.6458 35.786	g	ug/g	_304513	58		_304513			_304513			
1	1003045-16	SMP	1.0313	0.6172 40.152	g	ug/g	_304516	59		_304516			_304516			
1	1003045-16	DUP	1.0453	0.6256 40.152	g	ug/g	_304516D	60		_304516D			_304516D			
1	1003045-17	SMP	1.016	0.965 5.0567	g	ug/g	_304517	62		_304517			_304517			
1	1003045-18	SMP	1.0812	0.8657 19.931	g	ug/g	_304518	63		_304518			_304518			
1	1003045-19	SMP	1.0802	0.869 19.549	g	ug/g	_304519	64		_304519			_304519			
1	1003045-21	SMP	1.0118	0.6131 39.400	g	ug/g	_304521	9	BMF	_304521			_304521			B
1	1003045-23	SMP	1.0109	0.7799 22.849	g	ug/g	_304523	10		_304523			_304523			
1	AS100304-1	MB	1.0311	1.0311	g	ug/g	_3041B	11		_3041B			_3041B			
1	AS100304-1	LCS	1.0311	1.0311	g	ug/g	_3041L	12		_3041L			_3041L			

BMF 3/8/10

BMF 3/8/10

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	837.3610.32	20.660	DPM/ml	03/04/10	0.5	ml	AW013

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-235	644.3610.02	0.921	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-238	644.3610.02	20.008	DPM/ml	03/04/10	0.5	ml	AW013

20000659

Reporting Units

LabID:	TstGrpName:	RptUnits:
1003045-2	TotalU(Mass)	ug/g
1003045-4	TotalU(Mass)	ug/g
1003045-5	TotalU(Mass)	ug/g
1003045-8	TotalU(Mass)	ug/g
1003045-9	TotalU(Mass)	ug/g
1003045-10	TotalU(Mass)	ug/g
1003045-11	TotalU(Mass)	ug/g
1003045-12	TotalU(Mass)	ug/g
1003045-13	TotalU(Mass)	ug/g
1003045-16	TotalU(Mass)	ug/g
1003045-17	TotalU(Mass)	ug/g
1003045-18	TotalU(Mass)	ug/g
1003045-19	TotalU(Mass)	ug/g
1003045-21	TotalU(Mass)	ug/g
1003045-23	TotalU(Mass)	ug/g

Sample Barcodes

1003045-2
AS100304-1PS1

1003045-4
AS100304-1PS2

1003045-5
AS100304-1PS3

1003045-8
AS100304-1PS4

1003045-9
AS100304-1PS5

1003045-9DUP
AS100304-1PS6

1003045-10
AS100304-1PS7

1003045-11
AS100304-1PS8

1003045-12
AS100304-1PS9

1003045-13
AS100304-1PS10

1003045-16
AS100304-1PS11

1003045-16DUP
AS100304-1PS12

1003045-17
AS100304-1PS13

1003045-18
AS100304-1PS14

1003045-19
AS100304-1PS15

1003045-21
AS100304-1PS16

1003045-23
AS100304-1PS17

AS100304-1MB
AS100304-1PS18

20000660

AS100304-1LCS
AS100304-1PS19

20000661

Radiochemistry Prep Worksheet

ALS Laboratory Group -- FC

Prep Batch: AS100304-1

Prep Procedure: UTOT

Reviewed By: tde 1DC **Review Date:** 3/5/2010

Non-Routine Pre-Treatment? Y (N) **Batch:** N/A **Re-Prep?** Y (N) **Batch:** N/A **Prep QASS / NCR?** Y / (N) N/A

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart 1E
Prep Date: 3/4/2010
Prep Dept: AP

Balance: 27
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	1003045-2	SMP		1.0146	1.0146	As Received	1E	3/5/10	T1	
2	1	1003045-4	SMP		1.0385	1.0385	As Received			T1	
3	1	1003045-5	SMP		1.0195	1.0195	As Received			T1	
4	1	1003045-8	SMP		1.007	1.007	As Received			T1	
5	1	1003045-9	SMP		1.0334	1.0334	As Received			T1	
6	1	1003045-9	DUP		1.0501	1.0501	As Received			T1	
7	1	1003045-10	SMP		1.0013	1.0013	As Received			T1	
8	1	1003045-11	SMP		1.0644	1.0644	As Received			T1	
9	1	1003045-12	SMP		1.0171	1.0171	As Received			T1	
10	1	1003045-13	SMP		1.0057	1.0057	As Received			T1	
11	1	1003045-16	SMP		1.0313	1.0313	As Received			T1	
12	1	1003045-16	DUP		1.0453	1.0453	As Received			T1	
13	1	1003045-17	SMP		1.016	1.016	As Received			T1	
14	1	1003045-18	SMP		1.0812	1.0812	As Received			T1	
15	1	1003045-19	SMP		1.0802	1.0802	As Received			T1	
16	1	1003045-21	SMP		1.0118	1.0118	As Received			T1	
17	1	1003045-23	SMP		1.0109	1.0109	As Received			T1	
18	1	AS100304-1	MB		1.031076	1.031076	As Received			T1	
19	1	AS100304-1	LCS		1.031076	1.031076	As Received			S1,T1	

3/5/10 1E

Comments

Due to potential matrix interference, a reduced aliquot of ~1g was taken for all samples.

Spiked By: Tambrae Elhart **Date:** 3/4/2010

Witnessed By: Jeffrey T. Lee **Date:** 3/4/2010

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	837.3610.32	20.660	DPM/ml	03/04/10	0.5	ml	AW013

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-235	644.3610.02	0.921	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-238	644.3610.02	20.008	DPM/ml	03/04/10	0.5	ml	AW013

20000662

Radiochemistry Prep Worksheet

ALS Laboratory Group -- FC

Prep Batch: AS100304-1

Prep Procedure: UTOT

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep? Y / N** **Batch:** _____ **Prep QASS / NCR? Y / N** _____

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart TE
Prep Date: 3/4/2010
Prep Dept: AP

Balance: 27
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	1003045-2	SMP		1	1	As Received	1.0146		T1	
2	1	1003045-4	SMP		1	1	As Received	1.0385		T1	
3	1	1003045-5	SMP		1	1	As Received	1.0195		T1	
4	1	1003045-9	DUP	TE 3/4/10	1	1	As Received	1.0501		T1	
5	1	1003045-8	SMP		1	1	As Received	1.0070		T1	
6	1	1003045-9	SMP		1	1	As Received	1.0334		T1	
7	1	1003045-10	SMP		1	1	As Received	1.0013		T1	
8	1	1003045-11	SMP		1	1	As Received	1.0644		T1	
9	1	1003045-12	SMP		1	1	As Received	1.0171		T1	
10	1	1003045-13	SMP		1	1	As Received	1.0057		T1	
11	1	1003045-16	SMP		1	1	As Received TE 3/4/10	~~1.0313~~ 1.0313		T1	
12	1	1003045-16	DUP		1	1	As Received	1.0453		T1	
13	1	1003045-17	SMP		1	1	As Received	1.0160		T1	
14	1	1003045-18	SMP		1	1	As Received	1.0812		T1	
15	1	1003045-19	SMP		1	1	As Received	1.0802		T1	
16	1	1003045-21	SMP		1	1	As Received	1.0118		T1	
17	1	1003045-23	SMP		1	1	As Received	1.0109		T1	
18	1	AS100304-1	MB		1	1	As Received			T1	
19	1	AS100304-1	LCS		1	1	As Received			S1,T1	

Comments

Due to potential matrix interference, a reduced aliquot of ~1g was taken for all samples.

Spiked By: Tambrae Elhart TE **Date:** 3/4/2010 3/4/10

Witnessed By: _____ **Date:** 3/4/10

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	837.3610.32	20.660	DPM/ml	03/04/10	0.5	ml	AW013

20000663 T 4/29/10
20000663

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-235	644.3610.02	0.921	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-238	644.3610.02	20.008	DPM/ml	03/04/10	0.5	ml	AW013

Exp S1 1/15/11

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TE

ANALYSIS DATE: 3/4/10 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
1003045	2	wet	solid	As rec'd, standing water
	4			, no standing water
	5			, standing water
	8			, no standing water
	9			, "
	10			, "
	11			, standing water
	12			, "
	13			, "
	16			, "
	17			, no standing water
	18			, "
	19			, standing water
	21			, "
	23			, "

TE 3/4/10

20000664

Percent Moisture

Method SOP642 Revision 8

Lab Name: ALS Laboratory Group -- FC

Date Extracted: 03/05/2010
Date Analyzed: 03/05/2010
Analyst: Mike Lundgreen

Balance ID: 31
Oven ID: 17
In Oven: 3/4/2010 @ 2:30:00 PM
Out of Oven: 3/5/2010 @ 10:05:00 AM

Validated By: mtl
Validation Date: 03/05/2010
Validation Time: 11:27:02 AM

Run ID	Prep Batch ID	QC Batch ID	Lab ID	QC Type	Dish Wt	Wet Wt	Dry Wt	Dry Wt-Dish Wt	Percent Moisture	Percent Solids	RPD
EX100304-4A	EX100304-4	EX100304-4-1	1003045-10	SMP	1.303	10.09	9.693	8.39	16.9	83.1	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-11	SMP	1.306	10.14	9.266	7.96	21.5	78.5	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-12	SMP	1.301	10.66	8.807	7.51	29.6	70.4	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-13	SMP	1.295	10.31	7.918	6.62	35.8	64.2	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-16	SMP	1.295	10.56	7.615	6.32	40.2	59.8	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-17	DUP	1.292	10.16	10.96	9.67	4.8	95.2	5
EX100304-4A	EX100304-4	EX100304-4-2	1003045-17	SMP	1.294	10.22	11.00	9.71	5.1	94.9	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-18	SMP	1.308	10.79	9.949	8.64	19.9	80.1	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-19	SMP	1.31	10.29	9.59	8.28	19.5	80.5	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-2	SMP	1.295	10.09	7.817	6.52	35.4	64.6	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-21	SMP	1.298	10.30	7.541	6.24	39.4	60.6	
EX100304-4A	EX100304-4	EX100304-4-2	1003045-23	SMP	1.296	11.05	9.822	8.53	22.8	77.2	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-4	DUP	1.292	10.07	10.55	9.26	8.1	91.9	1
EX100304-4A	EX100304-4	EX100304-4-1	1003045-4	SMP	1.31	10.65	11.12	9.81	8.0	92.0	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-5	SMP	1.311	10.23	8.552	7.24	29.2	70.8	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-8	SMP	1.293	10.36	8.983	7.69	25.8	74.2	
EX100304-4A	EX100304-4	EX100304-4-1	1003045-9	SMP	1.295	10.83	10.35	9.05	16.4	83.6	
EX100304-4A	EX100304-4	EX100304-4-1	EX100304-4	MB	1.286	1.286	1.285	0.00	100.1	-0.1	
EX100304-4A	EX100304-4	EX100304-4-2	EX100304-4	MB	1.286	1.286	1.285	0.00	100.1	-0.1	

QC Types

CAR	Carrier reference sample
LCS	Laboratory Control Sample
MB	Method Blank
MSD	Laboratory Matrix Spike Duplicate
RVS	Reporting Level Verification Standar
SYS	Sample Yield Spike

DUP	Laboratory Duplicate
LCSD	Laboratory Control Sample Duplicate
MS	Laboratory Matrix Spike
REP	Sample replicate
SMP	Field Sample

Comments:

DUP = Sample Duplicate
Wet Wt = Sample Wet Wt - Dish Wt
Dry Wt = Sample Dry Wt + Dish Wt
Dry Wt - Dish Wt = Sample Dry Wt - Dish Wt
All weight values shown above are expressed in grams.

$$RPD = \frac{(\text{Sample Value} - \text{Duplicate Value})}{2} \times 100$$

$$\% \text{ Solids} = \frac{\text{Dry Weight}}{\text{Wet Weight}} \times 100$$

$$\% \text{ Moisture} = \frac{(\text{Wet Weight} - \text{Dry Weight})}{\text{Wet Weight}} \times 100$$

20000665

Radiochemistry Instrument Worksheet

ALS Laboratory Group -- FC

Prep Batch: AS100304-2

Prep Procedure: UTOT EW

Analytical QASS / NCR? Y / (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Report Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	1003045-1	SMP	500	500	ml	ug/l	_30451	9	EMF	_30451			_30451			A
1	1003045-3	SMP	500	500	ml	ug/l	_30453	10		_30453			_30453			
1	1003045-6	SMP	500	500	ml	ug/l	_30456	11		_30456			_30456			
1	1003045-7	SMP	500	500	ml	ug/l	_30457	12		_30457			_30457			
1	1003045-14	SMP	500	500	ml	ug/l	_304514	13		_304514			_304514			
1	1003045-15	SMP	500	500	ml	ug/l	_304515	14		_304515			_304515			
1	1003045-20	SMP	500	500	ml	ug/l	_304520	16		_304520			_304520			
1	1003045-22	SMP	500	500	ml	ug/l	_304522	17		_304522			_304522			
1	1003045-22	DUP	500	500	ml	ug/l	_304522D	18		_304522D			_304522D			
1	1003045-24	SMP	500	500	ml	ug/l	_304524	19		_304524			_304524			
1	1003045-25	SMP	500	500	ml	ug/l	_304525	22		_304525			_304525			
1	AS100304-2	MB	500	500	ml	ug/l	_3042B	23		_3042B			_3042B			
1	AS100304-2	LCS	500	500	ml	ug/l	_3042L	24		_3042L			_3042L			

EMF 3/8/10

EMF 3/8/10

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	837.3610.32	20.660	DPM/ml	03/04/10	0.5	ml	AW013

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-235	644.3610.02	0.921	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-238	644.3610.02	20.008	DPM/ml	03/04/10	0.5	ml	AW013

20000666

NA 3/5/10

Reporting Units

LabID:	TstGrpName:	RptUnits:
1003045-1	TotalU(Mass)	ug/l
1003045-3	TotalU(Mass)	ug/l
1003045-6	TotalU(Mass)	ug/l
1003045-7	TotalU(Mass)	ug/l
1003045-14	TotalU(Mass)	ug/l
1003045-15	TotalU(Mass)	ug/l
1003045-20	TotalU(Mass)	ug/l
1003045-22	TotalU(Mass)	ug/l
1003045-24	TotalU(Mass)	ug/l
1003045-25	TotalU(Mass)	ug/l

Sample Barcodes

1003045-1
AS100304-2PS1

1003045-3
AS100304-2PS2

1003045-6
AS100304-2PS3

1003045-7
AS100304-2PS4

1003045-14
AS100304-2PS5

1003045-15
AS100304-2PS6

1003045-20
AS100304-2PS7

1003045-22
AS100304-2PS8

1003045-22DUP
AS100304-2PS9

1003045-24
AS100304-2PS10

1003045-25
AS100304-2PS11

AS100304-2MB
AS100304-2PS12

AS100304-2LCS
AS100304-2PS13

20000667

Radiochemistry Prep Worksheet

ALS Laboratory Group -- FC

Prep Batch: AS100304-2

Prep Procedure: UTOT

Reviewed By: tde 1DC **Review Date:** 3/5/2010

Non-Routine Pre-Treatment? Y / (N) **Batch:** NA **Re-Prep?** Y / (N) **Batch:** NA **Prep QASS / NCR?** Y / (N) NA

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Tambrae Elhart
Prep Date: 3/4/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Aliq ml	Fin Aliq ml	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	1003045-1	SMP		500	500	Unfiltered	1C	3/5/10	T1	
2	1	1003045-3	SMP		500	500	Unfiltered			T1	
3	1	1003045-6	SMP		500	500	Unfiltered			T1	
4	1	1003045-7	SMP		500	500	Unfiltered			T1	
5	1	1003045-14	SMP		500	500	Unfiltered			T1	
6	1	1003045-15	SMP		500	500	Unfiltered			T1	
7	1	1003045-20	SMP		500	500	Unfiltered			T1	
8	1	1003045-22	SMP		500	500	Unfiltered			T1	
9	1	1003045-22	DUP		500	500	Unfiltered			T1	
10	1	1003045-24	SMP		500	500	Unfiltered			T1	
11	1	1003045-25	SMP		500	500	Unfiltered			T1	
12	1	AS100304-2	MB		500	500	Unfiltered			T1	
13	1	AS100304-2	LCS		500	500	Unfiltered			S1,T1	

BMF 3/5/10

BMF 3/5/10

Comments

A reduced aliquot of 500mL was taken for all samples. Standard MDC's will be met with a standard count time.

Spiked By: Tambrae Elhart **Date:** 3/4/2010

Witnessed By: Joel F. Nolte **Date:** 3/4/2010

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	837.3610.32	20.660	DPM/ml	03/04/10	0.5	ml	AW013

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-235	644.3610.02	0.921	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-238	644.3610.02	20.008	DPM/ml	03/04/10	0.5	ml	AW013

20000668

ALS Laboratory Group -- FC

Radiochemistry Prep Worksheet

Prep Batch: AS100304-2

Prep Procedure: UTOT

Prep Batch Not Validated!!!

Reviewed By: **Review Date:**

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep?** Y / N **Batch:** _____ **Prep QASS / NCR?** Y / N _____

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Tambrae Elhart 1E
Prep Date: 3/4/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	1003045-1	SMP		500	500	Unfiltered			T1	
2	1	1003045-3	SMP		500	500	Unfiltered			T1	
3	1	1003045-6	SMP		500	500	Unfiltered			T1	
4	1	1003045-7	SMP		500	500	Unfiltered			T1	
5	1	1003045-14	SMP		500	500	Unfiltered			T1	
6	1	1003045-15	SMP		500	500	Unfiltered			T1	
7	1	1003045-20	SMP		500	500	Unfiltered			T1	
8	1	1003045-22	SMP		500	500	Unfiltered			T1	
9	1	1003045-22	DUP		500	500	Unfiltered			T1	
10	1	1003045-24	SMP		500	500	Unfiltered			T1	
11	1	1003045-25	SMP		500	500	Unfiltered			T1	
12	1	AS100304-2	MB		500	500	Unfiltered			T1	
13	1	AS100304-2	LCS		500	500	Unfiltered			S1,T1	

Comments

A reduced aliquot of 500mL was taken for all samples. Standard MDC's will be met with a standard count time.

Spiked By: Tambrae Elhart 1E **Date:** 3/4/2010 3/4/10

Witnessed By: JN **Date:** 3-4-10

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	837.3610.32	20.660	DPM/ml	03/04/10	0.5	ml	AW013

4/29/10

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-235	644.3610.02	0.921	DPM/ml	03/04/10	0.5	ml	AW013
S1	U-238	644.3610.02	20.008	DPM/ml	03/04/10	0.5	ml	AW013

Exp 1/15/11

20000669

SAMPLE CONDITION FORM (LIQUID)

ANALYST: RE

ANALYSIS DATE: 3/4/10 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		pH	Color	Remarks
1003045	1	<2	clear	none
	3			
	6			
	7			
	14			
	15			
	20			
	22			
	24			
	25			

RE 3/4/10

20000670

Section 8

STANDARDS TRACEABILITY DOCUMENTS

20000671

PROJECT 644.3610.02 U-238/Nat Notebook No. 3610

Continued From Page

Prepare a working dilution of ~ 20.0 dpm/ml U-238 from 644.3020.53

1) Determine Density of 1M HNO_3 lot# 073371 Bal# 12 1

Mass of volumetric flask (100 ml)	68.7980 g
Mass of flask and 100 ml Acid	171.0125 g
Net Mass of Acid	102.7145 g

$\rho = 1.027145$ g/ml

2) Transfer 644.3020.53

Mass of Empty (No lid) 1000 ml Nalgene	74.7135 g
Mass of Nalgene and Std. Transferred	76.1629 g
Net Mass of Std. Transferred	1.4494 g

3) Dilute to final Vol.

Mass of Std, Nalgene, and diluent	1155.1 g
Mass of Nalgene	74.7135 g
Net Mass of New Std. Dilution	1080.3865 g

Final Activity Calculation

$$\frac{\left(242.0 \frac{Bq}{g}\right)\left(\frac{60\ dpm}{1\ Bq}\right)\left(1.4494\ g\right)\left(1.027145 \frac{g}{ml}\right)}{\left(1080.3865\ g\right)} = 20.01\ dpm/ml$$

Stnd ID: 644.3610.02

MC 7/13/08

Description: U-234/238
Expiration: 4/8/2009
Activity: 20.01 dpm/mL MC 7/13/08
Density of 1.0 gram/mL assumed
2s Uncertainty: 0.12 dpm/mL
Ref. Date: 8/1/1997
Ref Time: N/A
Prep Date: 4/7/2008 Prep by: jdd
Matrix/Comp: 1 M HNO3
Half Life (y): 4.47E+09

Reverification Log		
Analysis Date	Initials	Expiration Date
2/23/09	RG	2/23/2010
1/15/2010	RG	1/15/2011 MC 7/13/08

20000672

MC 7/13/08

Continued on Page 20000672

Read and Understood By

4/7/08 Date

Signed

7/13/08 Date

PROJECT 644.3020.53

Notebook No. 3020

Continued From Page

Direct transfer of RSO 644 to 40 mL VOA vial

Mass of VOA vial w/o lid: 20.9455 g
Mass of vial + standard: 24.6612 g
Net mass of std transferred: 3.7157 g

Bal 12

RSO 644
U-238: 242.0 Bq/g
U-235: 11.14 Bq/g
U-234: 233.1 Bq/g

AB 11/28/06

Continued on Page 20000673

Read and Understood By

Signed	Date	Signed	Date
A Bailey	11/28/06	[signature]	7/13/08

20000673

National Institute of Standards & Technology

Certificate

PAF ED 0644
rec'd 10-18-02

Standard Reference Material 4321C
Natural Uranium Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive natural uranium nitrate and nitric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of alpha-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains uranium-238, uranium-235, and uranium-234 with a total activity of approximately 2600 Bq. Uranium decays by alpha-particle emission. The progeny of uranium-238, uranium-235, and uranium-234 have a total activity of approximately 2600 Bq and decay by alpha- and beta-particle emission. None of the alpha or beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 11 keV to 2.0 MeV are also emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains nitric acid (HNO_3) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least August 2007.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
November 1997

Thomas E. Gills, Chief
Standard Reference Materials Program

20000674

*Notes and references are on pages 5 and 6.

20000674

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

20000675

*Notes and references are on pages 5 and 6.

PROPERTIES OF SRM 4321C
(Certified values are shown in bold type)

Source identification number	NIST SRM 4321C		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.053 ± 0.001) g·mL^{-1} at 21.4 °C** [b]*		
Solution mass	**(5.258 ± 0.002) g** [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L^{-1})	Mass Fraction (g·g^{-1})
	H_2O	53	0.91
	HNO_3	1.0	0.06
	$UO_2(NO_3)_2$	0.09	0.03
Radiological Properties:			
Radionuclide	**Natural Uranium (Mixture of U-238, U-235, and U-234)**		
Reference time	**1200 EST, 1 August 1997**		
Massic activity of the solution [c]	**U-238: 242.0 Bq·g^{-1}** **U-235: 11.14 Bq·g^{-1}** **U-234: 233.1 Bq·g^{-1}**		
Relative expanded uncertainty (k=2)	**U-238: 0.60%** [d] [e] **U-235: 0.62%** [d] [e] **U-234: 0.98%** [d] [e]		
Mass fraction of uranium	**(0.01960 ± 0.00010) g·g^{-1}** [b]		
Photon-emitting impurities	None detected [f]		
Half lives used	Uranium-238: (4.468 ± 0.003) × 10^9 a [g] Uranium-235: (7.038 ± 0.005) × 10^8 a [g] Uranium-234: (2.455 ± 0.006) × 10^5 a [g]		
Measuring instruments	Mass spectrometer, silicon surface-barrier detector, and $4\pi(\alpha+\beta)$ liquid-scintillation counting systems.		

20000676

*Notes and references are on pages 5 and 6.

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [h]	Relative Sensitivity Factor, $\lvert \partial y/\partial x_i \rvert \cdot (x_i/y)$ [i]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [j]
Isotopic uranium atom fraction in SRM 960	Standard deviation of the mean for repeated mass-spectrometric measurements (A)	U-238: 0.001 U-235: 0.07 U-234: 0.31	1.0 1.0 1.0	0.001 0.07 0.31
Half life	Standard uncertainty of the half life (A)	U-238: 0.07 U-235: 0.07 U-234: 0.25	1.0 1.0 1.0	0.07 0.07 0.25
Uranium mass fraction in SRM 960	Certificate value (B)	0.003	1.0	0.003
Quantitative dissolution	Estimated (B)	0.25	1.0	0.25
Gravimetric measurements	Estimated (B)	0.10	1.0	0.10
Photon-emitting impurities	Limit of detection (B) [k]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)			U-238: U-235: U-234:	0.30 0.31 0.49
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)			U-238: U-235: U-234:	0.60 0.62 0.98

20000677

*Notes and references are on pages 5 and 6.

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	<0.1	-	-

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) = |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic count rate is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] Estimated limits of detection for photon-emitting impurities are:
1.4 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 8 and 59 keV,
1.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 67 and 88 keV,
0.5 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 102 and 197 keV,
0.3 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 205 and 762 keV,
0.2 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 770 and 996 keV, and
0.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 1006 and 1900 keV,
provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of uranium-238, uranium-235, uranium-234, or their progeny.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

20000678

[h] Relative standard uncertainty of the input quantity x_i.

[i] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[j] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

[k] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of U-238)}·{(Bq of impurity)/(Bq of U-238)}. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), August 1997.

20000679

Prepare a Working Dilution of U-232 from 837.3020.72
- Use density of 1M HNO_3 Diluent from prior Range
lot# 083802, JDD 4/24/09 $\rho = 1.02669$ g/ml

bal #

1) Mass of Intermediate Used JDD 4/24/09
Mass of Open Empty 1000 ml Nalgene ~~74.96~~ 74.9942 g
Mass of Nalgene + Std. 77.8255 g
Net Mass of Std. Transferred. 2.8813 g

2) ~~Dilute~~ JDD 4/24/09 Dilute to Final Mass/Vol
Mass of Diluent, Std, + Nalgene 1012.0 g
Net Mass of New dilution 937.0558 g

Final Activity Calc:

$$\left(6745.123 \frac{dpm}{g}\right)(2.8813\ g)\left(\frac{1.02669\ g/ml}{937.0558\ g}\right) = 21.29\ dpm/ml$$

JDD 4/24/09
21.29

RG 8/18/09

Stnd ID: **837.3610.32**

RG 8/18/09

Description: **U-232**
Expiration: **4/29/2009** 10 RG 8/18/09
Activity: **21.29** **dpm/mL**

2s Uncertainty: **1.06** **dpm/mL**
Ref. Date: **3/7/2007**
Ref Time: **N/A**
Prep Date: **4/24/2009** *Prep by:* **JDD**
Matrix/Comp. **1.0M NO3**
Half Life (y): **6.89E+01**

RG 8/18/09

RG 8/18/09

Reverification Log		
Analysis Date	Initials	Expiration Date

RG 8/18/09

RG 8/18/09

20000680

Continued on Page

Read and Understood By

Signed 4/24/09 Date

Signed 4/24/09 Date

PROJECT 837.3020.72 U-232 Notebook No. _____
Continued From Page _____

Prepare a primary dilution of U-232, RSO #837, by diluting Contents (#74682-307) to a final volume of approx. 40 ml.

1) Prepare a 1.0 M HNO_3 solution by diluting 63 ml conc HNO_3, Fischer lot # 065460, in 1 L DI water.

2) Determine density of ~~0.5~~ 1.0 KAG 3/27/07 M HNO_3 lot # 065460 (Bal 12)

Mass of 100 ml volumetric flask: 62.4704 g
Mass of flask + acid: 165.3413 g
Net mass of acid: 102.8709 g
% 100 ml = density of 1.0 M HNO_3: 1.029 g/ml

3) Transfer contents of vial to a 40 ml VOA vial (Bal 12)

Mass of VOA vial (w/ lid): 24.7623 g
Mass of VOA vial + std: 29.9487 g
Net mass of std transferred: 5.1864 g

4) Dilute with 1.0 M HNO_3 (Bal 12)

Mass of vial + std + acid: 63.2324 g
Mass of vial from above: 24.7623 g
Net mass of primary std: 38.4701 g

5) Final Activity Calculation:

$$\frac{4375\ \text{dps}\ (60\ \text{s/min})(5.1864\ \text{g})}{(5.24665\ \text{g})(38.4701\ \text{g})} = 6745.123\ \text{dpm/g}$$

20000681
Continued on Page

Read and Understood By 20000681

Kryptal Brown 3/28/07 Renee Gallegos 4/11/07
Signed Date Signed Date

RSO # 837
Rcvd 3/14/07 MMP

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

74682-307

U-232 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 23236.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	U-232
ACTIVITY (Bq):	4.375 E3
HALF-LIFE:	68.9 years
CALIBRATION DATE:	March 7, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	5.0%

Impurities: γ-impurities <0.1%
U-233 <0.3%
Am-241 <0.15%

5.24665 grams 1M HNO_3 solution.

PO NUMBER 72905, Item 1

SOURCE PREPARED BY: M Dimitrova
M. D. Dimitrova, Radiochemist

Q A APPROVED: M. Mc 3-8-07

20000682

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

20000683

9

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency Calibrations

20000684

Calibration Data Summary

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 9:24:06 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	**RESULTS** %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	**LCL** %Efficiency Bkg CPM Energy keV	**LWL** %Efficiency Bkg CPM Energy keV	**UWL** %Efficiency Bkg CPM Energy keV	**UCL** %Efficiency Bkg CPM Energy keV
1003045-1	SMP	AS100304-2	UTOT	9	C10030209	3/2/2010	30.99	Pass	29.48	30.00	32.06	32.58
Spectrum #1		AS100304-2A			B10030209	3/2/2010	0.3170	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030209	3/2/2010	5538.2	Pass	5496.0	5506.0	5586.0	5596.0
1003045-2	SMP	AS100304-1	UTOT	25	C10030325	3/3/2010	29.36	Warning	26.95	27.42	29.32	29.79
Spectrum #1		AS100304-1A			B10030325	3/3/2010	0.4040	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030325	3/3/2010	5543.9	Pass	5496.0	5506.0	5586.0	5596.0
1003045-3	SMP	AS100304-2	UTOT	10a	C10030210	3/2/2010	31.56	Pass	29.79	30.31	32.41	32.93
Spectrum #1		AS100304-2A			B10030210	3/2/2010	0.2510	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030210	3/2/2010	5545.9	Pass	5486.2	5496.2	5576.2	5586.2
1003045-4	SMP	AS100304-1	UTOT	26	C10030326	3/3/2010	31.01	Pass	29.40	29.92	31.98	32.50
Spectrum #1		AS100304-1A			B10030326	3/3/2010	0.4110	Pass	0.0000	0.0498	0.4998	0.7500
3/5/2010					C10030326	3/3/2010	5544.2	Pass	5496.0	5506.0	5586.0	5596.0
1003045-5	SMP	AS100304-1	UTOT	27	C10030327	3/3/2010	29.97	Pass	28.26	28.76	30.74	31.24
Spectrum #1		AS100304-1A			B10030327	3/3/2010	0.3450	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030327	3/3/2010	5544.2	Pass	5494.2	5504.2	5584.2	5594.2
1003045-6	SMP	AS100304-2	UTOT	11	C10030211	3/2/2010	31.76	Pass	29.69	30.21	32.29	32.81
Spectrum #1		AS100304-2A			B10030211	3/2/2010	0.3030	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030211	3/2/2010	5536.2	Pass	5497.0	5507.0	5587.0	5597.0
1003045-7	SMP	AS100304-2	UTOT	12	C10030212	3/2/2010	30.64	Pass	29.29	29.80	31.86	32.37
Spectrum #1		AS100304-2A			B10030212	3/2/2010	0.2540	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030212	3/2/2010	5536.2	Pass	5507.7	5517.7	5597.7	5607.7
1003045-8	SMP	AS100304-1	UTOT	28	C10030328	3/3/2010	28.81	Pass	27.32	27.80	29.72	30.20
Spectrum #1		AS100304-1A			B10030328	3/3/2010	0.2860	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030328	3/3/2010	5544.2	Pass	5513.0	5523.0	5603.0	5613.0
1003045-9	SMP	AS100304-1	UTOT	29	C10030329	3/3/2010	28.34	Pass	27.50	27.99	29.92	30.40
Spectrum #1		AS100304-1A			B10030329	3/3/2010	0.2800	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030329	3/3/2010	5536.2	Pass	5486.0	5496.0	5576.0	5586.0

Data Package ID: *UT1003045-1*

Abbreviations:
Eff - Efficiency; Bkg - Background; LCL - Lower Control Limit; UWL - Upper Warning Limit
Egy - Energy; CPM - Counts per Minute; LWL - Lower Warning Limit; UCL - Upper Control Limit; CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

144
20000685
20000685

Calibration Data Summary

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 8:43:19 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	**RESULTS** %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	**LCL** %Efficiency Bkg CPM Energy keV	**LWL** %Efficiency Bkg CPM Energy keV	**UWL** %Efficiency Bkg CPM Energy keV	**UCL** %Efficiency Bkg CPM Energy keV
1003045-9	DUP	AS100304-1	UTOT	30	C10030330	3/3/2010	28.28	Pass	26.99	27.46	29.36	29.83
Spectrum #1		AS100304-1A			B10030330	3/3/2010	0.3070	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030330	3/3/2010	5546.0	Pass	5514.0	5524.0	5604.0	5614.0
1003045-10	SMP	AS100304-1	UTOT	31	C10030331	3/3/2010	29.66	Pass	28.09	28.58	30.56	31.05
Spectrum #1		AS100304-1A			B10030331	3/3/2010	0.3290	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030331	3/3/2010	5536.2	Pass	5496.0	5506.0	5586.0	5596.0
1003045-11	SMP	AS100304-1	UTOT	32	C1003032	3/3/2010	29.64	Pass	27.99	28.48	30.44	30.93
Spectrum #1		AS100304-1A			B10030332	3/3/2010	0.3360	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C1003032	3/3/2010	5546.0	Pass	5488.0	5498.0	5578.0	5588.0
1003045-12	SMP	AS100304-1	UTOT	57	C10030357	3/3/2010	30.63	Pass	29.30	29.81	31.87	32.38
Spectrum #1		AS100304-1A			B10030357	3/3/2010	0.1310	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030357	3/3/2010	5542.3	Pass	5494.0	5504.0	5584.0	5594.0
1003045-13	SMP	AS100304-1	UTOT	58	C10030358	3/3/2010	30.96	Pass	29.55	30.06	32.14	32.66
Spectrum #1		AS100304-1A			B10030358	3/3/2010	0.1610	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030358	3/3/2010	5544.3	Pass	5496.0	5506.0	5586.0	5596.0
1003045-14	SMP	AS100304-2	UTOT	13	C10030213	3/2/2010	31.64	Pass	30.25	30.78	32.90	33.43
Spectrum #1		AS100304-2A			B10030213	3/2/2010	0.2700	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030213	3/2/2010	5545.9	Pass	5486.2	5496.2	5576.2	5586.2
1003045-15	SMP	AS100304-2	UTOT	14	C10030214	3/2/2010	30.21	Pass	29.51	30.02	32.10	32.61
Spectrum #1		AS100304-2A			B10030214	3/2/2010	0.2520	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030214	3/2/2010	5536.2	Pass	5486.5	5496.5	5576.5	5586.5
1003045-16	SMP	AS100304-1	UTOT	59	C10030359	3/3/2010	31.43	Pass	30.14	30.67	32.79	33.32
Spectrum #1		AS100304-1A			B10030359	3/3/2010	0.2920	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030359	3/3/2010	5536.5	Pass	5494.3	5504.3	5584.3	5594.3
1003045-16	DUP	AS100304-1	UTOT	60	C10030360	3/3/2010	30.31	Pass	28.15	28.64	30.62	31.11
Spectrum #1		AS100304-1A			B10030360	3/3/2010	0.1820	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030360	3/3/2010	5538.4	Pass	5492.0	5502.0	5582.0	5592.0

Data Package ID: *UT1003045-1*

Abbreviations:

Eff - Efficiency	Bkg - Background	LCL - Lower Control Limit	UWL - Upper Warning Limit	
Egy - Energy	CPM - Counts per Minute	LWL - Lower Warning Limit	UCL - Upper Control Limit	CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

145

2000068

Calibration Data Summary

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 8:43:19 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	**RESULTS** %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	**LCL** %Efficiency Bkg CPM Energy keV	**LWL** %Efficiency Bkg CPM Energy keV	**UWL** %Efficiency Bkg CPM Energy keV	**UCL** %Efficiency Bkg CPM Energy keV
1003045-17	SMP	AS100304-1	UTOT	62	C10030362	3/3/2010	29.98	Warning	27.42	27.90	29.82	30.30
Spectrum #1		AS100304-1A			B10030362	3/3/2010	0.3490	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030362	3/3/2010	5544.2	Pass	5496.2	5506.2	5586.2	5596.2
1003045-18	SMP	AS100304-1	UTOT	63	C10030363	3/3/2010	31.04	Pass	29.41	29.93	31.99	32.51
Spectrum #1		AS100304-1A			B10030363	3/3/2010	0.2640	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030363	3/3/2010	5551.9	Pass	5486.5	5506.2	5586.2	5596.2
1003045-19	SMP	AS100304-1	UTOT	64	C10030364	3/3/2010	30.31	Pass	28.41	28.90	30.90	31.40
Spectrum #1		AS100304-1A			B10030364	3/3/2010	0.2440	Pass	0.0000	0.0500	0.5000	0.7500
3/5/2010					C10030364	3/3/2010	5536.5	Pass	5496.0	5506.0	5586.0	5596.0
1003045-20	SMP	AS100304-2	UTOT	16	C10030216	3/2/2010	30.65	Pass	29.39	29.91	31.97	32.49
Spectrum #1		AS100304-2A			B10030216	3/2/2010	0.2280	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030216	3/2/2010	5555.8	Pass	5494.4	5504.4	5584.4	5594.4
1003045-21	SMP	AS100304-1	UTOT	9	C10030209	3/2/2010	30.99	Pass	29.48	30.00	32.06	32.58
Spectrum #1		AS100304-1A			B10030209	3/2/2010	0.3170	Pass	0.0000	0.0498	0.4980	0.7500
3/6/2010					C10030209	3/2/2010	5538.2	Pass	5496.0	5506.0	5586.0	5596.0
1003045-22	SMP	AS100304-2	UTOT	17a	C10030217	3/2/2010	30.63	Pass	28.99	29.50	31.54	32.05
Spectrum #1		AS100304-2A			B10030217	3/2/2010	0.3830	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030217	3/2/2010	5536.2	Pass	5486.5	5496.5	5576.5	5586.5
1003045-22	DUP	AS100304-2	UTOT	18	C10030218	3/2/2010	30.38	Pass	28.65	29.15	31.17	31.67
Spectrum #1		AS100304-2A			B10030218	3/2/2010	0.4000	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030218	3/2/2010	5547.9	Pass	5496.0	5506.0	5586.0	5596.0
1003045-23	SMP	AS100304-1	UTOT	10a	C10030210	3/2/2010	31.56	Pass	29.79	30.31	32.41	32.93
Spectrum #1		AS100304-1A			B10030210	3/2/2010	0.2510	Pass	0.0000	0.0498	0.4980	0.7500
3/6/2010					C10030210	3/2/2010	5545.9	Pass	5486.2	5496.2	5576.2	5586.2
1003045-24	SMP	AS100304-2	UTOT	19	C10030219	3/2/2010	29.27	Pass	27.99	28.48	30.44	30.93
Spectrum #1		AS100304-2A			B10030219	3/2/2010	0.4040	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030219	3/2/2010	5536.2	Pass	5496.0	5506.0	5586.0	5596.0

Data Package ID: *UT1003045-1*

Abbreviations:
Eff - Efficiency; Bkg - Background; LCL - Lower Control Limit; UWL - Upper Warning Limit
Egy - Energy; CPM - Counts per Minute; LWL - Lower Warning Limit; UCL - Upper Control Limit; CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

20000687
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Calibration Data Summary

Laboratory Name: ALS Laboratory Group -- FC
PAI Work Order: 1003045

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, March 08, 2010 9:24:06 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	**RESULTS** %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	**LCL** %Efficiency Bkg CPM Energy keV	**LWL** %Efficiency Bkg CPM Energy keV	**UWL** %Efficiency Bkg CPM Energy keV	**UCL** %Efficiency Bkg CPM Energy keV
1003045-25	SMP	AS100304-2	UTOT	22	C10030222	3/2/2010	27.21	Pass	26.66	27.12	29.00	29.46
Spectrum #1		AS100304-2A			B10030222	3/2/2010	0.3560	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030222	3/2/2010	5532.6	Pass	5494.2	5504.2	5584.2	5594.2
AS100304-1	MB	AS100304-1	UTOT	11	C10030211	3/2/2010	31.76	Pass	29.69	30.21	32.29	32.81
Spectrum #1		AS100304-1A			B10030211	3/2/2010	0.3030	Pass	0.0000	0.0498	0.4980	0.7500
3/6/2010					C10030211	3/2/2010	5536.2	Pass	5497.0	5507.0	5587.0	5597.0
AS100304-1	LCS	AS100304-1	UTOT	12	C10030212	3/2/2010	30.64	Pass	29.29	29.80	31.86	32.37
Spectrum #1		AS100304-1A			B10030212	3/2/2010	0.2540	Pass	0.0000	0.0498	0.4980	0.7500
3/6/2010					C10030212	3/2/2010	5536.2	Pass	5507.7	5517.7	5597.7	5607.7
AS100304-2	MB	AS100304-2	UTOT	23	C10030223	3/2/2010	28.56	Pass	27.37	27.85	29.77	30.25
Spectrum #1		AS100304-2A			B10030223	3/2/2010	0.4130	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030223	3/2/2010	5545.9	Pass	5503.7	5513.7	5593.7	5603.7
AS100304-2	LCS	AS100304-2	UTOT	24	C10030224	3/2/2010	28.18	Warning	28.06	28.56	30.52	31.02
Spectrum #1		AS100304-2A			B10030224	3/2/2010	0.3100	Pass	0.0000	0.0498	0.4980	0.7500
3/5/2010					C10030224	3/2/2010	5544.2	Pass	5491.8	5501.8	5581.8	5591.8

Data Package ID: *UT1003045-1*

Abbreviations:

Eff - Efficiency	Bkg - Background	LCL - Lower Control Limit	UWL - Upper Warning Limit	
Egy - Energy	CPM - Counts per Minute	LWL - Lower Warning Limit	UCL - Upper Control Limit	CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

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Alpha Spec Calibration Source Re-Certification

Recalibration performed by Isotope Products Laboratories
Primary Certified Source
Source ID: 190
Planchet Label: 9
Recalibrated on: 5/7/2009
Received by ALS on: 4/6/2009

Values from certificate		
Source ID:	92MIX223027	
Total Activity:	3765	dpm
Ref. Date:	4/1/09	

Nuclide	Act (Bq)	Act (dpm)	Half-Life (yrs)	Decay Corrected
U-234:	49.73	2983.8	2.48E+05	2983.80 dpm
U-235:	1.10	65.7	7.04E+08	65.70 dpm
Am-241:	11.92	715.2	432.17	715.07 dpm
			TOTAL	3764.57 dpm

Efficiency Determination for Detector: 29

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Total cpm	Known dpm	Detector efficiency
92MIX223027	190	97-19-103-09	5/13/09	6938	29944	795	2100	1076.49	3764.57	28.60%

Sources 1 through 8 activity determination

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Detector Efficiency	Am-241 dpm	U-234 dpm	U-235 dpm	Combined dpm
92MIX2203026	182	97-19-103-01	5/20/09	12768	75759	1778	2100	28.60%	1275.74	7569.60	177.65	9022.99
92MIX2203028	183	97-19-103-02	5/20/09	14905	145935	3075	2100	28.60%	1489.26	14581.37	307.24	16377.87
92MIX2203024	184	97-19-103-03	5/20/09	67603	69736	1495	2100	28.60%	6754.68	6967.80	149.38	13871.86
92MIX2203021	185	97-19-103-04	5/20/09	21411	59324	1535	2100	28.60%	2139.32	5927.47	153.37	8220.16
92MIX2203025	186	97-19-103-05	5/20/09	94397	116030	2465	2100	28.60%	9431.85	11593.35	246.30	21271.50
92MIX2203022	187	97-19-103-06	5/20/09	73174	78212	1662	2100	28.60%	7311.32	7814.70	166.06	15292.07
92MIX2203023	188	97-19-103-07	5/20/09	42437	66293	1447	2100	28.60%	4240.17	6623.79	144.58	11008.54
92MIX2203029	189	97-19-103-08	5/20/09	32012	204687	4583	2100	28.60%	3198.54	20451.68	457.92	24108.14

Efficiency Verification

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	Count dur (s)	Total cpm	Known dpm	Detector efficiency	RPD	FLAG
92MIX223027	190	97-19-103-09	5/20/09	7015	29860	740	2100	1074.71	3764.57	28.55%	0.16%	PASS

Sources 1 through 8 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Obseved dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value?
92MIX2203026	182	97-19-103-01	9022.99	8864.99	1.78%	Yes
92MIX2203028	183	97-19-103-02	16377.87	16009.10	2.30%	Yes
92MIX2203024	184	97-19-103-03	13871.86	13577.99	2.16%	Yes
92MIX2203021	185	97-19-103-04	8220.16	8185.47	0.42%	Yes
92MIX2203025	186	97-19-103-05	21271.50	21082.49	0.90%	Yes
92MIX2203022	187	97-19-103-06	15292.07	15370.55	-0.51%	Yes
92MIX2203023	188	97-19-103-07	11008.54	10774.58	2.17%	Yes
92MIX2203029	189	97-19-103-08	24108.14	23631.30	2.02%	Yes

* Certificate values decay corrected to the count date

Data from certificates

Reference Date	U-234 (Bq)	U-234 (dpm)	U-235 (Bq)	U-235 (dpm)	Am-241 (Bq)	Am-241 (dpm)
5/1/2003	124.10	7446.00	2.43	145.74	21.43	1285.80
5/1/2003	239.30	14358.00	4.20	252.00	23.55	1413.00
5/1/2003	119.40	7164.00	1.93	115.56	106.00	6360.00
4/1/2003	101.00	6060.00	1.26	75.84	34.50	2070.00
4/1/2003	203.00	12180.00	3.41	204.72	146.40	8784.00
4/1/2003	132.90	7974.00	3.17	189.96	121.30	7278.00
4/1/2003	107.10	6426.00	0.93	55.54	72.26	4335.60
5/1/2003	334.80	20088.00	6.55	393.18	53.02	3181.20

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EXP 5/20/10

RG 5/29/09

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29
11:40:00AM 5/13/2009

Calibration

Energy Calibration: RSO 190 (#9)
Description:

Analysis Date: 5/13/2009 11:38:46AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

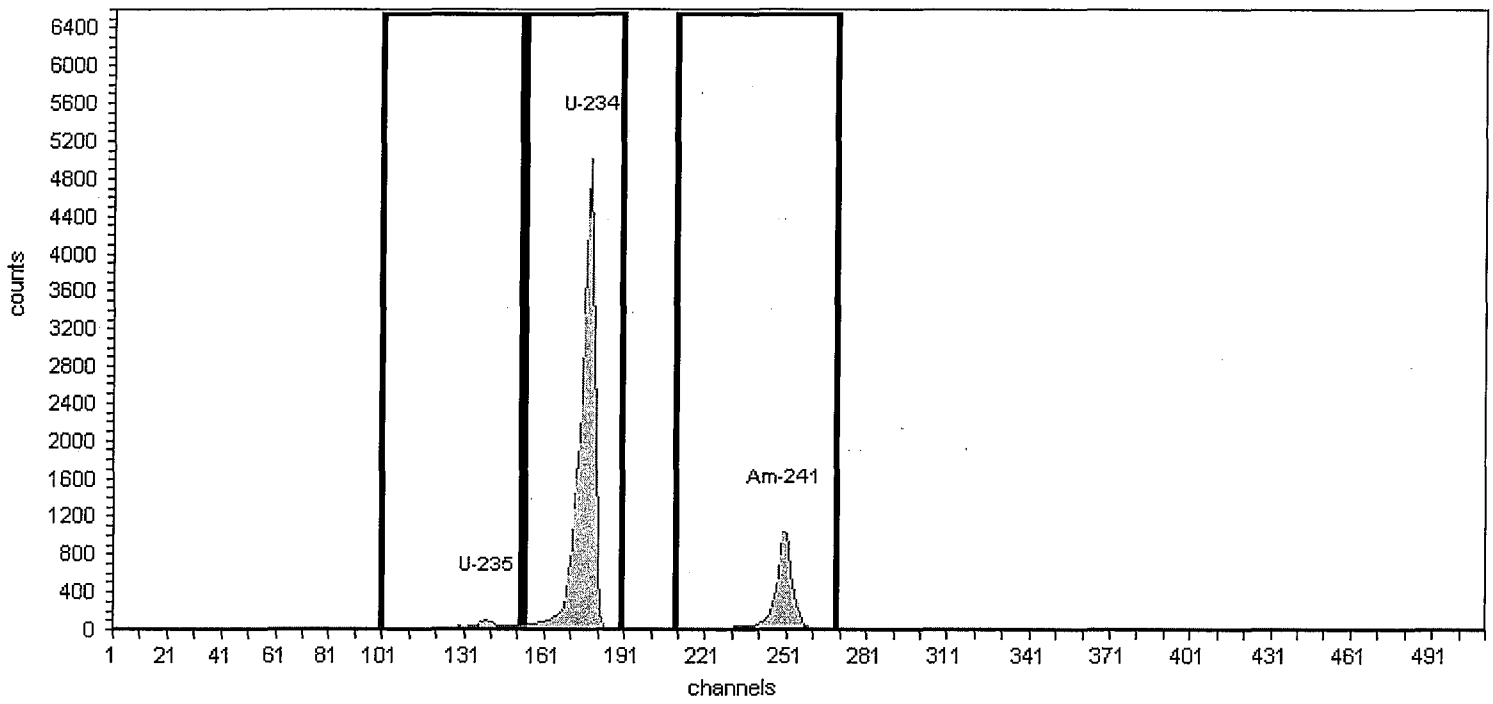
Detector: 29 , SN:
Acquisition Start Date: 5/7/2009 10:13:12AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190 (#9)

Energy Calibration Equation:
Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.43% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	795.00	22.71
U-234	178	4.78	153	190	29,944.00	855.54
Am-241	250	5.49	210	270	6,938.00	198.23

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AlphaVision v5.3 — Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29
7:46:29AM 5/20/2009

Calibration

Energy Calibration: RSO 182 (#1)
Description:

Analysis Date: 5/20/2009 7:46:17AM
Calibration Type: Energy

Source Info

Certificate ID: A1 RSO#182
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:45PM

Acquisition

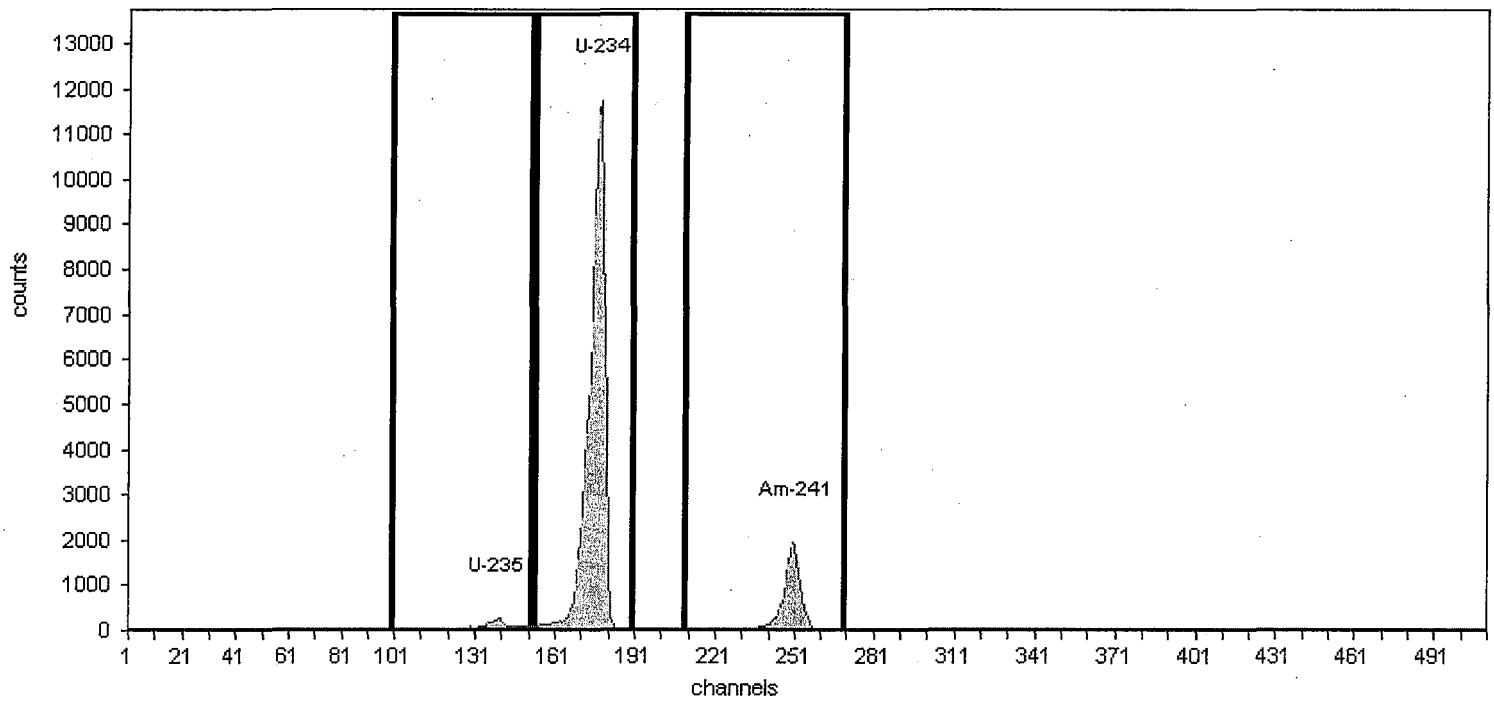
Detector: 29 , SN:
Acquisition Start Date: 5/7/2009 11:38:55AM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 182 (#1)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 29.06% +/- 0.20% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,778.00	50.80
U-234	178	4.78	153	190	75,759.00	2,164.54
Am-241	251	5.49	210	270	12,768.00	364.80

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AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29
7:47:07AM 5/20/2009

Calibration

Energy Calibration: RSO 183 (#2)
Description:

Analysis Date: 5/20/2009 7:46:53AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A2 RSO#183
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

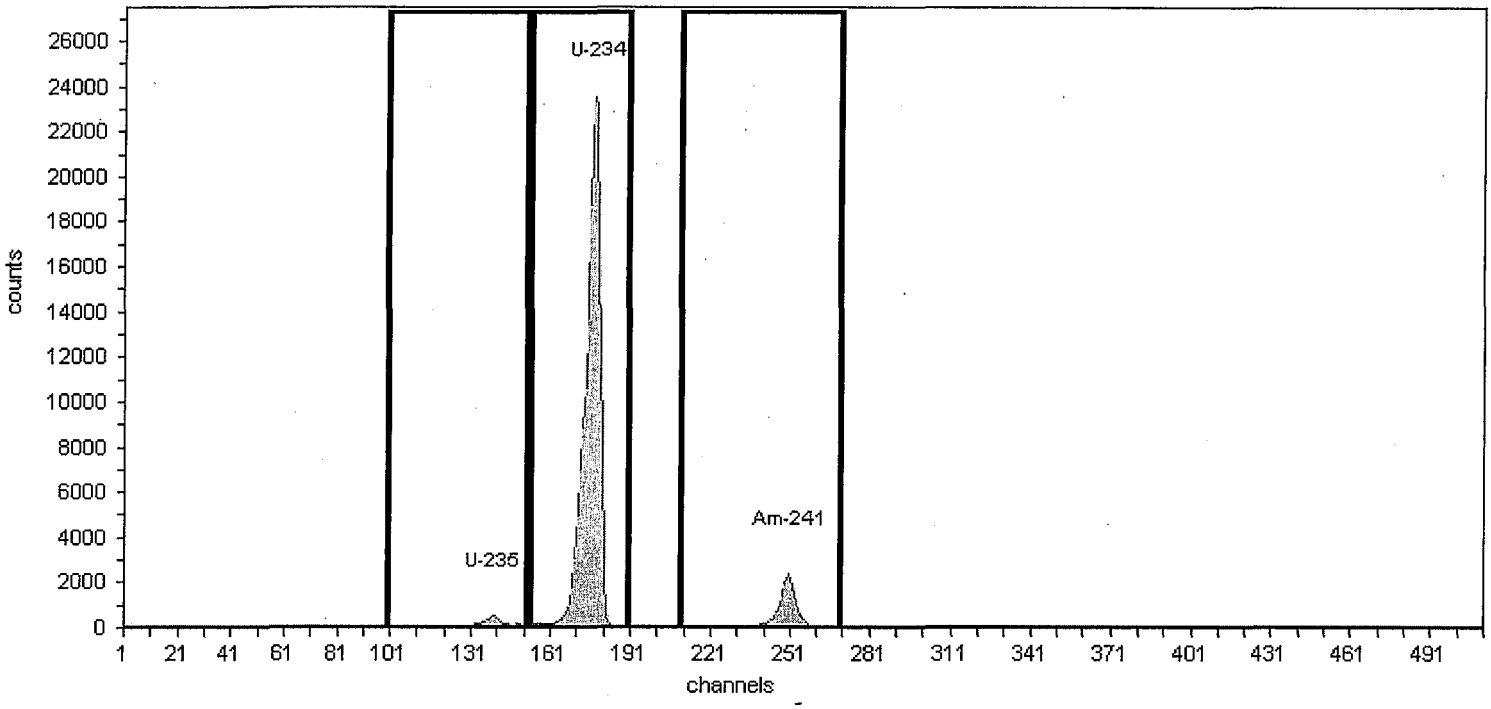
Detector: 29 , SN:
Acquisition Start Date: 5/7/2009 12:45:03PM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 183 (#2)

Energy Calibration Equation:
Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 29.21% +/- 0.15% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	3,075.00	87.86
U-234	178	4.78	153	190	145,935.00	4,169.57
Am-241	250	5.49	210	270	14,905.00	425.86

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AlphaVision v5.3 — Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29
7:47:51AM 5/20/2009

Calibration

Energy Calibration: RSO 184 (#3)
Description:

Analysis Date: 5/20/2009 7:47:30AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A3 RSO#184
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

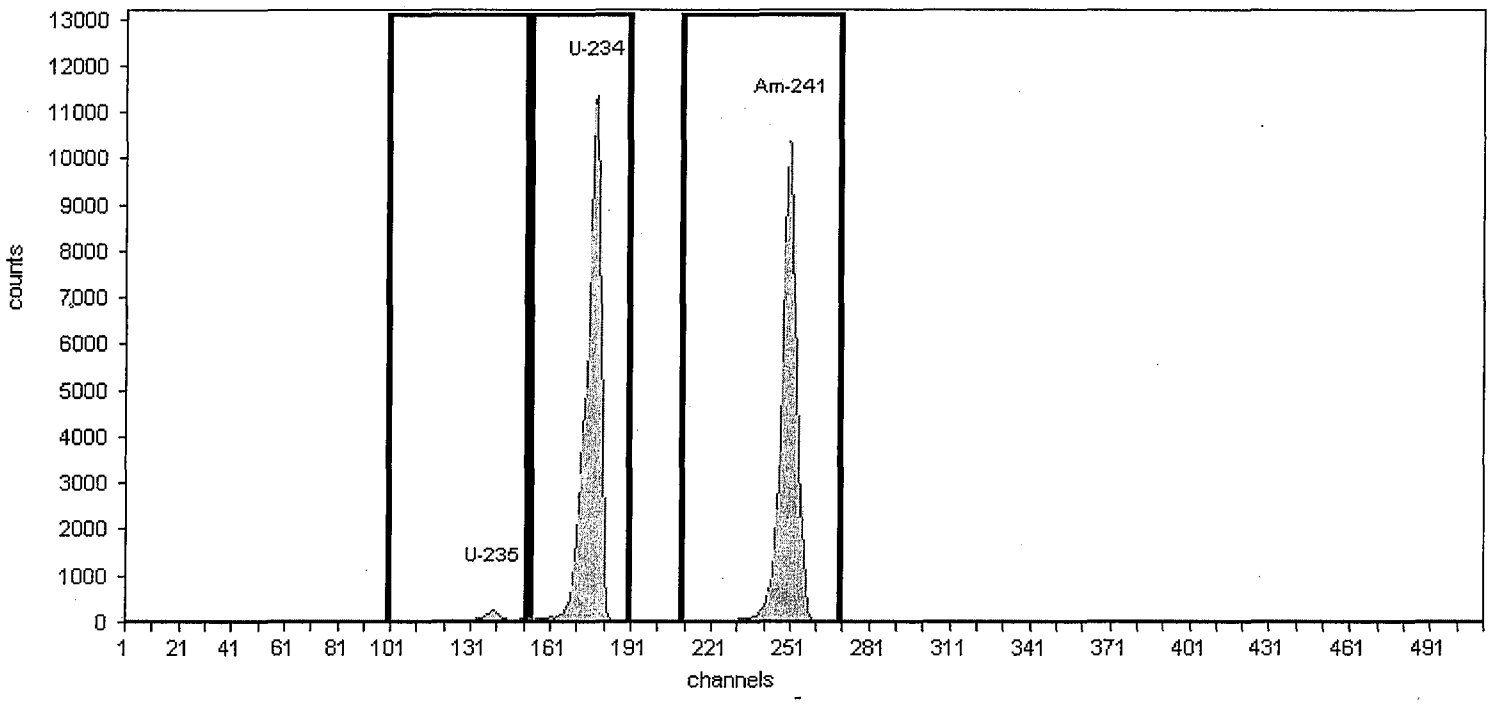
Detector: 29 , SN:
Acquisition Start Date: 5/7/2009 1:21:42PM

Live Time: 35.00 min.
Real Time: 35.04 min.

Efficiency Calibration Name: RSO 184 (#3)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 29.11% +/- 0.16% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,495.00	42.71
U-234	177	4.78	153	190	69,763.00	1,993.23
Am-241	250	5.49	210	270	67,603.00	1,931.51

20000693

20000693

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29
7:48:18AM 5/20/2009

Calibration

Energy Calibration: RSO 185 (#4)
Description:

Analysis Date: 5/20/2009 7:48:08AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A4 RSO#185
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

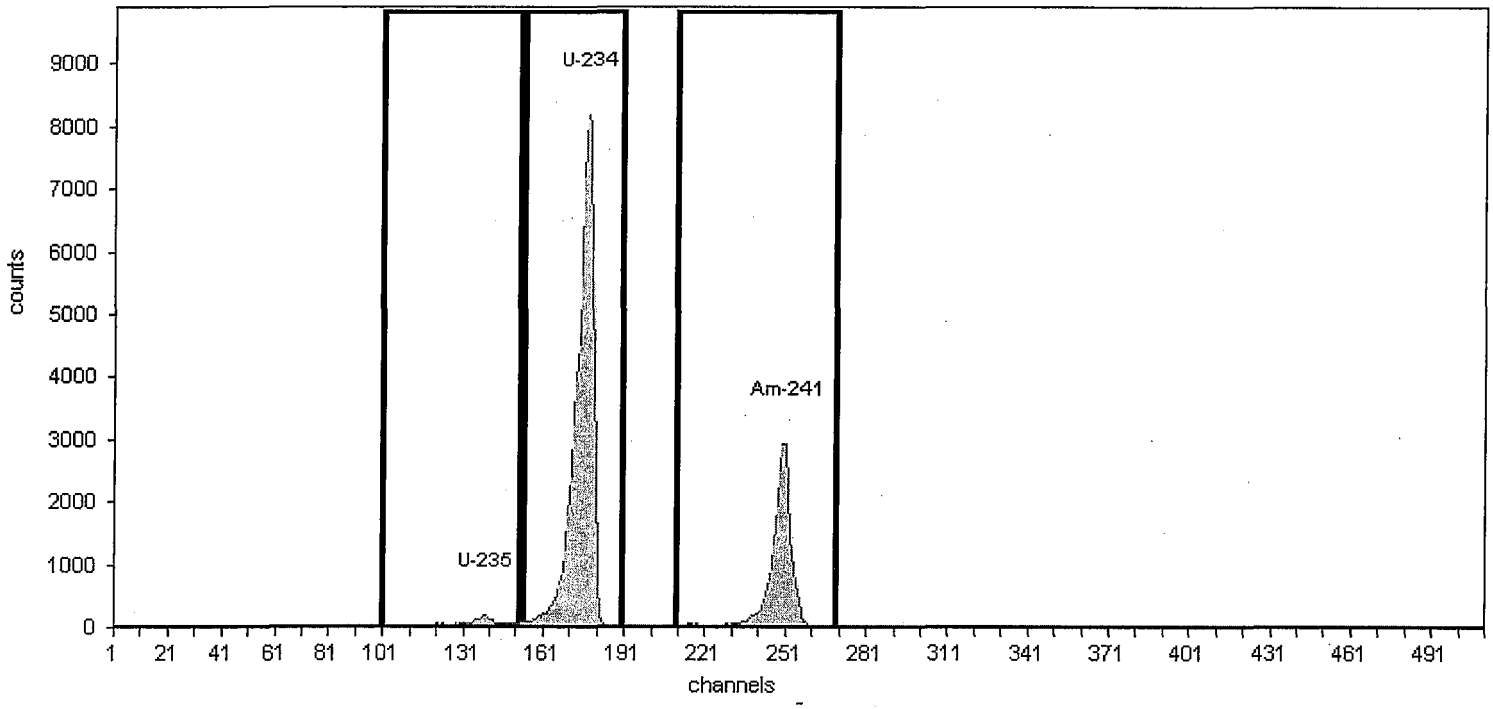
Detector: 29 , SN:
Acquisition Start Date: 5/7/2009 2:33:20PM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 185 (#4)

Energy Calibration Equation:
Gain = 9.7108 keV / Ch
Offset = 3,050.49 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.43% +/- 0.20% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,535.00	43.86
U-234	177	4.78	153	190	59,324.00	1,694.97
Am-241	251	5.49	210	270	21,411.00	611.74

20000694

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29
7:48:44AM 5/20/2009

Calibration

Energy Calibration: RSO 186 (#5)
Description:

Analysis Date: 5/20/2009 7:48:37AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A5 RSO#186
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

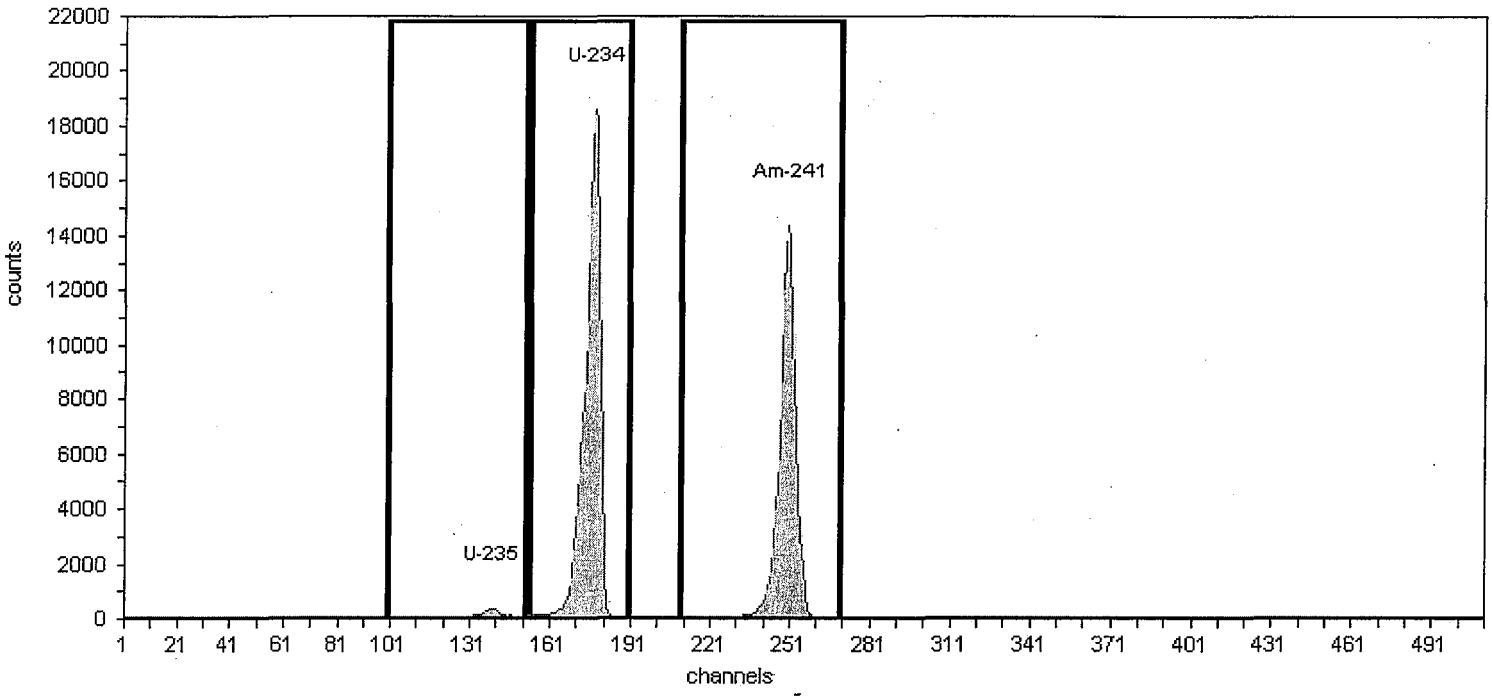
Detector: 29 , SN:
Acquisition Start Date: 5/7/2009 3:40:33PM

Live Time: 35.00 min.
Real Time: 35.06 min.

Efficiency Calibration Name: RSO 186 (#5)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.71% +/- 0.13% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	2,465.00	70.43
U-234	177	4.78	153	190	116,030.00	3,315.14
Am-241	250	5.49	210	270	94,397.00	2,697.06

20000695

20000695

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29

7:49:23AM 5/20/2009

Calibration

Energy Calibration: RSO 187 (#6)
Description:

Analysis Date: 5/20/2009 7:49:17AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A6 RSO#187
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

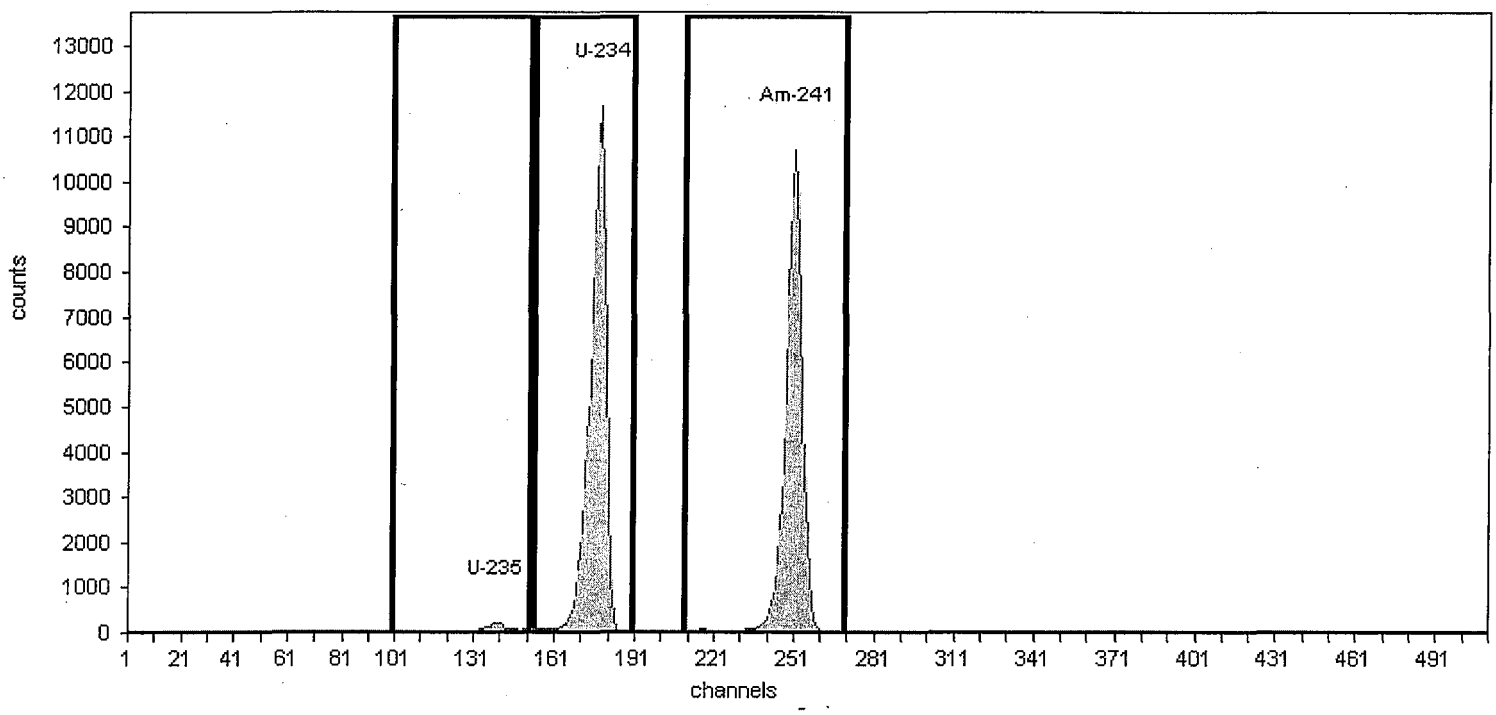
Detector: 29 , SN:
Acquisition Start Date: 5/8/2009 8:19:53AM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 187 (#6)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.47% +/- 0.15% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,662.00	47.49
U-234	178	4.78	153	190	78,212.00	2,234.63
Am-241	251	5.49	210	270	73,174.00	2,090.69

20000696

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29
7:50:10AM 5/20/2009

Calibration

Energy Calibration: RSO 188 (#7)
Description:

Analysis Date: 5/20/2009 7:49:57AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A7 RSO#188
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

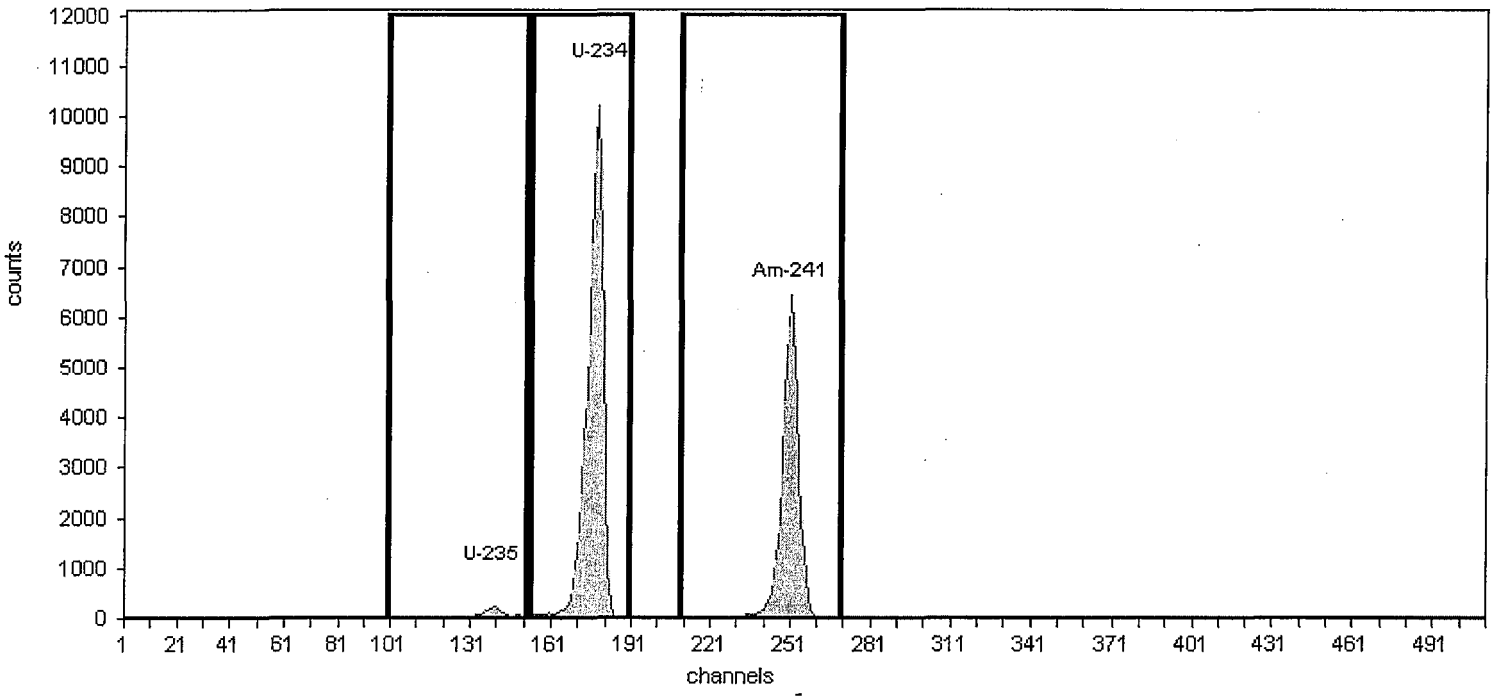
Detector: 29 , SN:
Acquisition Start Date: 5/8/2009 9:18:26AM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 188 (#7)

Energy Calibration Equation:
Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.98% +/- 0.18% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,447.00	41.34
U-234	178	4.78	153	190	66,293.00	1,894.09
Am-241	250	5.49	210	270	42,437.00	1,212.49

20000697

20000697

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29

7:50:37AM 5/20/2009

Calibration

Energy Calibration: RSO 189 (#8)
Description:

Analysis Date: 5/20/2009 7:50:29AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A8 RSO#189
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

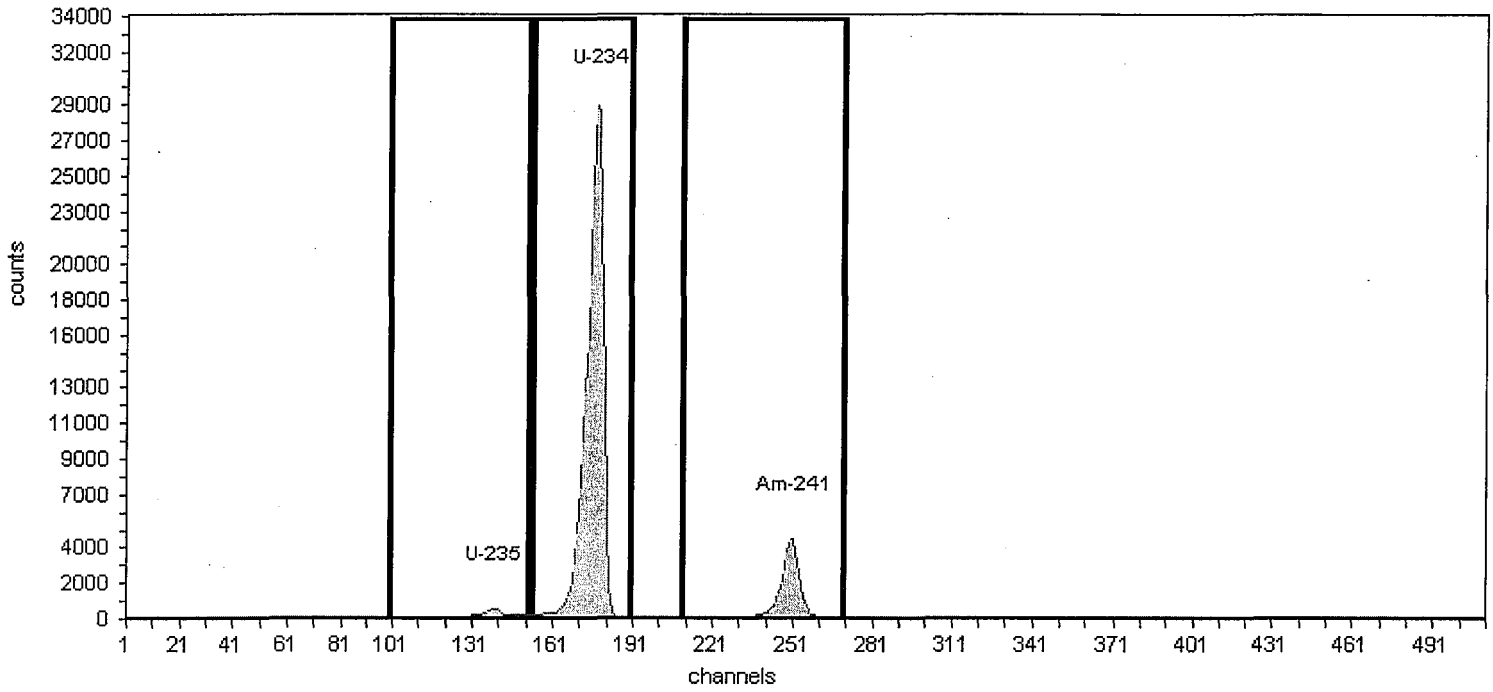
Detector: 29 , SN:
Acquisition Start Date: 5/8/2009 10:02:56AM

Live Time: 35.00 min.
Real Time: 35.07 min.

Efficiency Calibration Name: RSO 189 (#8)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 29.17% +/- 0.12% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	4,583.00	130.94
U-234	178	4.78	153	190	204,687.00	5,848.20
Am-241	251	5.49	210	270	32,012.00	914.66

20000698

AlphaVision v5.3 — Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 29
7:51:33AM 5/20/2009

Calibration

Energy Calibration: RSO 190 (#9A)
Description:

Analysis Date: 5/20/2009 7:51:21AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

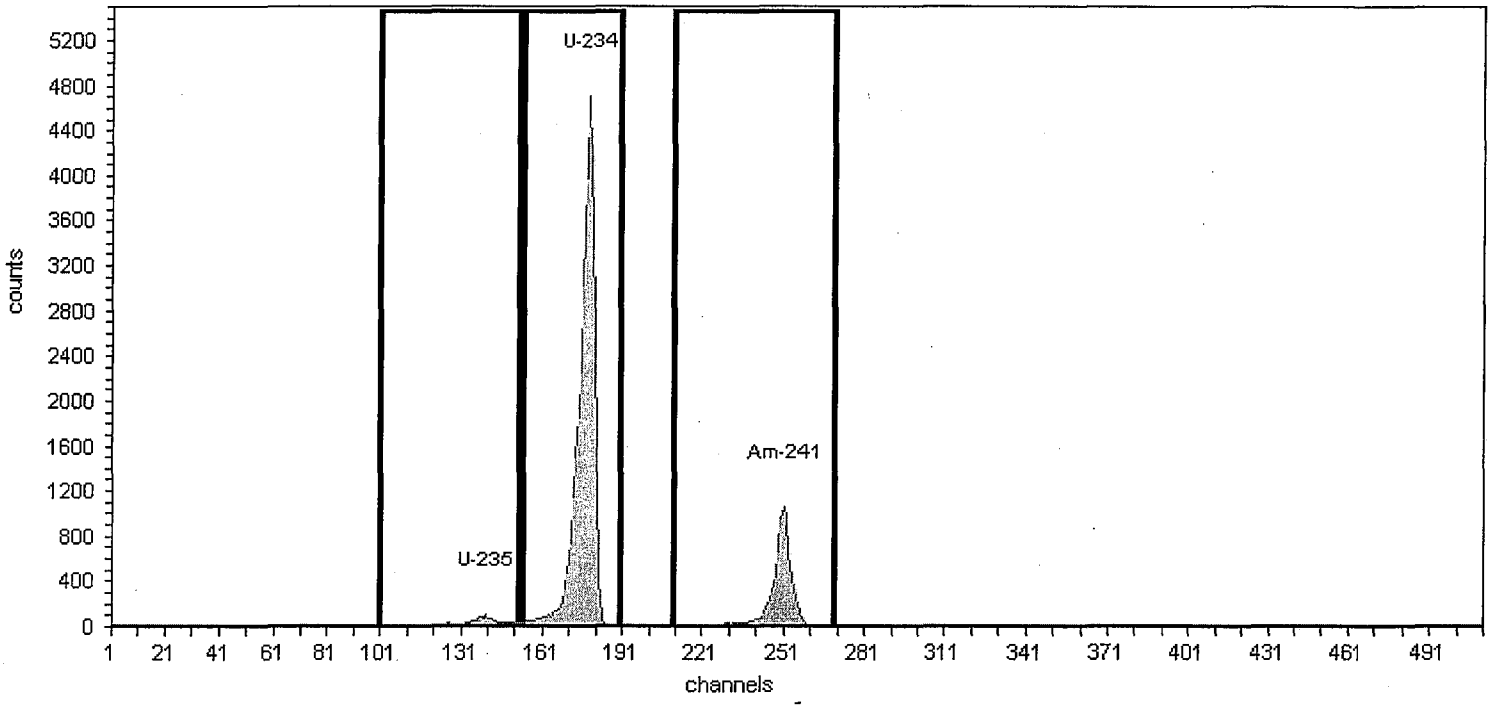
Detector: 29 , SN:
Acquisition Start Date: 5/8/2009 10:45:06AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190 (#9A)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.41% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	740.00	21.14
U-234	178	4.78	153	190	29,860.00	853.14
Am-241	251	5.49	210	270	7,015.00	200.43

20000699

20000699

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α1 reverified 5/7/09 expires 5/7/10

PAT 187 recalibrate 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203026
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.354 nCi	(124.1 Bq)	Am-241:	0.5793 nCi	(21.43 Bq)
U-235:	0.06566 nCi	(2.429 Bq)	Total Activity:	3.999 nCi	(148.0 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4483 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7 20000700

Isotope Products Laboratories
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α2 reverified 5/7/09 expires 5/7/10

PAI 183 recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203028
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	6.467	nCi	(239.3 Bq)	Am-241:	0.6366	nCi	(23.55 Bq)
U-235:	0.1135	nCi	(4.200 Bq)	Total Activity:	7.217	nCi	(267.1 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 8091 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7
20000701

reverified 5/7/09
expires 5/7/10

α3

PAT I.D 184
recalibrated 4-1503

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CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203024
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.227	nCi	(119.4 Bq)	Am-241:	2.866	nCi	(106.0 Bq)
U-235:	0.05205	nCi	(1.926 Bq)	Total Activity:	6.145	nCi	(227.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 6889 α/min in 2π on 11 Apr 03.

Daniel James VanDalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7
20000702

reverified 5/7/09
1 of 4
expires 5/7/10

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PAI ID 00185
recd from recalibrator
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203021
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	2.731	nCi	(101.0 Bq)	Am-241:	0.9325	nCi	(34.50 Bq)
U-235:	0.03416	nCi	(1.264 Bq)	Total Activity:	3.698	nCi	(136.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4145 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2
20000703

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45 reverified 4/1/04 expires 4/1/10

PAI ID 00186
recalibration
received 3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203025
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	5.486	nCi	(203.0 Bq)	Am-241:	3.958	nCi	(146.4 Bq)
U-235:	0.09221	nCi	(3.412 Bq)	Total Activity:	9.536	nCi	(352.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 10690 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2
20000704

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α6 reverified 9/8/09 expires 9/1/10

PAID 00187
recd from recalibration 3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203022
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.592	nCi	(132.9 Bq)	Am-241:	3.279	nCi	(121.3 Bq)
U-235:	0.08556	nCi	(3.166 Bq)	Total Activity:	6.957	nCi	(257.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α/min in 2π on 18 Mar 03.

Daniel James VanDalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2
20000705

reverified 5/8/09
α 7 expires ~~5/7/09~~ 5/7/10 RG

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

PAID 188
rec'd for recalibration 3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203023
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	2.895	nCi	(107.1 Bq)	Am-241:	1.953	nCi	(72.26 Bq)
U-235:	0.02502	nCi	(0.9257 Bq)	Total Activity:	4.873	nCi	(180.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 5463 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2
20000706

reverified 5/8/09
α 8 expires ~~5/1/09~~ 5/1/10 2nd

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

PAI, IO 189
recd 4-21-03
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203029
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	9.048	nCi	(334.8 Bq)	Am-241:	1.433	nCi	(53.02 Bq)
U-235:	0.1771	nCi	(6.553 Bq)	Total Activity:	10.66	nCi	(394.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.0%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11950 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7
20000707

Eckert & Ziegler
Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

α9
RSO #190
Rec'd 4/16/09 EMF

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide:	U-235	**P.O. No.:**	70359/R4367
Radionuclide:	Am-241	**Catalog No.:**	MISC-STD
Half-life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-09 12:00 PST
Half-life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX223027
Half-life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	1.344	**nCi,**	49.73	**Bq**	Am-241:	0.3221	**nCi,**	11.92	**Bq**
U-235:	0.02959	**nCi,**	1.095	**Bq**	Total Activity:	1.696	**nCi,**	62.75	**Bq**

Physical Description:

A. Capsule type:	Disk (47 mm OD x 0.76 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxide
C. Active diameter/volume:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in May 2001.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 1901 α/min in 2π on 17-Mar-09.

20000708

Quality Control — 17 Mar 09 Date — IPL Ref. No.: 1143-35

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

March 16, 2010

Ms. Kristie Warr
Weston Solutions, Inc.
5599 San Felipe, Stuite 700
Houston, TX 77056

Re: ALS Workorder: 10-03-063
Project Name: Paguate
Project Number: TO0019100202

Dear Ms. Warr:

Five soil, seven water and six sediment samples were received from Weston Solutions, Inc. on March 5, 2010. The samples were scheduled for the following analyses:

Metals	pages 1-412
Inorganics	pages 1-38
Total Uranium	pages 1-148

The results for these analyses are contained in the enclosed reports.

Thank you for your confidence in ALS Laboratory Group. Should you have any questions, please call.

Sincerely,

ALS Laboratory Group
for Lance Steere
Senior Project Manager

LRS/eh
Enclosure (s): Report

20000709

ALS Laboratory Group -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1003063
Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
JM-SS-04	1003063-1		SOIL	03-Mar-10	11:01
JM-SS-05	1003063-2		SOIL	03-Mar-10	10:40
RM-JM-SED	1003063-3		SEDIMEN	03-Mar-10	15:29
RP-SW-02	1003063-4		WATER	03-Mar-10	10:30
JM-SED-02	1003063-5		SOIL	03-Mar-10	15:35
JM-SS-03	1003063-6		SOIL	03-Mar-10	11:47
JM-SW-02	1003063-7		WATER	03-Mar-10	15:35
RP-JM-SED	1003063-8		SEDIMEN	03-Mar-10	14:32
RP-JM-SED-01	1003063-9		SEDIMEN	03-Mar-10	15:11
RP-JM-SW	1003063-10		WATER	03-Mar-10	14:32
RP-JM-SW-01	1003063-11		WATER	03-Mar-10	15:11
RP-SED-01	1003063-12		SEDIMEN	03-Mar-10	11:35
RP-SED-01D	1003063-13		SEDIMEN	03-Mar-10	11:35
JM-SS-01	1003063-14		SOIL	04-Mar-10	9:50
RM-JM-SW	1003063-15		WATER	03-Mar-10	15:29
RP-SED-02	1003063-16		SEDIMEN	03-Mar-10	10:30
RP-SW-01	1003063-17		WATER	03-Mar-10	11:35
RP-SW-01D	1003063-18		WATER	03-Mar-10	11:35

20000710

1003063

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0006

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
1	JM-SS-04	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	11:01	1	16 oz	4 C	46 uR/hr	
2	JM-SS-05	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	10:40	1	16 oz	4 C	109 uR/hr	
3	RM-JM-SED	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	15:29	1	16 oz	4 C	26 uR/hr	
4	RP-SW-02	TAL Metals + Mercury	3	Days	Water	3/3/2010	10:30	1	1 L poly	HNO3 pH<2	8 uR/hr	Y
	RP-SW-02	Total Cyanide	3	Days	Water	3/3/2010	10:30	1	250 mL	NaOH	8 uR/hr	Y
	RP-SW-02	Isotopic Uranium	3	Days	Water	3/3/2010	10:30	1	1 L poly	HNO3 pH<2	8 uR/hr	Y

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
		03.04.10		3.5.10	0735						

20000711

1003063

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0007

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
5	JM-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	15:35	1	16 oz	4 C	20 uR/hr	
6	JM-SS-03	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	11:47	1	16 oz	4 C	80 uR/hr	
7	JM-SW-02	TAL Metals + Mercury	3	Days	Water	3/3/2010	15:35	1	1 L poly	HNO3 pH<2	20 uR/hr	
↓	JM-SW-02	Total Cyanide	3	Days	Water	3/3/2010	15:35	1	250 mL	NaOH	20 uR/hr	
↓	JM-SW-02	Isotopic Uranium	3	Days	Water	3/3/2010	15:35	1	1 L poly	HNO3 pH<2	20 uR/hr	
8	RP-JM-SED	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	14:32	1	16 oz	4 C	27 uR/hr	
9	RP-JM-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	15:11	1	16 oz	4 C	19 uR/hr	
10	RP-JM-SW	TAL Metals + Mercury	3	Days	Water	3/3/2010	14:32	1	1 L poly	HNO3 pH<2	27 uR/hr	
↓	RP-JM-SW	Total Cyanide	3	Days	Water	3/3/2010	14:32	1	250 mL	NaOH	27 uR/hr	
↓	RP-JM-SW	Isotopic Uranium	3	Days	Water	3/3/2010	14:32	1	1 L poly	HNO3 pH<2	27 uR/hr	
11	RP-JM-SW-01	TAL Metals + Mercury	3	Days	Water	3/3/2010	15:11	1	1 L poly	HNO3 pH<2	19 uR/hr	
↓	RP-JM-SW-01	Total Cyanide	3	Days	Water	3/3/2010	15:11	1	250 mL	NaOH	19 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
		03.04.10		3.5.10	0735						

20000712

1003063

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0007

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
11	RP-JM-SW-01	Isotopic Uranium	3	Days	Water	3/3/2010	15:11	1	1 L poly	HNO3 pH<2	19 uR/hr	
12	RP-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	11:35	1	16 oz	4 C	18 uR/hr	
13	RP-SED-01D	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	11:35	1	16 oz	4 C	8 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
		03.04.10		3.5.10	0735						

20000713

100363

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0008

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
14	JM-SS-01	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/4/2010	09:50	1	16 oz	4 C	56 uR/hr	
15	RM-JM-SW	TAL Metals + Mercury	3	Days	Water	3/3/2010	15:29	1	1 L poly	HNO3 pH<2	26 uR/hr	
	RM-JM-SW	Total Cyanide	3	Days	Water	3/3/2010	15:29	1	250 mL	NaOH	26 uR/hr	
	RM-JM-SW	Isotopic Uranium	3	Days	Water	3/3/2010	15:29	1	1 L poly	HNO3 pH<2	26 uR/hr	
16	RP-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	10:30	1	16 oz	4 C	8 uR/hr	Y
17	RP-SW-01	TAL Metals + Mercury	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	
	RP-SW-01	Total Cyanide	3	Days	Water	3/3/2010	11:35	1	250 mL	NaOH	18 uR/hr	
	RP-SW-01	Isotopic Uranium	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	
18	RP-SW-01D	TAL Metals + Mercury	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	
	RP-SW-01D	Total Cyanide	3	Days	Water	3/3/2010	11:35	1	250 mL	NaOH	18 uR/hr	
	RP-SW-01D	Isotopic Uranium	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	Melinda Wuttke	03/04/10		3.5.10	0735						

20000714

ALS Laboratory Group - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003063

Project Manager: LRS Initials: LAS Date: 3.5.10

1.	Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2.	Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3.	Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4.	Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5.	Are the **COC and bottle labels complete and legible**?		(YES)	NO
6.	Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7.	Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8.	Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	N/A	YES	(NO) *
9.	Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10.	Is there **sufficient sample** for the requested analyses?		(YES)	NO
11.	Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12.	Are all samples within **holding times** for the requested analyses?		(YES)	NO
13.	Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14.	Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15.	Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16.	Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17.	Were the samples **shipped on ice**?		(YES)	NO
18.	Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** (#2) #4	RAD ONLY	(YES)	NO

Cooler #:	1	2	3					
Temperature (°C):	2.6	2.8	1.8					
No. of custody seals on cooler:	Ø	Ø	Ø					
DOT Survey/ Acceptance Information — External µR/hr reading:	14	14	13					
Background µR/hr reading:	11							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES / NO / NA** (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

20000715

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: 3/5/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003063

Project Manager: LRS Initials: LAS Date: 3/5/10

Additional Information:

6 (*) sample 1003063-4 (RP-SW-02) came with MS/MSD bottles which were not marked on COC
sample 1003063-16 (RP-SED-02) came with MS/MSD bottles which were not marked on COC Noted in far Right column.

(*) 1003063-7 (JM-SW-02) has heavy dark dusting in all 3 bottles Noted Settled decant; Suspended incl.

(*) Maximum added, pH still not met Noted.

Was the laboratory directed to proceed with the analysis of any samples yielding the presence of residual chlorine? **YES / NO / NA**

NOTE:

No pH adjustments shall be made without prior consent of Project Manager. After pH adjustments, hold metals and radchem samples ≥ 24 hrs. before analysis.

Was the pH of any sample adjusted by the laboratory? **YES** (See Table below) / **NO**

pH Excursion:

Laboratory Sample ID	Client Sample ID	Initial pH LAS 3/5/10	Final pH	Reagent Used	Volume Added (mL)	Lot No. of Reagent	Requested Analysis	Initials / Date / Time
1003063-4-2	RP-SW-02	~~<~~ 10	>12	NaOH	1.0		CYAN	LAS 3/5/10 @ 1015
4-5	RP-SW-02 MS	10						
4-8	RP-SW-02MSD							
(*) 7-2	JM-SW-02		10		1.5			
10-2	RP-JM-SW		>12		1.0			
11-2	RP-JM-SW-01				1.5			
15-2	RM-JM-SW				1.0			
17-2	RP-SW-01							
18-2	RPSW-01D							
								20000716

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: [signature] 3/5

1003063

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

Ship Date: 04MAR10
ActWgt: 13.3 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

1.80 13.0-

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

3 of 3

MPS# 0263 7933 2472 5196

Mstr# 7933 2472 4970 0201

FRI - 05 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

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SGL

20000717

10003063

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

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14

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Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

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20000718

735

1003063

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

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SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
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Fort Collins, CO 80524

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2 of 3

MPS# 0263 7933 2472 5038

Mstr# 7933 2472 4970 0201

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20000719

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division
Fort Collins, Colorado

Inorganics

Case Narrative

Weston Solutions, Inc.

Paguate -- TO0019100202

Work Order Number: 1003063

1. This report consists of 7 water samples, 6 sediment samples, and 5 soil samples.

2. The samples were received cool and intact by ALS on 03/05/10.

3. The water samples were preserved with sodium hydroxide upon receipt. All water samples with the exception of sample 1003063-7 had a pH of 12 at the time of the total cyanide analysis. Sample 1003063-7 had a pH of approximately 10 at the time of analysis.

4. The samples were prepared for analysis based on SW-846, 3rd Edition procedures. Sediment was not visible in the water samples. Samples 1003063-3, -5, -9, -12, -13, and -16 were sediment samples that contained standing water. These samples were stirred prior to aliquotting.

5. The samples were analyzed following SW-846 procedures for the following methods:

Analyte	Method	SOP #
Total cyanide	9014	1110 Rev 13

6. All standards and solutions were used within their recommended shelf life.

7. The samples were prepared and analyzed within the established hold time for this analysis.

All in house quality control procedures were followed, as described below.

8. General quality control procedures.

20000720

- A preparation (method) blank and laboratory control sample (LCS) were prepared and analyzed with the samples in each preparation batch. There were not more than 20 samples in each preparation batch.

- The method blank associated with each batch was below the reporting limit for the requested analyte. This indicates that no contaminants were introduced to the samples during preparation and analysis.
- The LCS was within the acceptance limits for each batch.
- All initial and continuing calibration blanks (ICB/CCB) associated with each analytical batch were below the reporting limit for the requested analyte.
- All initial and continuing calibration verifications (ICV/CCV) associated with each analytical batch were within the acceptance criteria for the requested analyte. This indicates a valid calibration and stable instrument conditions.

9. Matrix specific quality control procedures.

   Sample 1003063-4 was designated as the quality control sample for the water analysis. Sample 1003063-16 was designated as the quality control sample for the sediment and soil analysis.

   Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

   - A matrix spike (MS) and matrix spike duplicate (MSD) were prepared and analyzed with each batch. All guidance criteria for precision and accuracy were met.

10. Sample dilutions were not required for the requested analyses.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Megan Johnson — 3/11/10
Megan Johnson
Inorganics Primary Data Reviewer
Date

3/10/10
Inorganics Final Data Reviewer
Date

20000721

Inorganic Data Reporting Qualifiers

The following qualifiers are used by the laboratory when reporting results of inorganic analyses.

- Concentration qualifier -- If the analyte was analyzed for but not detected a “U” is entered.
- QC qualifier -- Specified entries and their meanings are as follows:

  N - Spiked sample recovery not within control limits.

  * - Duplicate analysis (relative percent difference) not within control limits.

  Z - Calibration spike recovery not within control limits.

Chain of Custody

20000723

ALS Laboratory Group -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1003063
Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
JM-SS-04	1003063-1		SOIL	03-Mar-10	11:01
JM-SS-05	1003063-2		SOIL	03-Mar-10	10:40
RM-JM-SED	1003063-3		SEDIMEN	03-Mar-10	15:29
RP-SW-02	1003063-4		WATER	03-Mar-10	10:30
JM-SED-02	1003063-5		SOIL	03-Mar-10	15:35
JM-SS-03	1003063-6		SOIL	03-Mar-10	11:47
JM-SW-02	1003063-7		WATER	03-Mar-10	15:35
RP-JM-SED	1003063-8		SEDIMEN	03-Mar-10	14:32
RP-JM-SED-01	1003063-9		SEDIMEN	03-Mar-10	15:11
RP-JM-SW	1003063-10		WATER	03-Mar-10	14:32
RP-JM-SW-01	1003063-11		WATER	03-Mar-10	15:11
RP-SED-01	1003063-12		SEDIMEN	03-Mar-10	11:35
RP-SED-01D	1003063-13		SEDIMEN	03-Mar-10	11:35
JM-SS-01	1003063-14		SOIL	04-Mar-10	9:50
RM-JM-SW	1003063-15		WATER	03-Mar-10	15:29
RP-SED-02	1003063-16		SEDIMEN	03-Mar-10	10:30
RP-SW-01	1003063-17		WATER	03-Mar-10	11:35
RP-SW-01D	1003063-18		WATER	03-Mar-10	11:35

20000724

1003063

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0006

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
1	JM-SS-04	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	11:01	1	16 oz	4 C	46 uR/hr	
2	JM-SS-05	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	10:40	1	16 oz	4 C	109 uR/hr	
3	RM-JM-SED	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	15:29	1	16 oz	4 C	26 uR/hr	
4	RP-SW-02	TAL Metals + Mercury	3	Days	Water	3/3/2010	10:30	1	1 L poly	HNO3 pH<2	8 uR/hr	Y
	RP-SW-02	Total Cyanide	3	Days	Water	3/3/2010	10:30	1	250 mL	NaOH	8 uR/hr	Y
↓	RP-SW-02	Isotopic Uranium	3	Days	Water	3/3/2010	10:30	1	1 L poly	HNO3 pH<2	8 uR/hr	Y

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	[signature]	03.04.10	[signature]	3.5.10	0735						

20000725

1003063

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0007

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
5	JM-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	15:35	1	16 oz	4 C	20 uR/hr	
6	JM-SS-03	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	11:47	1	16 oz	4 C	80 uR/hr	
7	JM-SW-02	TAL Metals + Mercury	3	Days	Water	3/3/2010	15:35	1	1 L poly	HNO3 pH<2	20 uR/hr	
↓	JM-SW-02	Total Cyanide	3	Days	Water	3/3/2010	15:35	1	250 mL	NaOH	20 uR/hr	
↓	JM-SW-02	Isotopic Uranium	3	Days	Water	3/3/2010	15:35	1	1 L poly	HNO3 pH<2	20 uR/hr	
8	RP-JM-SED	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	14:32	1	16 oz	4 C	27 uR/hr	
9	RP-JM-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	15:11	1	16 oz	4 C	19 uR/hr	
10	RP-JM-SW	TAL Metals + Mercury	3	Days	Water	3/3/2010	14:32	1	1 L poly	HNO3 pH<2	27 uR/hr	
↓	RP-JM-SW	Total Cyanide	3	Days	Water	3/3/2010	14:32	1	250 mL	NaOH	27 uR/hr	
↓	RP-JM-SW	Isotopic Uranium	3	Days	Water	3/3/2010	14:32	1	1 L poly	HNO3 pH<2	27 uR/hr	
11	RP-JM-SW-01	TAL Metals + Mercury	3	Days	Water	3/3/2010	15:11	1	1 L poly	HNO3 pH<2	19 uR/hr	
↓	RP-JM-SW-01	Total Cyanide	3	Days	Water	3/3/2010	15:11	1	250 mL	NaOH	19 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
		03.04.10		3.5.10	0735						

20000726

1003063

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0007

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
11	RP-JM-SW-01	Isotopic Uranium	3	Days	Water	3/3/2010	15:11	1	1 L poly	HNO3 pH<2	19 uR/hr	
12	RP-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	11:35	1	16 oz	4 C	18 uR/hr	
13	RP-SED-01D	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	11:35	1	16 oz	4 C	8 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
		03.04.10		3.5.10	0735						

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100363

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0008

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
14	JM-SS-01	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/4/2010	09:50	1	16 oz	4 C	56 uR/hr	
15	RM-JM-SW	TAL Metals + Mercury	3	Days	Water	3/3/2010	15:29	1	1 L poly	HNO3 pH<2	26 uR/hr	
	RM-JM-SW	Total Cyanide	3	Days	Water	3/3/2010	15:29	1	250 mL	NaOH	26 uR/hr	
	RM-JM-SW	Isotopic Uranium	3	Days	Water	3/3/2010	15:29	1	1 L poly	HNO3 pH<2	26 uR/hr	
16	RP-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	10:30	1	16 oz	4 C	8 uR/hr	Y
17	RP-SW-01	TAL Metals + Mercury	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	
	RP-SW-01	Total Cyanide	3	Days	Water	3/3/2010	11:35	1	250 mL	NaOH	18 uR/hr	
	RP-SW-01	Isotopic Uranium	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	
18	RP-SW-01D	TAL Metals + Mercury	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	
	RP-SW-01D	Total Cyanide	3	Days	Water	3/3/2010	11:35	1	250 mL	NaOH	18 uR/hr	
	RP-SW-01D	Isotopic Uranium	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	Melinda Wuttke	03/04/10		3.5.10	0735						

20000728

ALS Laboratory Group - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003063

Project Manager: LRS Initials: LAS Date: 3.5.10

1.	Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2.	Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3.	Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4.	Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5.	Are the **COC and bottle labels complete and legible**?		(YES)	NO
6.	Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO) **
7.	Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8.	Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	N/A	YES	(NO) *
9.	Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10.	Is there **sufficient sample** for the requested analyses?		(YES)	NO
11.	Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12.	Are all samples within **holding times** for the requested analyses?		(YES)	NO
13.	Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14.	Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15.	Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16.	Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17.	Were the samples **shipped on ice**?		(YES)	NO
18.	Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** (#2) #4	RAD ONLY	(YES)	NO

	Cooler #:	1	2	3						
	Temperature (°C):	2.6	2.8	1.8						
	No. of custody seals on cooler:	Ø	Ø	Ø						
DOT Survey/ Acceptance Information	External µR/hr reading:	14	14	13						
	Background µR/hr reading:	11								

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES / NO / NA** (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

20000729

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: 3/5/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r22.xls (6/1/09)

ALS Laboratory Group - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003063

Project Manager: LRS Initials: LAS Date: 3/5/10

Additional Information:

(6)(*) Sample 1003063-4 (RP-SW-02) came with MS/MSD bottles which were not marked on COC
Sample 1003063-16 (RP-SED-02) came with MS/MSD bottles which were not marked on COC Noted in far Right column.

(*) 1003063-7 (JM-SW-02) has heavy dark dusting in all 3 bottles Noted/h Settled decanti; Suspended incl. /h

(*) Maximum added, pH still not met Noted./h

Was the laboratory directed to proceed with the analysis of any samples yielding the presence of residual chlorine? **YES / NO / NA**

NOTE:

No pH adjustments shall be made without prior consent of Project Manager. After pH adjustments, hold metals and radchem samples ≥ 24 hrs. before analysis.

Was the pH of any sample adjusted by the laboratory? **YES** (See Table below) / **NO**

pH Excursion:

Laboratory Sample ID	Client Sample ID	Initial pH (LAS 3/5/10)	Final pH	Reagent Used	Volume Added (mL)	Lot No. of Reagent	Requested Analysis	Initials / Date / Time
1003063-4-2	RP-SW-02	≤10	>12	NaOH	1.0		CYAN	LAS 3/5/10 @ 1015
4-5	RP-SW-02 MS	10	↓	↓	↓	↓	↓	↓
4-8	RP-SW-02 MSD	↓	↓	↓	↓	↓	↓	↓
(*) 7-2	JM-SW-02	↓	10	↓	1.5	↓	↓	↓
10-2	RP-JM-SW	↓	>12	↓	1.0	↓	↓	↓
11-2	RP-JM-SW-01	↓	↓	↓	1.5	↓	↓	↓
15-2	RM-JM-SW	↓	↓	↓	1.0	↓	↓	↓
17-2	RP-SW-01	↓	↓	↓	↓	↓	↓	↓
18-2	RPSW-01D	↓	↓	↓	↓	↓	↓	↓ 20000730

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: _____ 3/5

1003063

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Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

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ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

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20000731

SGL

1003063

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

J1010102220224

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1 of 3

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1003063

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

J1010102220224

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Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

2 of 3

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20000733

Sample Results

20000734

CYANIDE, TOTAL

Method SW9014

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003063
Reporting Basis: Dry Weight
Prep Method: SW9010
Final Volume: 50 ml
Matrix: SOIL
Result Units: MG/KG

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
JM-SS-04	1003063-1	03/03/2010	03/10/2010	03/10/2010	3.5	1	0.52	0.52	U	1 g
JM-SS-05	1003063-2	03/03/2010	03/10/2010	03/10/2010	1.9	1	0.51	0.51	U	1 g
JM-SED-02	1003063-5	03/03/2010	03/10/2010	03/10/2010	42.7	1	0.87	0.87	U	1 g
JM-SS-03	1003063-6	03/03/2010	03/10/2010	03/10/2010	4.2	1	0.52	0.52	U	1 g
JM-SS-01	1003063-14	03/04/2010	03/10/2010	03/10/2010	2.4	1	0.51	0.51	U	1 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *cn1003063-1*

20000735

CYANIDE, TOTAL

Method SW9014

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003063
Reporting Basis: Dry Weight
Prep Method: SW9010
Final Volume: 50 ml
Matrix: SEDIMENT
Result Units: MG/KG

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
RM-JM-SED	1003063-3	03/03/2010	03/10/2010	03/10/2010	35.7	1	0.78	0.78	U	1 g
RP-JM-SED	1003063-8	03/03/2010	03/10/2010	03/10/2010	31.7	1	0.73	0.73	U	1 g
RP-JM-SED-01	1003063-9	03/03/2010	03/10/2010	03/10/2010	27.1	1	0.69	0.69	U	1 g
RP-SED-01	1003063-12	03/03/2010	03/10/2010	03/10/2010	27.3	1	0.69	0.69	U	1 g
RP-SED-01D	1003063-13	03/03/2010	03/10/2010	03/10/2010	26.9	1	0.68	0.68	U	1 g
RP-SED-02	1003063-16	03/03/2010	03/10/2010	03/10/2010	32.5	1	0.74	0.74	U	1 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *cn1003063-1*

20000736

CYANIDE, TOTAL

Method SW9014

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003063
Reporting Basis: As Received
Prep Method: SW9010
Final Volume: 50 ml
Matrix: WATER
Result Units: MG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
RP-SW-02	1003063-4	03/03/2010	03/09/2010	03/09/2010	N/A	1	0.01	0.01	U	50 ml
JM-SW-02	1003063-7	03/03/2010	03/09/2010	03/09/2010	N/A	1	0.01	0.01	U	50 ml
RP-JM-SW	1003063-10	03/03/2010	03/09/2010	03/09/2010	N/A	1	0.01	0.01	U	50 ml
RP-JM-SW-01	1003063-11	03/03/2010	03/09/2010	03/09/2010	N/A	1	0.01	0.01	U	50 ml
RM-JM-SW	1003063-15	03/03/2010	03/09/2010	03/09/2010	N/A	1	0.01	0.01	U	50 ml
RP-SW-01	1003063-17	03/03/2010	03/09/2010	03/09/2010	N/A	1	0.01	0.01	U	50 ml
RP-SW-01D	1003063-18	03/03/2010	03/09/2010	03/09/2010	N/A	1	0.01	0.01	U	50 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *cn1003063-1*

20000737

QC and Summary Report Forms

20000738

Total Cyanide

Method SW9014

Method Blank

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CN100309-1MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 09-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW9010

Prep Batch: CN100309-3
QCBatchID: CN100309-3-1
Run ID: cn100309-1a
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
57-12-5	CYANIDE, TOTAL	1	0.01	0.01	U	

20000739

Data Package ID: *cn1003063-1*

Total Cyanide

Method SW9014

Method Blank

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CN100310-1MB

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 10-Mar-10
Date Analyzed: 10-Mar-10
Prep Method: SW9010

Prep Batch: CN100310-1
QCBatchID: CN100310-1-1
Run ID: cn100310-1a
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
57-12-5	CYANIDE, TOTAL	1	0.5	0.5	U	

20000740

Data Package ID: *cn1003063-1*

Total Cyanide

Method SW9014

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: CN100309-1LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/09/2010
Date Analyzed: 03/09/2010
Prep Method: SW9010

Prep Batch: CN100309-3
QCBatchID: CN100309-3-1
Run ID: cn100309-1a
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
57-12-5	CYANIDE, TOTAL	0.4	0.396	0.01		99	85 - 115%

20000741

Data Package ID: *cn1003063-1*

Total Cyanide

Method SW9014

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: CN100310-1LCS

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/10/2010
Date Analyzed: 03/10/2010
Prep Method: SW9010

Prep Batch: CN100310-1
QCBatchID: CN100310-1-1
Run ID: cn100310-1a
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
57-12-5	CYANIDE, TOTAL	20	20.1	0.5		100	85 - 115%

20000742

Data Package ID: *cn1003063-1*

Total Cyanide

Method SW9014

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-02
LabID: 1003063-4MS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 09-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW9010

Prep Batch: CN100309-3
QCBatchID: CN100309-3-1
Run ID: cn100309-1a
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
File Name: Manual Entry

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
57-12-5	CYANIDE, TOTAL	0.01	U	0.102		0.01	0.1	102	75 - 125%

Field ID: RP-SW-02
LabID: 1003063-4MSD

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 09-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW9010

Prep Batch: CN100309-3
QCBatchID: CN100309-3-1
Run ID: cn100309-1a
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
File Name: Manual Entry

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
57-12-5	CYANIDE, TOTAL	0.0988		0.1	99	0.01	30	3

20000743

Data Package ID: *cn1003063-1*

Total Cyanide

Method SW9014

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-02
LabID: 1003063-16MS

Sample Matrix: SEDIMENT
% Moisture: 32.5
Date Collected: 03-Mar-10
Date Extracted: 10-Mar-10
Date Analyzed: 10-Mar-10
Prep Method: SW9010

Prep Batch: CN100310-1
QCBatchID: CN100310-1-1
Run ID: cn100310-1a
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: MG/KG
File Name: Manual Entry

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
57-12-5	CYANIDE, TOTAL	0.74	U	7.78		0.741	7.41	105	75 - 125%

Field ID: RP-SED-02
LabID: 1003063-16MSD

Sample Matrix: SEDIMENT
% Moisture: 32.5
Date Collected: 03-Mar-10
Date Extracted: 10-Mar-10
Date Analyzed: 10-Mar-10
Prep Method: SW9010

Prep Batch: CN100310-1
QCBatchID: CN100310-1-1
Run ID: cn100310-1a
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: MG/KG
File Name: Manual Entry

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
57-12-5	CYANIDE, TOTAL	7.31		7.41	99	0.741	30	6

20000744

Data Package ID: *cn1003063-1*

CYANIDE, TOTAL

Method SW9014

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Run ID: CN100309-1A

Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
ICV	Initial Calibration	3/9/2010		0.0999	0.0993	0.01	N/A	99	85 - 115
CCV2	Continuing Calibration	3/9/2010		0.2	0.201	0.01	N/A	100	85 - 115
CCV1	Continuing Calibration	3/9/2010		0.2	0.201	0.01	N/A	101	85 - 115

Data Package ID: *cn1003063-1*

20000745

CYANIDE, TOTAL

Method SW9014

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: CN100310-1A
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
ICV	Initial Calibration	3/10/2010		0.0999	0.0999	0.01	N/A	100	85 - 115
CCV2	Continuing Calibration	3/10/2010		0.2	0.2	0.01	N/A	100	85 - 115
CCV1	Continuing Calibration	3/10/2010		0.2	0.201	0.01	N/A	101	85 - 115

Data Package ID: *cn1003063-1*

20000746

CYANIDE, TOTAL

Method SW9014

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Run ID: CN100309-1A

Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Result	Reporting Limit	Flag
ICB	Initial Calibration	3/9/2010		0.01	0.01	U
CCB2	Continuing Calibration	3/9/2010		0.01	0.01	U
CCB1	Continuing Calibration	3/9/2010		0.01	0.01	U

Data Package ID: *cn1003063-1*

CYANIDE, TOTAL

Method SW9014

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: CN100310-1A
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Result	Reporting Limit	Flag
ICB	Initial Calibration	3/10/2010		0.01	0.01	U
CCB2	Continuing Calibration	3/10/2010		0.01	0.01	U
CCB1	Continuing Calibration	3/10/2010		0.01	0.01	U

Data Package ID: *cn1003063-1*

Prep Batch ID: CN100309-3

Start Date: 03/09/10
Start Time: 9:00
Prep Analyst: Jason McNall

End Date: 03/09/10
End Time: 11:00

Concentration Method: NONE
Extract Method: SW9010
Initial Volume Units: ml
Final Volume Units: ml

Batch Created By: JBM
Date Created: 03/09/10
Time Created: 8:39
Validated By: JBM
Date Validated: 03/09/10
Time Validated: 10:12

Comments:

QC Batch ID: CN100309-3-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
CN100309-1	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003063
CN100309-1	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003063
CN100309-1	LCSD	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003063
1003063-4	MS	RP-SW-02	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-4	MSD	RP-SW-02	WATER	3/3/2010	50	50	NONE	1	1003063
1003046-11	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003046
1003046-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003046
1003046-5	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003046
1003046-8	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003046
1003063-10	SMP	RP-JM-SW	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-11	SMP	RP-JM-SW-01	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-15	SMP	RM-JM-SW	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-17	SMP	RP-SW-01	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-18	SMP	RP-SW-01D	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-4	SMP	RP-SW-02	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-7	SMP	JM-SW-02	WATER	3/3/2010	50	50	NONE	1	1003063

QC Types

CAR	Carrier reference sample		DUP	Laboratory Duplicate
LCS	Laboratory Control Sample		LCSD	Laboratory Control Sample Duplicat
MB	Method Blank		MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate		REP	Sample replicate
RVS	Reporting Level Verification Standar		SMP	Field Sample
SYS	Sample Yield Spike			

20000749

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Wednesday, March 10, 2010

Prep Batch ID: CN100310-1

Start Date: 03/10/10
Start Time: 8:30
Prep Analyst: Jason McNall

End Date: 03/10/10
End Time: 10:30

Concentration Method: NONE
Extract Method: SW9010
Initial Volume Units: g
Final Volume Units: ml

Batch Created By: JBM
Date Created: 03/10/10
Time Created: 8:45
Validated By: JBM
Date Validated: 03/10/10
Time Validated: 9:26

Comments:

QC Batch ID: CN100310-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
CN100310-1	MB	XXXXXX	SEDIME	XXXXXX	1	50	NONE	1	1003063
CN100310-1	LCS	XXXXXX	SEDIME	XXXXXX	1	50	NONE	1	1003063
CN100310-1	LCSD	XXXXXX	SEDIME	XXXXXX	1	50	NONE	1	1003063
1003063-16	MS	RP-SED-02	SEDIME	3/3/2010	1	50	NONE	1	1003063
1003063-16	MSD	RP-SED-02	SEDIME	3/3/2010	1	50	NONE	1	1003063
1003039-1	SMP	XXXXXX	SOIL	XXXXXX	1	50	NONE	1	1003039
1003063-1	SMP	JM-SS-04	SOIL	3/3/2010	1	50	NONE	1	1003063
1003063-12	SMP	RP-SED-01	SEDIME	3/3/2010	1	50	NONE	1	1003063
1003063-13	SMP	RP-SED-01D	SEDIME	3/3/2010	1	50	NONE	1	1003063
1003063-14	SMP	JM-SS-01	SOIL	3/4/2010	1	50	NONE	1	1003063
1003063-16	SMP	RP-SED-02	SEDIME	3/3/2010	1	50	NONE	1	1003063
1003063-2	SMP	JM-SS-05	SOIL	3/3/2010	1	50	NONE	1	1003063
1003063-3	SMP	RM-JM-SED	SEDIME	3/3/2010	1	50	NONE	1	1003063
1003063-5	SMP	JM-SED-02	SOIL	3/3/2010	1	50	NONE	1	1003063
1003063-6	SMP	JM-SS-03	SOIL	3/3/2010	1	50	NONE	1	1003063
1003063-8	SMP	RP-JM-SED	SEDIME	3/3/2010	1	50	NONE	1	1003063
1003063-9	SMP	RP-JM-SED-01	SEDIME	3/3/2010	1	50	NONE	1	1003063

QC Types

CAR	Carrier reference sample		DUP	Laboratory Duplicate
LCS	Laboratory Control Sample		LCSD	Laboratory Control Sample Duplicat
MB	Method Blank		MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate		REP	Sample replicate
RVS	Reporting Level Verification Standar		SMP	Field Sample
SYS	Sample Yield Spike			

20000750

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Wednesday, March 10, 2010

Supporting Raw Data

20000751

CYANIDE, TOTAL Raw Data Worksheet

Anal Run ID **CN100309-1A**

Anal Start Date **3/9/2010** JBM

Calib Ref ID **CNCAL100309-1**

Rw. C 3/10/10

Standard	Response	Soln Conc	Units
0	0.005	-0.001565333	mg/L
0.01	0.027	0.009818511	mg/L
0.05	0.104	0.04966196	mg/L
0.1	0.205	0.1019242	mg/L
0.2	0.397	0.2012741	mg/L
0.3	0.592	0.3021763	mg/L
0.4	0.771	0.3947994	mg/L
0.5	0.978	0.501911	mg/L

Slope	0.5174474
Intercept	-0.004152569
RSQ	0.9998255

Num	Don't Use	ReRun Num	Lab ID	QC Type	Anal Dil	Abs (578nm)	Soln Conc(mg/L)	pH	KI	Pb	Expected	%Rec	Prepared?
1	☐	0	ICV	ICV	1	0.2	0.09933691	NA	NA	NA	0.1	99	NO
2	☐	0	ICB	ICB	1	0.004	-0.0020828	NA	NA	NA			NO
3	☐	0	CN100309-1	MB	1	0.005	-0.0015653	NA	NA	NA			YES
4	☐	0	CN100309-1	LCS	1	0.773	0.3958343	NA	NA	NA			YES
5	☐	0	CN100309-1	LCSD	1	0.391	0.1981694	NA	NA	NA			YES
6	☐	0	1003063-4	SMP	1	0.006	-0.0010479	12	-	-			YES
7	☐	0	1003063-4	MS	1	0.205	0.1019242	12	-	-			YES
8	☐	0	1003063-4	MSD	1	0.199	0.09881947	12	-	-			YES
9	☐	0	1003063-7	SMP	1	0.006	-0.0010479	~10	-	-			YES
10	☐	0	1003063-10	SMP	1	0.007	-0.0005304	12	-	-			YES
11	☐	0	1003063-11	SMP	1	0.005	-0.0015653	12	-	-			YES
12	☐	0	1003063-15	SMP	1	0.008	-1.299E-05	12	-	-			YES
13	☐	0	CCV1	CCV	1	0.397	0.2012741	NA	NA	NA	0.2	101	NO
14	☐	0	CCB1	CCB	1	0.006	-0.0010479	NA	NA	NA			NO
15	☐	0	1003063-17	SMP	1	0.005	-0.0015653	12	-	-			YES
16	☐	0	1003063-18	SMP	1	0.007	-0.0005304	12	-	-			YES
17	☐	0	1003046-2	SMP	1	0.006	-0.0010479	12	-	-			YES
18	☐	0	1003046-5	SMP	1	0.007	-0.0005304	12	-	-			YES
19	☐	0	1003046-8	SMP	1	0.005	-0.0015653	12	-	-			YES
20	☐	0	1003046-11	SMP	1	0.006	-0.0010479	12	-	-			YES
21	☐	0	1003058-1	SMP	1	0.009	0.00050446	12	-	-			YES
22	☐	0	1003071-1	SMP	1	0.009	0.00050446	12	-	-			YES
23	☐	0	1003071-2	SMP	1	0.008	-1.299E-05	12	-	-			YES
24	☐	0	1003071-3	SMP	1	0.01	0.00102190	12	-	-			YES
25	☐	0	CCV2	CCV	1	0.396	0.2007566	NA	NA	NA	0.2	100	NO
26	☐	0	CCB2	CCB	1	0.005	-0.0015653	NA	NA	NA			NO

JBM

20000752

Anal Run ID **CN100309-1A**

Anal Start Date **3/9/2010**

Num	Don't Use	ReRun Num	Lab ID	QC Type	Anal Dil	Abs (578nm)	Soln Conc(mg/L)	pH	KI	Pb	Expected	%Rec	Prepared?

Comments: PREPPED 3/9/2010 0900-1100 (JBM)
ANALYZED 3/9/2010 1245-1300 (JBM) JBM

Standards, Batch QC, and Matrix Spike Information

ID	Parent ID	Parent Conc	Parent Vol.	Final Vol.
0.50 mg/L CN	*	10 mg/L CN	0.5	10
0.40 mg/L CN	*	10 mg/L CN	0.4	10
0.30 mg/L CN	*	10 mg/L CN	0.3	10
0.20 mg/L CN	*	10 mg/L CN	0.2	10
0.10 mg/L CN	*	10 mg/L CN	0.1	10
0.05 mg/L CN	*	10 mg/L CN	0.05	10
0.01 mg/L CN	*	10 mg/L CN	0.01	10
LCS(0.4mg/L CN)	*	10 mg/L CN	2	50
LCSD (0.2mg/L CN)	*	10 mg/L CN	1	50
MS/MSD (0.1mg/L CN)	*	10 mg/L CN	0.5	50
LCS (20mg/kg CN)	*	100 mg/kg CN	2	50
LCSD (10mg/kg CN)	*	100 mg/kg CN	1	50
MS/MSD (5mg/kg CN)	*	100 mg/kg CN	0.5	50
ICV (0.10 mg/L CN)	**	10 mg/L CN	0.1	10
CCV (0.20 mg/L CN)	*	10 mg/L CN	0.2	10
REAC LCS	***	1000 mg/L	10.0	100

Reagent List:

50% H2SO4	**RG091117-1**
0.25 N NaOH	**RG100308-1**
Sand	**RG090807-1**
NaH2PO4 Solution	**RG100305-3**
Chloramine-T Solution	**RG050411-1**
Pyridine-Barbituric Acid	**RG100126-2**
CN Parent Std(*)	**ST100205-1**
CN 2nd Source Std(**)	**ST100205-2**
51% MgCL2	
Acetate Buffer	
ZN Acetate Solution	

JBM 3/9/10

20000753

CYANIDE, TOTAL Raw Data Worksheet

Anal Run ID **CN100310-1A**

Anal Start Date **3/10/2010** JBM

Calib Ref ID **CNCAL100310-1**

Rw C 3/10/10

Standard	Response	Soln Conc	Units
0	0	-0.002230774	mg/L
0.01	0.022	0.007804675	mg/L
0.05	0.119	0.05205188	mg/L
0.1	0.232	0.1035976	mg/L
0.2	0.443	0.1998467	mg/L
0.3	0.665	0.3011135	mg/L
0.4	0.875	0.3969064	mg/L
0.5	1.103	0.5009102	mg/L

Slope	0.4561568
Intercept	-0.002230774
RSQ	0.9998446

Num	Don't Use	ReRun Num	Lab ID	QC Type	Anal Dil	Abs (578nm)	Soln Conc(mg/L)	pH	KI	Pb	Expected	%Rec	Prepared?
1	☐	0	ICV	ICV	1	0.224	0.09994835	NA	NA	NA	0.1	100	NO
2	☐	0	ICB	ICB	1	0.001	-0.0017746	NA	NA	NA			NO
3	☐	0	CN100310-1	MB	1	0.005	5.001E-05	NA	NA	NA			YES
4	☐	0	CN100310-1	LCS	1	0.884	0.4010118	NA	NA	NA			YES
5	☐	0	CN100310-1	LCSD	1	0.458	0.206689	NA	NA	NA			YES
6	☐	0	1003039-1	SMP	1	0.007	0.00096232	NA	NA	NA			YES
7	☐	0	1003063-1	SMP	1	0	-0.0022308	NA	NA	NA			YES
8	☐	0	1003063-2	SMP	1	0.007	0.00096232	NA	NA	NA			YES
9	☐	0	1003063-3	SMP	1	0.011	0.00278695	NA	NA	NA			YES
10	☑	0	1003063-5	SMP	1	0.036	0.01419087	NA	NA	NA			YES
11	☐	0	1003063-6	SMP	1	0.006	0.00050617	NA	NA	NA			YES
12	☐	0	1003063-8	SMP	1	0.013	0.00369926	NA	NA	NA			YES
13	☐	0	CCV1	CCV	1	0.446	0.2012151	NA	NA	NA	0.2	101	NO
14	☐	0	CCB1	CCB	1	0	-0.0022308	NA	NA	NA			NO
15	☐	0	1003063-9	SMP	1	0.003	-0.0008623	NA	NA	NA			YES
16	☐	0	1003063-12	SMP	1	0.001	-0.0017746	NA	NA	NA			YES
17	☐	0	1003063-13	SMP	1	0.004	-0.0004061	NA	NA	NA			YES
18	☐	0	1003063-14	SMP	1	0.004	-0.0004061	NA	NA	NA			YES
19	☐	0	1003063-16	SMP	1	0.005	5.001E-05	NA	NA	NA			YES
20	☐	0	1003063-16	MS	1	0.235	0.1049661	NA	NA	NA			YES
21	☐	0	1003063-16	MSD	1	0.221	0.09857988	NA	NA	NA			YES
22	☐	0	1003063-5	SMP	1	0.011	0.00278695	NA	NA	NA			YES
23	☐	0	CCV2	CCV	1	0.443	0.1998467	NA	NA	NA	0.2	100	NO
24	☐	0	CCB2	CCB	1	0	-0.0022308	NA	NA	NA			NO

20000754

Anal Run ID **CN100310-1A**

Anal Start Date **3/10/2010**

Num	Don't Use	ReRun Num	Lab ID	QC Type	Anal Dil	Abs (578nm)	Soln Conc(mg/L)	pH	KI	Pb	Expected	%Rec	Prepared?

Comments: PREPPED 3/10/2010 0830-1030 (JBM)
ANALYZED 3/10/2010 1400-1515 (JBM)

1003063-5 SAMPLE TURNED CLOUDY AFTER ADDITTION OF REAGENTS DURING COLORING, SAMPLE WAS FILTERED THROUGH A 0.45um IC FILTER.

SAMPLES 1003063-3,5,9,12,13,16 CONTAINED STANDING WATER JBM

Standards, Batch QC, and Matrix Spike Information

ID	Parent ID	Parent Conc	Parent Vol.	Final Vol.
0.50 mg/L CN	*	10 mg/L CN	0.5	10
0.40 mg/L CN	*	10 mg/L CN	0.4	10
0.30 mg/L CN	*	10 mg/L CN	0.3	10
0.20 mg/L CN	*	10 mg/L CN	0.2	10
0.10 mg/L CN	*	10 mg/L CN	0.1	10
0.05 mg/L CN	*	10 mg/L CN	0.05	10
0.01 mg/L CN	*	10 mg/L CN	0.01	10
LCS(0.4mg/L CN)	*	10 mg/L CN	2	50
LCSD (0.2mg/L CN)	*	10 mg/L CN	1	50
MS/MSD (0.1mg/L CN)	*	10 mg/L CN	0.5	50
LCS (20mg/kg CN)	*	100 mg/kg CN	2	50
LCSD (10mg/kg CN)	*	100 mg/kg CN	1	50
MS/MSD (5mg/kg CN)	*	100 mg/kg CN	0.5	50
ICV (0.10 mg/L CN)	**	10 mg/L CN	0.1	10
CCV (0.20 mg/L CN)	*	10 mg/L CN	0.2	10
REAC LCS	***	1000 mg/L	10.0	100

Reagent List:

50% H2SO4	**RG091117-1**
0.25 N NaOH	**RG100310-1**
Sand	**RG090807-1**
NaH2PO4 Solution	**RG100305-3**
Chloramine-T Solution	**RG050411-1**
Pyridine-Barbituric Acid	**RG100310-2**
CN Parent Std(*)	**ST100205-1**
CN 2nd Source Std(**)	**ST100205-2**
51% MgCL2	
Acetate Buffer	
ZN Acetate Solution	

JBM
3/10/10

20000755

Miscellaneous

20000756

Percent Moisture

Method SOP642 Revision 8

Lab Name: ALS Laboratory Group -- FC

Date Extracted: 03/06/2010
Date Analyzed: 03/06/2010
Analyst: Mike Lundgreen

Balance ID: 31
Oven ID: 17
In Oven: 3/5/2010 @ 3:15:00 PM
Out of Oven: 3/6/2010 @ 12:20:00 PM

Validated By: bch
Validation Date: 03/06/2010
Validation Time: 12:36:41 PM

Run ID	Prep Batch ID	QC Batch ID	Lab ID	QC Type	Dish Wt	Wet Wt	Dry Wt	Dry Wt-Dish Wt	Percent Moisture	Percent Solids	RPD
EX100305-1A	EX100305-1	EX100305-1-1	1003063-1	SMP	1.33	10.12	11.1	9.77	3.5	96.5	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-12	SMP	1.323	11.18	9.454	8.13	27.3	72.7	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-13	SMP	1.328	11.26	9.563	8.23	26.9	73.1	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-14	DUP	1.319	10.51	11.59	10.27	2.3	97.7	3
EX100305-1A	EX100305-1	EX100305-1-2	1003063-14	SMP	1.32	10.48	11.55	10.23	2.4	97.6	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-16	SMP	1.315	11.81	9.28	7.97	32.5	67.5	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-2	SMP	1.323	10.52	11.65	10.32	1.9	98.1	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-3	SMP	1.321	12.58	9.409	8.09	35.7	64.3	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-5	SMP	1.32	13.17	8.869	7.55	42.7	57.3	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-6	SMP	1.328	10.57	11.45	10.13	4.2	95.8	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-8	SMP	1.326	10.53	8.517	7.19	31.7	68.3	
EX100305-1A	EX100305-1	EX100305-1-2	1003063-9	SMP	1.322	11.08	9.404	8.08	27.1	72.9	
EX100305-1A	EX100305-1	EX100305-1-2	EX100305-1	MB	1.298	1.298	1.298	0.00	100.0	0.0	

QC Types

CAR	Carrier reference sample
LCS	Laboratory Control Sample
MB	Method Blank
MSD	Laboratory Matrix Spike Duplicate
RVS	Reporting Level Verification Standar
SYS	Sample Yield Spike

DUP	Laboratory Duplicate
LCSD	Laboratory Control Sample Duplicat
MS	Laboratory Matrix Spike
REP	Sample replicate
SMP	Field Sample

Comments:

DUP = Sample Duplicate
Wet Wt = Sample Wet Wt - Dish Wt
Dry Wt = Sample Dry Wt + Dish Wt
Dry Wt - Dish Wt = Sample Dry Wt - Dish Wt
All weight values shown above are expressed in grams.

$$RPD = \frac{(\text{Sample Value} - \text{Duplicate Value})}{2} \times 100$$

$$\%\ \text{Solids} = \frac{\text{Dry Weight}}{\text{Wet Weight}} \times 100$$

$$\%\ \text{Moisture} = \frac{(\text{Wet Weight} - \text{Dry Weight})}{\text{Wet Weight}} \times 100$$

20000757

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division
Fort Collins, Colorado

Metals

Case Narrative

Weston Solutions, Inc.

Paguate – TO0019100202

Work Order Number: 1003063

1. This report consists of 7 water samples, 5 soil samples, and 6 sediment samples.

2. The samples were received cool and intact by ALS on 03/05/10.

3. All water samples, with the exception of 1003063-7, had a pH less than 2 upon receipt. Due to lab error, the pH of sample 1003063-7 was not recorded upon receipt. This sample had a pH of 7 prior to digestion.

4. The samples were prepared for analysis based on SW-846, 3rd Edition procedures.

   Sediment was visible in water sample 1003063-7. This sample was decanted to avoid the sediment.

   All of the sediment samples contained standing water. These samples were stirred prior to aliquotting.

   For analysis by Trace ICP, the water samples were digested following method 3005A and SOP 806 Rev. 13. The soil and sediment samples were digested following method 3050B and SOP 806 Rev. 13.

   For analysis by Cold Vapor AA (CVAA), the water samples were digested following method 7470A and SOP 812 Rev. 14. The soil and sediment samples were digested following method 7471A and SOP 812 Rev. 14.

5. The samples were analyzed following SW-846, 3rd Edition procedures.

   20000758

   Analysis by Trace ICP followed method 6010B and SOP 834 Rev. 7.

   The relationship between intensity and concentration for each element is established using at least four standards, one of which is a blank solution.

During sample analysis concentrations are computed by the software and the results are printed in mg/L. The instrument software does not provide a printout which gives both intensity and concentration. The validity of the calibration equation is tested by analyzing the following solutions: a blank, a low level check solution with concentrations near the reporting limit, an Initial Calibration Verification (ICV) standard from a 2nd source standard solution with concentrations near the middle of the analytical range, a Continuing Calibration Verification (CCV) standard with concentrations at two times those in the ICV, and a readback of the highest calibration standard.

These solutions provide verification that the calibration equations are functioning properly throughout the analytical range of the instrument. During sample analysis dilutions are made for analytes found at concentrations above the highest calibration standard. No results are taken from extrapolations beyond the highest standard.

Water analysis by CVAA followed method 7470A and SOP 812 Rev. 14. Soil analysis by CVAA followed method 7471A and SOP 812 Rev. 14.

The relationship between intensity and concentration is determined daily, prior to sample analysis. At least five standards and a blank solution are analyzed to establish the calibration curve. The instrument software performs a linear regression to fit the calibration data to a curve of the form:

$$conc. = B * I + C$$

where: conc. = concentration

B = slope coefficient
I = intensity
C = intercept coefficient

A printout summarizing the calibration data supplies the calibration curve and correlation coefficient. During sample analysis both intensity and concentration values are printed. Dilutions are made for concentrations above the highest calibration standard. No results are taken from extrapolations above the highest standard.

6. All standards and solutions are NIST traceable and were used within their recommended shelf life.

7. The samples were prepared and analyzed within the established hold times.

All in house quality control procedures were followed, as described below.

8. General quality control procedures.

- A preparation (method) blank and laboratory control sample were digested and analyzed with the samples in each digestion batch. There were not more than 20 samples in each digestion batch.

- The preparation (method) blank associated with each digestion batch was below the reporting limit for the requested analytes, with the exception of iron in the method blank associated with the soil and sediment samples. The associated samples contained more than ten times the concentration of iron detected in the method blank, so no further action was taken.
- The laboratory control sample associated with each digestion batch was within the acceptance limits. This indicates complete digestions according to the method.
- All initial and continuing calibration blanks associated with each analytical batch were below the practical quantitation limits for the requested analytes.
- All initial and continuing calibration verifications associated with each analytical batch were within the acceptance criteria for the requested analytes. This indicates a valid calibration and stable instrument conditions.
- The interference check samples and high standard readbacks associated with Method 6010B were within acceptance criteria.

9. Matrix specific quality control procedures.

   Sample 1003063-4 was designated as the quality control sample for the water analyses. Sample 1003063-16 was designated as the quality control sample for the soil and sediment analyses.

   Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

   - A matrix spike and matrix spike duplicate were digested and analyzed with each batch. All acceptance criteria for accuracy were met with the following exceptions:

Analyte	Sample ID
Antimony	1003063-16MS & MSD
Calcium	1003063-16MS

     The native sample results are flagged for matrix spike failure and an analytical post spike was performed. The results of the spike were acceptable indicating that the matrix was not significantly affecting quantitation of these analytes.

   - Matrix spike recoveries could not be evaluated for the following analytes:

Analyte	Sample ID
Aluminum	1003063-16
Iron	1003063-16

     The concentrations of these analytes in the native sample were greater than four times the concentration of matrix spike added during the digestion. When sample concentration is that much greater than the spike added, spike recoveries may not be accurate. The laboratory control sample indicates that the digestion and analysis were in control.

     20000760

   - A sample duplicate and matrix spike duplicate were digested and analyzed with each batch. All acceptance criteria for precision were met.

     20000760

- A serial dilution was analyzed with each ICP batch. All acceptance criteria were met.

10. Sample 1003063-7 required a dilution to bring calcium, magnesium, and sodium into the analytical range of the Trace ICP.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Emily Knodel
Inorganics Primary Data Reviewer

03-15-10
Date

Inorganics Final Data Reviewer

3/15/10
Date

20000761

Inorganic Data Reporting Qualifiers

The following qualifiers are used by the laboratory when reporting results of inorganic analyses.

- Result qualifier -- If the analyte was analyzed for but not detected a “U” is entered.
- QC qualifier -- Specified entries and their meanings are as follows:

  E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

  M - Duplicate injection precision was not met.

  N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

  Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

  * - Duplicate analysis (relative percent difference) not within control limits.

Chain of Custody

20000763

ALS Laboratory Group -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1003063
Client Name: Weston Solutions, Inc.
Client Project Name: Paguate
Client Project Number: TO0019100202
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
JM-SS-04	1003063-1		SOIL	03-Mar-10	11:01
JM-SS-05	1003063-2		SOIL	03-Mar-10	10:40
RM-JM-SED	1003063-3		SEDIMEN	03-Mar-10	15:29
RP-SW-02	1003063-4		WATER	03-Mar-10	10:30
JM-SED-02	1003063-5		SOIL	03-Mar-10	15:35
JM-SS-03	1003063-6		SOIL	03-Mar-10	11:47
JM-SW-02	1003063-7		WATER	03-Mar-10	15:35
RP-JM-SED	1003063-8		SEDIMEN	03-Mar-10	14:32
RP-JM-SED-01	1003063-9		SEDIMEN	03-Mar-10	15:11
RP-JM-SW	1003063-10		WATER	03-Mar-10	14:32
RP-JM-SW-01	1003063-11		WATER	03-Mar-10	15:11
RP-SED-01	1003063-12		SEDIMEN	03-Mar-10	11:35
RP-SED-01D	1003063-13		SEDIMEN	03-Mar-10	11:35
JM-SS-01	1003063-14		SOIL	04-Mar-10	9:50
RM-JM-SW	1003063-15		WATER	03-Mar-10	15:29
RP-SED-02	1003063-16		SEDIMEN	03-Mar-10	10:30
RP-SW-01	1003063-17		WATER	03-Mar-10	11:35
RP-SW-01D	1003063-18		WATER	03-Mar-10	11:35

20000764

1003063

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0006

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
1	JM-SS-04	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	11:01	1	16 oz	4 C	46 uR/hr	
2	JM-SS-05	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	10:40	1	16 oz	4 C	109 uR/hr	
3	RM-JM-SED	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	15:29	1	16 oz	4 C	26 uR/hr	
4	RP-SW-02	TAL Metals + Mercury	3	Days	Water	3/3/2010	10:30	1	1 L poly	HNO3 pH<2	8 uR/hr	Y
	RP-SW-02	Total Cyanide	3	Days	Water	3/3/2010	10:30	1	250 mL	NaOH	8 uR/hr	Y
↓	RP-SW-02	Isotopic Uranium	3	Days	Water	3/3/2010	10:30	1	1 L poly	HNO3 pH<2	8 uR/hr	Y

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	[signature]	03.04.10	[signature]	3.5.10	0735						

20000765

1003063

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0007

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
5	JM-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	15:35	1	16 oz	4 C	20 uR/hr	
6	JM-SS-03	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/3/2010	11:47	1	16 oz	4 C	80 uR/hr	
7	JM-SW-02	TAL Metals + Mercury	3	Days	Water	3/3/2010	15:35	1	1 L poly	HNO3 pH<2	20 uR/hr	
↓	JM-SW-02	Total Cyanide	3	Days	Water	3/3/2010	15:35	1	250 mL	NaOH	20 uR/hr	
↓	JM-SW-02	Isotopic Uranium	3	Days	Water	3/3/2010	15:35	1	1 L poly	HNO3 pH<2	20 uR/hr	
8	RP-JM-SED	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	14:32	1	16 oz	4 C	27 uR/hr	
9	RP-JM-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	15:11	1	16 oz	4 C	19 uR/hr	
10	RP-JM-SW	TAL Metals + Mercury	3	Days	Water	3/3/2010	14:32	1	1 L poly	HNO3 pH<2	27 uR/hr	
↓	RP-JM-SW	Total Cyanide	3	Days	Water	3/3/2010	14:32	1	250 mL	NaOH	27 uR/hr	
↓	RP-JM-SW	Isotopic Uranium	3	Days	Water	3/3/2010	14:32	1	1 L poly	HNO3 pH<2	27 uR/hr	
11	RP-JM-SW-01	TAL Metals + Mercury	3	Days	Water	3/3/2010	15:11	1	1 L poly	HNO3 pH<2	19 uR/hr	
↓	RP-JM-SW-01	Total Cyanide	3	Days	Water	3/3/2010	15:11	1	250 mL	NaOH	19 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
		03.04.10		3.5.10	0735						

20000766

1003063

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0007

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
11	RP-JM-SW-01	Isotopic Uranium	3	Days	Water	3/3/2010	15:11	1	1 L poly	HNO3 pH<2	19 uR/hr	
12	RP-SED-01	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	11:35	1	16 oz	4 C	18 uR/hr	
13	RP-SED-01D	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	11:35	1	16 oz	4 C	8 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
		03.04.10		3.5.10	0735						

20000767

100363

CHAIN OF CUSTODY RECORD

No: TO0019100202-03/04/10-0008

Site #: TO0019100202

Contact Name: Weston Soloutions, Inc.

Lab: ALS

Contact Phone: Kristie Warr 832-444-7976

Lab Phone: 970.490.1511

Lab #	Sample #	Analyses	Analyses Turnaround Time	Analyses Turnaround Time Units	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Sample_Remarks	MS/MSD
14	JM-SS-01	TAL Metals + Hg + CN + Iso U	3	Days	Soil	3/4/2010	09:50	1	16 oz	4 C	56 uR/hr	
15	RM-JM-SW	TAL Metals + Mercury	3	Days	Water	3/3/2010	15:29	1	1 L poly	HNO3 pH<2	26 uR/hr	
	RM-JM-SW	Total Cyanide	3	Days	Water	3/3/2010	15:29	1	250 mL	NaOH	26 uR/hr	
	RM-JM-SW	Isotopic Uranium	3	Days	Water	3/3/2010	15:29	1	1 L poly	HNO3 pH<2	26 uR/hr	
16	RP-SED-02	TAL Metals + Hg + CN + Iso U	3	Days	Sediment	3/3/2010	10:30	1	16 oz	4 C	8 uR/hr	Y
17	RP-SW-01	TAL Metals + Mercury	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	
	RP-SW-01	Total Cyanide	3	Days	Water	3/3/2010	11:35	1	250 mL	NaOH	18 uR/hr	
	RP-SW-01	Isotopic Uranium	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	
18	RP-SW-01D	TAL Metals + Mercury	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	
	RP-SW-01D	Total Cyanide	3	Days	Water	3/3/2010	11:35	1	250 mL	NaOH	18 uR/hr	
	RP-SW-01D	Isotopic Uranium	3	Days	Water	3/3/2010	11:35	1	1 L poly	HNO3 pH<2	18 uR/hr	

Special Instructions: please email preliminary results to kristie.warr@westonsolutions.com and michelle.brown@westonsolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	Melinda Wuttke	03/04/10		3.5.10	0735						

20000768

ALS Laboratory Group - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003063

Project Manager: LRS Initials: LAS Date: 3.5.10

1.	Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2.	Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3.	Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4.	Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5.	Are the **COC and bottle labels complete and legible**?		(YES)	NO
6.	Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO) **
7.	Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8.	Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	N/A	YES	(NO) *
9.	Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10.	Is there **sufficient sample** for the requested analyses?		(YES)	NO
11.	Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12.	Are all samples within **holding times** for the requested analyses?		(YES)	NO
13.	Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14.	Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15.	Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16.	Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17.	Were the samples **shipped on ice**?		(YES)	NO
18.	Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** (#2) #4	RAD ONLY	(YES)	NO

Cooler #:	1	2	3						
Temperature (°C):	2.6	2.8	1.8						
No. of custody seals on cooler:	Ø	Ø	Ø						
DOT Survey/ Acceptance Information — External µR/hr reading:	14	14	13						
Background µR/hr reading:	11								

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES / NO / NA** (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

20000769

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: 3/5/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r22.xls (6/1/09)

ALS Laboratory Group - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Weston Workorder No: 1003063

Project Manager: LRS Initials: LAS Date: 3/5/10

Additional Information:

(6)(*) Sample 1003063-4 (RP-SW-02) came with MS/MSD bottles which were not marked on COC
Sample 1003063-16 (RP-SED-02) came with MS/MSD bottles which were not marked on COC Noted in far Right column.

(*) 1003063-7 (JM-SW-02) has heavy dark dusting in all 3 bottles Noted/h Settled decanti; Suspended incl. /h

(*) Maximum added, pH still not met Noted./h

Was the laboratory directed to proceed with the analysis of any samples yielding the presence of residual chlorine? **YES / NO / NA**

NOTE:

No pH adjustments shall be made without prior consent of Project Manager. After pH adjustments, hold metals and radchem samples ≥ 24 hrs. before analysis.

Was the pH of any sample adjusted by the laboratory? **YES** (See Table below) / **NO**

pH Excursion:

Laboratory Sample ID	Client Sample ID	Initial pH LAS 3/5/10	Final pH	Reagent Used	Volume Added (mL)	Lot No. of Reagent	Requested Analysis	Initials / Date / Time
1003063-4-2	RP-SW-02	≤10	>12	NaOH	1.0		CYAN	LAS 3/5/10 @ 1015
4-5	RP-SW-02 MS	10	↓	↓	↓	↓	↓	↓
4-8	RP-SW-02 MSD	↓	↓	↓	↓	↓	↓	↓
(*) 7-2	JM-SW-02	↓	10	↓	1.5	↓	↓	↓
10-2	RP-JM-SW	↓	>12	↓	1.0	↓	↓	↓
11-2	RP-JM-SW-01	↓	↓	↓	1.5	↓	↓	↓
15-2	RM-JM-SW	↓	↓	↓	1.0	↓	↓	↓
17-2	RP-SW-01	↓	↓	↓	↓	↓	↓	↓
18-2	RPSW-01D	↓	↓	↓	↓	↓	↓	↓ 20000770

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: _____ 3/5

1003063

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

J1810882228224

Ship Date: 04MAR10
ActWgt: 13.3 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

1.80 13 0-

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

3 of 3

MPS# 0263 7933 2472 5196

Mstr# 7933 2472 4970 0201

FRI - 05 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

505G1/F853/5FE8

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20000771

SGL

1003063

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

J1010102220224

Ship Date: 04MAR10
ActWgt: 13.3 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

1 of 3

TRK# 0201 7933 2472 4970

FRI - 05 MA A2
FIRST OVERNIGHT

MASTER

X1 FTCA

28°

80524
CO-US
DEN

505G1/F853/5FE0

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20000772

735

1003063

From: Origin ID: ADSA (469) 374-7700
Michelle Brown
Weston Solutions, Inc
14160 Dallas Parkway, Suite 850

Dallas, TX 75254

FedEx Express

J1010102220224

Ship Date: 04MAR10
ActWgt: 13.3 LB
CAD: 2557564/INET3010

Delivery Address Bar Code

Ref # 20406.016.019.0514.01
Invoice #
PO #
Dept #

14.0

SHIP TO: (970) 490-1511 BILL SENDER

Lance Steere
ALS Laboratory Group
225 Commerce Drive

Fort Collins, CO 80524

2 of 3

MPS# 0263 7933 2472 5038

Mstr# 7933 2472 4970 0201

FRI - 05 MAR A2
FIRST OVERNIGHT

80524
CO-US
DEN

X1 FTCA

26"

586G1/F653/5FE8

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

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20000773

Sample Results

20000774

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-02
Lab ID: 1003063-4

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.37	0.2		
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	140	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.61	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	90	1		
7439-96-5	MANGANESE	1	0.087	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	7.5	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	120	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

20000775

Data Package ID: *IT1003063-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: JM-SW-02
Lab ID: 1003063-7

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	3.5	0.2		
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	100	750	100		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.023	0.01		
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	10	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	100	1900	100		
7439-96-5	MANGANESE	1	1.3	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	57	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	100	1400	100		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.026	0.02		

20000776

Data Package ID: *IT1003063-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-JM-SW
Lab ID: 1003063-10

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.4	0.2		
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	130	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.74	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	52	1		
7439-96-5	MANGANESE	1	0.14	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	6.1	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	46	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

20000777

Data Package ID: *IT1003063-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-JM-SW-01
Lab ID: 1003063-11

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	130	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.33	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	74	1		
7439-96-5	MANGANESE	1	0.095	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	7	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	98	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

20000778

Data Package ID: *IT1003063-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RM-JM-SW
Lab ID: 1003063-15

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	130	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.2	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	90	1		
7439-96-5	MANGANESE	1	0.072	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	7.6	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	140	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

20000779

Data Package ID: *IT1003063-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-01
Lab ID: 1003063-17

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	140	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.4	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	93	1		
7439-96-5	MANGANESE	1	0.19	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	7.4	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	120	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

20000780

Data Package ID: *IT1003063-1*

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-01D
Lab ID: 1003063-18

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	140	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.41	0.1		
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	91	1		
7439-96-5	MANGANESE	1	0.19	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	7.4	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	120	1		
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

20000781

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: JM-SS-04
Lab ID: 1003063-1

Sample Matrix: SOIL
% Moisture: 3.5
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.012 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	2400	20		
7440-36-0	ANTIMONY	1	2	2	U	
7440-38-2	ARSENIC	1	2.9	1		
7440-39-3	BARIUM	1	22	10		
7440-41-7	BERYLLIUM	1	0.51	0.51	U	
7440-43-9	CADMIUM	1	0.51	0.51	U	
7440-70-2	CALCIUM	1	5000	100		
7440-47-3	CHROMIUM	1	1.6	1		
7440-48-4	COBALT	1	3.2	1		
7440-50-8	COPPER	1	9.5	1		
7439-89-6	IRON	1	6300	10		
7439-92-1	LEAD	1	6.4	0.31		
7439-95-4	MAGNESIUM	1	2900	100		
7439-96-5	MANGANESE	1	50	1		
7440-02-0	NICKEL	1	3.5	2		
7440-09-7	POTASSIUM	1	470	100		
7782-49-2	SELENIUM	1	0.51	0.51	U	
7440-22-4	SILVER	1	1	1	U	
7440-23-5	SODIUM	1	100	100	U	
7440-28-0	THALLIUM	1	1	1	U	
7440-62-2	VANADIUM	1	3.7	1		
7440-66-6	ZINC	1	46	2		

20000782

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: JM-SS-05
Lab ID: 1003063-2

Sample Matrix: SOIL
% Moisture: 1.9
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.005 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	1900	20		
7440-36-0	ANTIMONY	1	2	2	U	
7440-38-2	ARSENIC	1	1.6	1		
7440-39-3	BARIUM	1	30	10		
7440-41-7	BERYLLIUM	1	0.51	0.51	U	
7440-43-9	CADMIUM	1	0.51	0.51	U	
7440-70-2	CALCIUM	1	910	100		
7440-47-3	CHROMIUM	1	1.2	1		
7440-48-4	COBALT	1	1	1	U	
7440-50-8	COPPER	1	1.2	1		
7439-89-6	IRON	1	3700	10		
7439-92-1	LEAD	1	9.2	0.3		
7439-95-4	MAGNESIUM	1	730	100		
7439-96-5	MANGANESE	1	25	1		
7440-02-0	NICKEL	1	2	2	U	
7440-09-7	POTASSIUM	1	370	100		
7782-49-2	SELENIUM	1	0.51	0.51	U	
7440-22-4	SILVER	1	1	1	U	
7440-23-5	SODIUM	1	100	100	U	
7440-28-0	THALLIUM	1	1	1	U	
7440-62-2	VANADIUM	1	90	1		
7440-66-6	ZINC	1	3.3	2		

20000783

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RM-JM-SED
Lab ID: 1003063-3

Sample Matrix: SEDIMENT
% Moisture: 35.7
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.016 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	8100	31		
7440-36-0	ANTIMONY	1	3.1	3.1	U	
7440-38-2	ARSENIC	1	6.5	1.5		
7440-39-3	BARIUM	1	75	15		
7440-41-7	BERYLLIUM	1	0.77	0.77	U	
7440-43-9	CADMIUM	1	0.77	0.77	U	
7440-70-2	CALCIUM	1	18000	150		
7440-47-3	CHROMIUM	1	8.3	1.5		
7440-48-4	COBALT	1	6.4	1.5		
7440-50-8	COPPER	1	12	1.5		
7439-89-6	IRON	1	21000	15		
7439-92-1	LEAD	1	12	0.46		
7439-95-4	MAGNESIUM	1	5300	150		
7439-96-5	MANGANESE	1	220	1.5		
7440-02-0	NICKEL	1	13	3.1		
7440-09-7	POTASSIUM	1	1700	150		
7782-49-2	SELENIUM	1	0.77	0.77	U	
7440-22-4	SILVER	1	1.5	1.5	U	
7440-23-5	SODIUM	1	370	150		
7440-28-0	THALLIUM	1	1.5	1.5	U	
7440-62-2	VANADIUM	1	18	1.5		
7440-66-6	ZINC	1	44	3.1		

20000784

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: JM-SED-02
Lab ID: 1003063-5

Sample Matrix: SOIL
% Moisture: 42.7
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.035 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	6700	34		
7440-36-0	ANTIMONY	1	3.4	3.4	U	
7440-38-2	ARSENIC	1	10	1.7		
7440-39-3	BARIUM	1	32	17		
7440-41-7	BERYLLIUM	1	0.84	0.84	U	
7440-43-9	CADMIUM	1	0.84	0.84	U	
7440-70-2	CALCIUM	1	40000	170		
7440-47-3	CHROMIUM	1	5.8	1.7		
7440-48-4	COBALT	1	5.7	1.7		
7440-50-8	COPPER	1	8.2	1.7		
7439-89-6	IRON	1	17000	17		
7439-92-1	LEAD	1	10	0.51		
7439-95-4	MAGNESIUM	1	13000	170		
7439-96-5	MANGANESE	1	270	1.7		
7440-02-0	NICKEL	1	11	3.4		
7440-09-7	POTASSIUM	1	1700	170		
7782-49-2	SELENIUM	1	3.4	0.84		
7440-22-4	SILVER	1	1.7	1.7	U	
7440-23-5	SODIUM	1	2200	170		
7440-28-0	THALLIUM	1	1.7	1.7	U	
7440-62-2	VANADIUM	1	15	1.7		
7440-66-6	ZINC	1	36	3.4		

20000785

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: JM-SS-03
Lab ID: 1003063-6

Sample Matrix: SOIL
% Moisture: 4.2
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.005 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	3100	21		
7440-36-0	ANTIMONY	1	2.1	2.1	U	
7440-38-2	ARSENIC	1	2.9	1		
7440-39-3	BARIUM	1	58	10		
7440-41-7	BERYLLIUM	1	0.52	0.52	U	
7440-43-9	CADMIUM	1	0.52	0.52	U	
7440-70-2	CALCIUM	1	8700	100		
7440-47-3	CHROMIUM	1	3.2	1		
7440-48-4	COBALT	1	2.9	1		
7440-50-8	COPPER	1	3.9	1		
7439-89-6	IRON	1	9000	10		
7439-92-1	LEAD	1	8.3	0.31		
7439-95-4	MAGNESIUM	1	3000	100		
7439-96-5	MANGANESE	1	84	1		
7440-02-0	NICKEL	1	4.5	2.1		
7440-09-7	POTASSIUM	1	630	100		
7782-49-2	SELENIUM	1	1.9	0.52		
7440-22-4	SILVER	1	1	1	U	
7440-23-5	SODIUM	1	270	100		
7440-28-0	THALLIUM	1	1	1	U	
7440-62-2	VANADIUM	1	20	1		
7440-66-6	ZINC	1	16	2.1		

20000786

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-JM-SED
Lab ID: 1003063-8

Sample Matrix: SEDIMENT
% Moisture: 31.7
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.009 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	5900	29		
7440-36-0	ANTIMONY	1	2.9	2.9	U	
7440-38-2	ARSENIC	1	5.4	1.5		
7440-39-3	BARIUM	1	110	15		
7440-41-7	BERYLLIUM	1	0.73	0.73	U	
7440-43-9	CADMIUM	1	0.73	0.73	U	
7440-70-2	CALCIUM	1	15000	150		
7440-47-3	CHROMIUM	1	6	1.5		
7440-48-4	COBALT	1	5.5	1.5		
7440-50-8	COPPER	1	9.6	1.5		
7439-89-6	IRON	1	21000	15		
7439-92-1	LEAD	1	9.5	0.44		
7439-95-4	MAGNESIUM	1	4200	150		
7439-96-5	MANGANESE	1	240	1.5		
7440-02-0	NICKEL	1	10	2.9		
7440-09-7	POTASSIUM	1	1200	150		
7782-49-2	SELENIUM	1	0.93	0.73		
7440-22-4	SILVER	1	1.5	1.5	U	
7440-23-5	SODIUM	1	310	150		
7440-28-0	THALLIUM	1	1.5	1.5	U	
7440-62-2	VANADIUM	1	17	1.5		
7440-66-6	ZINC	1	40	2.9		

20000787

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-JM-SED-01
Lab ID: 1003063-9

Sample Matrix: SEDIMENT
% Moisture: 27.1
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.003 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	5000	27		
7440-36-0	ANTIMONY	1	2.7	2.7	U	
7440-38-2	ARSENIC	1	4.8	1.4		
7440-39-3	BARIUM	1	56	14		
7440-41-7	BERYLLIUM	1	0.68	0.68	U	
7440-43-9	CADMIUM	1	0.68	0.68	U	
7440-70-2	CALCIUM	1	38000	140		
7440-47-3	CHROMIUM	1	7.7	1.4		
7440-48-4	COBALT	1	5.2	1.4		
7440-50-8	COPPER	1	7.5	1.4		
7439-89-6	IRON	1	17000	14		
7439-92-1	LEAD	1	7.2	0.41		
7439-95-4	MAGNESIUM	1	4600	140		
7439-96-5	MANGANESE	1	180	1.4		
7440-02-0	NICKEL	1	11	2.7		
7440-09-7	POTASSIUM	1	950	140		
7782-49-2	SELENIUM	1	0.79	0.68		
7440-22-4	SILVER	1	1.4	1.4	U	
7440-23-5	SODIUM	1	300	140		
7440-28-0	THALLIUM	1	1.4	1.4	U	
7440-62-2	VANADIUM	1	18	1.4		
7440-66-6	ZINC	1	29	2.7		

20000788

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-01
Lab ID: 1003063-12

Sample Matrix: SEDIMENT
% Moisture: 27.3
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.023 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	4700	27		
7440-36-0	ANTIMONY	1	2.7	2.7	U	
7440-38-2	ARSENIC	1	4.3	1.3		
7440-39-3	BARIUM	1	66	13		
7440-41-7	BERYLLIUM	1	0.67	0.67	U	
7440-43-9	CADMIUM	1	0.67	0.67	U	
7440-70-2	CALCIUM	1	15000	130		
7440-47-3	CHROMIUM	1	6	1.3		
7440-48-4	COBALT	1	3.8	1.3		
7440-50-8	COPPER	1	5.9	1.3		
7439-89-6	IRON	1	13000	13		
7439-92-1	LEAD	1	8.3	0.4		
7439-95-4	MAGNESIUM	1	3700	130		
7439-96-5	MANGANESE	1	180	1.3		
7440-02-0	NICKEL	1	7	2.7		
7440-09-7	POTASSIUM	1	1000	130		
7782-49-2	SELENIUM	1	0.67	0.67	U	
7440-22-4	SILVER	1	1.3	1.3	U	
7440-23-5	SODIUM	1	190	130		
7440-28-0	THALLIUM	1	1.3	1.3	U	
7440-62-2	VANADIUM	1	14	1.3		
7440-66-6	ZINC	1	25	2.7		

20000789

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-01D
Lab ID: 1003063-13

Sample Matrix: SEDIMENT
% Moisture: 26.9
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.125 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	4300	24		
7440-36-0	ANTIMONY	1	2.4	2.4	U	
7440-38-2	ARSENIC	1	4.3	1.2		
7440-39-3	BARIUM	1	76	12		
7440-41-7	BERYLLIUM	1	0.61	0.61	U	
7440-43-9	CADMIUM	1	0.61	0.61	U	
7440-70-2	CALCIUM	1	17000	120		
7440-47-3	CHROMIUM	1	4.9	1.2		
7440-48-4	COBALT	1	3.9	1.2		
7440-50-8	COPPER	1	5.4	1.2		
7439-89-6	IRON	1	14000	12		
7439-92-1	LEAD	1	7.1	0.36		
7439-95-4	MAGNESIUM	1	3300	120		
7439-96-5	MANGANESE	1	200	1.2		
7440-02-0	NICKEL	1	7.3	2.4		
7440-09-7	POTASSIUM	1	930	120		
7782-49-2	SELENIUM	1	0.61	0.61	U	
7440-22-4	SILVER	1	1.2	1.2	U	
7440-23-5	SODIUM	1	180	120		
7440-28-0	THALLIUM	1	1.2	1.2	U	
7440-62-2	VANADIUM	1	13	1.2		
7440-66-6	ZINC	1	24	2.4		

20000790

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: JM-SS-01
Lab ID: 1003063-14

Sample Matrix: SOIL
% Moisture: 2.4
Date Collected: 04-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.015 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	1900	20		
7440-36-0	ANTIMONY	1	2	2	U	
7440-38-2	ARSENIC	1	2.9	1		
7440-39-3	BARIUM	1	53	10		
7440-41-7	BERYLLIUM	1	0.5	0.5	U	
7440-43-9	CADMIUM	1	0.5	0.5	U	
7440-70-2	CALCIUM	1	930	100		
7440-47-3	CHROMIUM	1	1	1	U	
7440-48-4	COBALT	1	1.7	1		
7440-50-8	COPPER	1	3.2	1		
7439-89-6	IRON	1	3400	10		
7439-92-1	LEAD	1	5.4	0.3		
7439-95-4	MAGNESIUM	1	780	100		
7439-96-5	MANGANESE	1	16	1		
7440-02-0	NICKEL	1	2	2	U	
7440-09-7	POTASSIUM	1	350	100		
7782-49-2	SELENIUM	1	1.6	0.5		
7440-22-4	SILVER	1	1	1	U	
7440-23-5	SODIUM	1	100	100	U	
7440-28-0	THALLIUM	1	1	1	U	
7440-62-2	VANADIUM	1	30	1		
7440-66-6	ZINC	1	4.9	2		

20000791

Data Package ID: *IT1003063-1*

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-02
Lab ID: 1003063-16

Sample Matrix: SEDIMENT
% Moisture: 32.5
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.022 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	6400	29		
7440-36-0	ANTIMONY	1	2.9	2.9	U	N
7440-38-2	ARSENIC	1	5.7	1.5		
7440-39-3	BARIUM	1	110	15		
7440-41-7	BERYLLIUM	1	0.73	0.73	U	
7440-43-9	CADMIUM	1	0.73	0.73	U	
7440-70-2	CALCIUM	1	22000	150		N
7440-47-3	CHROMIUM	1	6.4	1.5		
7440-48-4	COBALT	1	5.3	1.5		
7440-50-8	COPPER	1	9.3	1.5		
7439-89-6	IRON	1	17000	15		
7439-92-1	LEAD	1	11	0.44		
7439-95-4	MAGNESIUM	1	5100	150		
7439-96-5	MANGANESE	1	210	1.5		
7440-02-0	NICKEL	1	9.8	2.9		
7440-09-7	POTASSIUM	1	1400	150		
7782-49-2	SELENIUM	1	0.73	0.73	U	
7440-22-4	SILVER	1	1.5	1.5	U	
7440-23-5	SODIUM	1	270	150		
7440-28-0	THALLIUM	1	1.5	1.5	U	
7440-62-2	VANADIUM	1	16	1.5		
7440-66-6	ZINC	1	36	2.9		

20000792

Data Package ID: *IT1003063-1*

Total MERCURY

Method SW7470A

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003063
Reporting Basis: As Received
Prep Method: METHOD
Final Volume: 20 g
Matrix: WATER
Result Units: MG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
RP-SW-02	1003063-4	03/03/2010	03/08/2010	03/08/2010	N/A	1	0.0002	0.0002	U	20 g
JM-SW-02	1003063-7	03/03/2010	03/08/2010	03/08/2010	N/A	1	0.0002	0.0002	U	20 g
RP-JM-SW	1003063-10	03/03/2010	03/08/2010	03/08/2010	N/A	1	0.0002	0.0002	U	20 g
RP-JM-SW-01	1003063-11	03/03/2010	03/08/2010	03/08/2010	N/A	1	0.0002	0.0002	U	20 g
RM-JM-SW	1003063-15	03/03/2010	03/08/2010	03/08/2010	N/A	1	0.0002	0.0002	U	20 g
RP-SW-01	1003063-17	03/03/2010	03/08/2010	03/08/2010	N/A	1	0.0002	0.0002	U	20 g
RP-SW-01D	1003063-18	03/03/2010	03/08/2010	03/08/2010	N/A	1	0.0002	0.0002	U	20 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *HG1003063-1*

20000793

Total MERCURY

Method SW7471A

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003063
Reporting Basis: Dry Weight
Prep Method: METHOD
Final Volume: 100 g
Matrix: SEDIMENT
Result Units: MG/KG

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
RM-JM-SED	1003063-3	03/03/2010	03/08/2010	03/08/2010	35.7	1	0.051	0.051	U	0.608 g
RP-JM-SED	1003063-8	03/03/2010	03/08/2010	03/08/2010	31.7	1	0.049	0.049	U	0.602 g
RP-JM-SED-01	1003063-9	03/03/2010	03/08/2010	03/08/2010	27.1	1	0.045	0.045	U	0.609 g
RP-SED-01	1003063-12	03/03/2010	03/08/2010	03/08/2010	27.3	1	0.045	0.045	U	0.607 g
RP-SED-01D	1003063-13	03/03/2010	03/08/2010	03/08/2010	26.9	1	0.045	0.045	U	0.604 g
RP-SED-02	1003063-16	03/03/2010	03/08/2010	03/08/2010	32.5	1	0.049	0.049	U	0.6 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *HG1003063-1*

20000794

Total MERCURY

Method SW7471A

Sample Results

Lab Name: ALS Laboratory Group -- FC
Client Name: Weston Solutions, Inc.
Client Project ID: Paguate TO0019100202
Work Order Number: 1003063
Reporting Basis: Dry Weight
Prep Method: METHOD
Final Volume: 100 g
Matrix: SOIL
Result Units: MG/KG

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	Flag	Sample Aliquot
JM-SS-04	1003063-1	03/03/2010	03/08/2010	03/08/2010	3.5	1	0.034	0.034	U	0.604 g
JM-SS-05	1003063-2	03/03/2010	03/08/2010	03/08/2010	1.9	1	0.034	0.034	U	0.603 g
JM-SED-02	1003063-5	03/03/2010	03/08/2010	03/08/2010	42.7	1	0.058	0.058	U	0.606 g
JM-SS-03	1003063-6	03/03/2010	03/08/2010	03/08/2010	4.2	1	0.035	0.035	U	0.604 g
JM-SS-01	1003063-14	03/04/2010	03/08/2010	03/08/2010	2.4	1	0.034	0.034	U	0.605 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *HG1003063-1*

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Summary Report Forms

20000796

ICP Metals

Method SW6010B

Method Blank

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: IP100308-1MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: N/A
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-36-0	ANTIMONY	1	0.02	0.02	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	1	1	U	
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-92-1	LEAD	1	0.003	0.003	U	
7439-95-4	MAGNESIUM	1	1	1	U	
7439-96-5	MANGANESE	1	0.01	0.01	U	
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	1	1	U	
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-22-4	SILVER	1	0.01	0.01	U	
7440-23-5	SODIUM	1	1	1	U	
7440-28-0	THALLIUM	1	0.01	0.01	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

20000797

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010B

Method Blank

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: IP100308-4MB

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: N/A
File Name: 100309A.

Sample Aliquot: 1 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	20	20	U	
7440-36-0	ANTIMONY	1	2	2	U	
7440-38-2	ARSENIC	1	1	1	U	
7440-39-3	BARIUM	1	10	10	U	
7440-41-7	BERYLLIUM	1	0.5	0.5	U	
7440-43-9	CADMIUM	1	0.5	0.5	U	
7440-70-2	CALCIUM	1	100	100	U	
7440-47-3	CHROMIUM	1	1	1	U	
7440-48-4	COBALT	1	1	1	U	
7440-50-8	COPPER	1	1	1	U	
7439-89-6	IRON	1	10	10		
7439-92-1	LEAD	1	0.3	0.3	U	
7439-95-4	MAGNESIUM	1	100	100	U	
7439-96-5	MANGANESE	1	1	1	U	
7440-02-0	NICKEL	1	2	2	U	
7440-09-7	POTASSIUM	1	100	100	U	
7782-49-2	SELENIUM	1	0.5	0.5	U	
7440-22-4	SILVER	1	1	1	U	
7440-23-5	SODIUM	1	100	100	U	
7440-28-0	THALLIUM	1	1	1	U	
7440-62-2	VANADIUM	1	1	1	U	
7440-66-6	ZINC	1	2	2	U	

20000798

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010B

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: IP100308-1LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/08/2010
Date Analyzed: 03/09/2010
Prep Method: SW3005A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: N/A
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7429-90-5	ALUMINUM	2	2.13	0.2		107	80 - 120%
7440-36-0	ANTIMONY	0.5	0.51	0.02		102	80 - 120%
7440-38-2	ARSENIC	2	2.11	0.01		105	80 - 120%
7440-39-3	BARIUM	2	2.02	0.1		101	80 - 120%
7440-41-7	BERYLLIUM	0.05	0.0498	0.005		100	80 - 120%
7440-43-9	CADMIUM	0.05	0.0504	0.005		101	80 - 120%
7440-70-2	CALCIUM	40	41.7	1		104	80 - 120%
7440-47-3	CHROMIUM	0.2	0.199	0.01		100	80 - 120%
7440-48-4	COBALT	0.5	0.499	0.01		100	80 - 120%
7440-50-8	COPPER	0.25	0.262	0.01		105	80 - 120%
7439-89-6	IRON	1	1.04	0.1		104	80 - 120%
7439-92-1	LEAD	0.5	0.487	0.003		97	80 - 120%
7439-95-4	MAGNESIUM	40	42.3	1		106	80 - 120%
7439-96-5	MANGANESE	0.5	0.494	0.01		99	80 - 120%
7440-02-0	NICKEL	0.5	0.502	0.02		100	80 - 120%
7440-09-7	POTASSIUM	40	38.7	1		97	80 - 120%
7782-49-2	SELENIUM	2	2.09	0.005		104	80 - 120%
7440-22-4	SILVER	0.1	0.102	0.01		102	80 - 120%
7440-23-5	SODIUM	40	38.5	1		96	80 - 120%
7440-28-0	THALLIUM	2	2.12	0.01		106	80 - 120%
7440-62-2	VANADIUM	0.5	0.505	0.01		101	80 - 120%
7440-66-6	ZINC	0.5	0.491	0.02		98	80 - 120%

20000799

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010

Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Lab ID: IP100308-4LCS

Sample Matrix: SEDIMENT
% Moisture: N/A
Date Collected: N/A
Date Extracted: 03/08/2010
Date Analyzed: 03/09/2010
Prep Method: SW3050B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: N/A
File Name: 100309A.

Sample Aliquot: 1 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7429-90-5	ALUMINUM	200	206	20		103	80 - 120%
7440-36-0	ANTIMONY	50	48.1	2		96	80 - 120%
7440-38-2	ARSENIC	200	198	1		99	80 - 120%
7440-39-3	BARIUM	200	197	10		99	80 - 120%
7440-41-7	BERYLLIUM	5	4.7	0.5		94	80 - 120%
7440-43-9	CADMIUM	5	4.83	0.5		97	80 - 120%
7440-70-2	CALCIUM	4000	3990	100		100	80 - 120%
7440-47-3	CHROMIUM	20	19.3	1		96	80 - 120%
7440-48-4	COBALT	50	48	1		96	80 - 120%
7440-50-8	COPPER	25	25.9	1		104	80 - 120%
7439-89-6	IRON	100	103	10		103	80 - 120%
7439-92-1	LEAD	50	46.5	0.3		93	80 - 120%
7439-95-4	MAGNESIUM	4000	4030	100		101	80 - 120%
7439-96-5	MANGANESE	50	47.4	1		95	80 - 120%
7440-02-0	NICKEL	50	48.1	2		96	80 - 120%
7440-09-7	POTASSIUM	4000	3760	100		94	80 - 120%
7782-49-2	SELENIUM	200	188	0.5		94	80 - 120%
7440-22-4	SILVER	10	9.7	1		97	80 - 120%
7440-23-5	SODIUM	4000	3680	100		92	80 - 120%
7440-28-0	THALLIUM	200	202	1		101	80 - 120%
7440-62-2	VANADIUM	50	49	1		98	80 - 120%
7440-66-6	ZINC	50	45.9	2		92	80 - 120%

20000800

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-02
LabID: 1003063-16MS

Sample Matrix: SEDIMENT
% Moisture: 32.5
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1.04 g
Final Volume: 100 ml
Result Units: MG/KG
File Name: 100309A.

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7429-90-5	ALUMINUM	6400		9900		28.5	285	1244	80 - 120%
7440-36-0	ANTIMONY	2.85	U	32.6	N	2.85	71.3	46	80 - 120%
7440-38-2	ARSENIC	5.7		274		1.43	285	94	80 - 120%
7440-39-3	BARIUM	110		374		14.3	285	93	80 - 120%
7440-41-7	BERYLLIUM	0.713	U	7		0.713	7.13	98	80 - 120%
7440-43-9	CADMIUM	0.713	U	6.62		0.713	7.13	93	80 - 120%
7440-70-2	CALCIUM	22000		26700	N	143	5700	75	80 - 120%
7440-47-3	CHROMIUM	6.4		33.7		1.43	28.5	96	80 - 120%
7440-48-4	COBALT	5.3		69.6		1.43	71.3	90	80 - 120%
7440-50-8	COPPER	9.3		45.7		1.43	35.6	102	80 - 120%
7439-89-6	IRON	17000		16900		14.3	143	-266	80 - 120%
7439-92-1	LEAD	11		71.9		0.428	71.3	86	80 - 120%
7439-95-4	MAGNESIUM	5100		10700		143	5700	97	80 - 120%
7439-96-5	MANGANESE	210		270		1.43	71.3	80	80 - 120%
7440-02-0	NICKEL	9.8		74.1		2.85	71.3	90	80 - 120%
7440-09-7	POTASSIUM	1400		7140		143	5700	101	80 - 120%
7782-49-2	SELENIUM	0.713	U	255		0.713	285	89	80 - 120%
7440-22-4	SILVER	1.43	U	13.3		1.43	14.3	94	80 - 120%
7440-23-5	SODIUM	270		5850		143	5700	98	80 - 120%
7440-28-0	THALLIUM	1.43	U	273		1.43	285	96	80 - 120%
7440-62-2	VANADIUM	16		83		1.43	71.3	95	80 - 120%
7440-66-6	ZINC	36		93.4		2.85	71.3	80	80 - 120%

20000801

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-02
LabID: 1003063-16MSD

Sample Matrix: SEDIMENT
% Moisture: 32.5
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3050 Rev B

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1.004 g
Final Volume: 100 ml
Result Units: MG/KG
File Name: 100309A.

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7429-90-5	ALUMINUM	10800		295	1494	29.5	20	8
7440-36-0	ANTIMONY	31.9	N	73.8	43	2.95	20	2
7440-38-2	ARSENIC	289		295	96	1.48	20	5
7440-39-3	BARIUM	393		295	96	14.8	20	5
7440-41-7	BERYLLIUM	7.46		7.38	101	0.738	20	6
7440-43-9	CADMIUM	7.08		7.38	96	0.738	20	7
7440-70-2	CALCIUM	29200		5910	116	148	20	9
7440-47-3	CHROMIUM	36.1		29.5	101	1.48	20	7
7440-48-4	COBALT	73.6		73.8	93	1.48	20	6
7440-50-8	COPPER	48.1		36.9	105	1.48	20	5
7439-89-6	IRON	18800		148	1026	14.8	20	11
7439-92-1	LEAD	76.3		73.8	89	0.443	20	6
7439-95-4	MAGNESIUM	11600		5910	109	148	20	8
7439-96-5	MANGANESE	289		73.8	102	1.48	20	7
7440-02-0	NICKEL	79.4		73.8	94	2.95	20	7
7440-09-7	POTASSIUM	7490		5910	104	148	20	5
7782-49-2	SELENIUM	265		295	90	0.738	20	4
7440-22-4	SILVER	14.1		14.8	95	1.48	20	5
7440-23-5	SODIUM	6090		5910	99	148	20	4
7440-28-0	THALLIUM	289		295	98	1.48	20	5
7440-62-2	VANADIUM	88.6		73.8	99	1.48	20	6
7440-66-6	ZINC	101		73.8	88	2.95	20	8

20000802

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010

Analytical Spike Sample Recovery

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-02

LabID: 1003063-16A

Run ID: IT100310-2A1

Date Analyzed: 10-Mar-10

Result Units: mg/l

Target Analyte	Sample Result	Samp Qual	PS Result	PS Qual	Spike Added	PS % Rec.	Control Limits
ANTIMONY	0.0200	U	0.460		0.5	92	75 - 125%
CALCIUM	154		219		80	81	75 - 125%

20000803

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-02
LabID: 1003063-4MS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
File Name: 100309A.

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7429-90-5	ALUMINUM	0.37		2.7		0.2	2	117	80 - 120%
7440-36-0	ANTIMONY	0.02	U	0.511		0.02	0.5	102	80 - 120%
7440-38-2	ARSENIC	0.01	U	2.11		0.01	2	105	80 - 120%
7440-39-3	BARIUM	0.1	U	2.05		0.1	2	102	80 - 120%
7440-41-7	BERYLLIUM	0.005	U	0.0482		0.005	0.05	96	80 - 120%
7440-43-9	CADMIUM	0.005	U	0.0501		0.005	0.05	100	80 - 120%
7440-70-2	CALCIUM	140		182		1	40	112	80 - 120%
7440-47-3	CHROMIUM	0.01	U	0.192		0.01	0.2	96	80 - 120%
7440-48-4	COBALT	0.01	U	0.483		0.01	0.5	97	80 - 120%
7440-50-8	COPPER	0.01	U	0.266		0.01	0.25	106	80 - 120%
7439-89-6	IRON	0.61		1.64		0.1	1	103	80 - 120%
7439-92-1	LEAD	0.003	U	0.473		0.003	0.5	95	80 - 120%
7439-95-4	MAGNESIUM	90		134		1	40	111	80 - 120%
7439-96-5	MANGANESE	0.087		0.567		0.01	0.5	96	80 - 120%
7440-02-0	NICKEL	0.02	U	0.483		0.02	0.5	97	80 - 120%
7440-09-7	POTASSIUM	7.5		54.3		1	40	117	80 - 120%
7782-49-2	SELENIUM	0.005	U	2.1		0.005	2	105	80 - 120%
7440-22-4	SILVER	0.01	U	0.102		0.01	0.1	102	80 - 120%
7440-23-5	SODIUM	120		163		1	40	107	80 - 120%
7440-28-0	THALLIUM	0.01	U	2.08		0.01	2	104	80 - 120%
7440-62-2	VANADIUM	0.01	U	0.495		0.01	0.5	99	80 - 120%
7440-66-6	ZINC	0.02	U	0.465		0.02	0.5	93	80 - 120%

20000804

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-02
LabID: 1003063-4MSD

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03-Mar-10
Date Extracted: 08-Mar-10
Date Analyzed: 09-Mar-10
Prep Method: SW3005 Rev A

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
File Name: 100309A.

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7429-90-5	ALUMINUM	2.63		2	113	0.2	20	3
7440-36-0	ANTIMONY	0.495		0.5	99	0.02	20	3
7440-38-2	ARSENIC	2.03		2	102	0.01	20	3
7440-39-3	BARIUM	2		2	100	0.1	20	2
7440-41-7	BERYLLIUM	0.0464		0.05	93	0.005	20	4
7440-43-9	CADMIUM	0.0484		0.05	97	0.005	20	3
7440-70-2	CALCIUM	175		40	95	1	20	4
7440-47-3	CHROMIUM	0.186		0.2	93	0.01	20	3
7440-48-4	COBALT	0.466		0.5	93	0.01	20	4
7440-50-8	COPPER	0.261		0.25	104	0.01	20	2
7439-89-6	IRON	1.59		1	98	0.1	20	3
7439-92-1	LEAD	0.456		0.5	91	0.003	20	4
7439-95-4	MAGNESIUM	129		40	99	1	20	4
7439-96-5	MANGANESE	0.548		0.5	92	0.01	20	3
7440-02-0	NICKEL	0.467		0.5	93	0.02	20	3
7440-09-7	POTASSIUM	53.3		40	115	1	20	2
7782-49-2	SELENIUM	2.03		2	102	0.005	20	3
7440-22-4	SILVER	0.1		0.1	100	0.01	20	2
7440-23-5	SODIUM	158		40	97	1	20	3
7440-28-0	THALLIUM	2.01		2	101	0.01	20	3
7440-62-2	VANADIUM	0.481		0.5	96	0.01	20	3
7440-66-6	ZINC	0.443		0.5	89	0.02	20	5

20000805

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010

Duplicate Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-02
Lab ID: 1003063-16D

Sample Matrix: SEDIMENT
% Moisture: 32.5
Date Collected: 03/03/2010
Date Extracted: 03/08/2010
Date Analyzed: 03/09/2010

Prep Batch: IP100308-4
QCBatchID: IP100308-4-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: Dry Weight
File Name: 100309A.

Sample Aliquot: 1.007 g
Final Volume: 100 ml
Result Units: MG/KG
Clean DF: 1

CASNO	Target Analyte	Sample Result	Samp Qual	Duplicate Result	Dup Qual	Reporting Limit	Dilution Factor	RPD	RPD Limit
7429-90-5	ALUMINUM	6400		6450		29.4	1	1	20
7440-36-0	ANTIMONY	2.94	U	2.94	U	2.94	1		20
7440-38-2	ARSENIC	5.7		5.84		1.47	1		20
7440-39-3	BARIUM	110		107		14.7	1	2	20
7440-41-7	BERYLLIUM	0.736	U	0.736	U	0.736	1		20
7440-43-9	CADMIUM	0.736	U	0.736	U	0.736	1		20
7440-70-2	CALCIUM	22000		21500		147	1	4	20
7440-47-3	CHROMIUM	6.4		6.31		1.47	1		20
7440-48-4	COBALT	5.3		5.3		1.47	1		20
7440-50-8	COPPER	9.3		9.4		1.47	1	1	20
7439-89-6	IRON	17000		16700		14.7	1	4	20
7439-92-1	LEAD	11		10.4		0.442	1	3	20
7439-95-4	MAGNESIUM	5100		5010		147	1	3	20
7439-96-5	MANGANESE	210		211		1.47	1	1	20
7440-02-0	NICKEL	9.8		9.83		2.94	1		20
7440-09-7	POTASSIUM	1400		1380		147	1	1	20
7782-49-2	SELENIUM	0.736	U	0.802		0.736	1		20
7440-22-4	SILVER	1.47	U	1.47	U	1.47	1		20
7440-23-5	SODIUM	270		274		147	1		20
7440-28-0	THALLIUM	1.47	U	1.47	U	1.47	1		20
7440-62-2	VANADIUM	16		15.5		1.47	1	0	20
7440-66-6	ZINC	36		34.6		2.94	1	5	20

20000806

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010

Duplicate Sample Results

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-02
Lab ID: 1003063-4D

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 03/03/2010
Date Extracted: 03/08/2010
Date Analyzed: 03/09/2010

Prep Batch: IP100308-1
QCBatchID: IP100308-1-1
Run ID: IT100309-2A1
Cleanup: NONE
Basis: As Received
File Name: 100309A.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Sample Result	Samp Qual	Duplicate Result	Dup Qual	Reporting Limit	Dilution Factor	RPD	RPD Limit
7429-90-5	ALUMINUM	0.37		0.373		0.2	1		20
7440-36-0	ANTIMONY	0.02	U	0.02	U	0.02	1		20
7440-38-2	ARSENIC	0.01	U	0.01	U	0.01	1		20
7440-39-3	BARIUM	0.1	U	0.1	U	0.1	1		20
7440-41-7	BERYLLIUM	0.005	U	0.005	U	0.005	1		20
7440-43-9	CADMIUM	0.005	U	0.005	U	0.005	1		20
7440-70-2	CALCIUM	140		135		1	1	2	20
7440-47-3	CHROMIUM	0.01	U	0.01	U	0.01	1		20
7440-48-4	COBALT	0.01	U	0.01	U	0.01	1		20
7440-50-8	COPPER	0.01	U	0.01	U	0.01	1		20
7439-89-6	IRON	0.61		0.59		0.1	1	3	20
7439-92-1	LEAD	0.003	U	0.003	U	0.003	1		20
7439-95-4	MAGNESIUM	90		88.4		1	1	2	20
7439-96-5	MANGANESE	0.087		0.0852		0.01	1	2	20
7440-02-0	NICKEL	0.02	U	0.02	U	0.02	1		20
7440-09-7	POTASSIUM	7.5		7.43		1	1	1	20
7782-49-2	SELENIUM	0.005	U	0.005	U	0.005	1		20
7440-22-4	SILVER	0.01	U	0.01	U	0.01	1		20
7440-23-5	SODIUM	120		119		1	1	1	20
7440-28-0	THALLIUM	0.01	U	0.01	U	0.01	1		20
7440-62-2	VANADIUM	0.01	U	0.01	U	0.01	1		20
7440-66-6	ZINC	0.02	U	0.02	U	0.02	1		20

20000807

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010

Serial Dilution

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Field ID: RP-SED-02
Lab ID: 1003063-16L

Run ID: IT100309-2A1
Date Analyzed: 09-Mar-10
Result Units: mg/l

CASNO	Target Analyte	Sample Result	Samp Qual	SD Result	SD Qual	EPA Qualifier	%D
7429-90-5	ALUMINUM	43.8		43.6			0
7440-36-0	ANTIMONY	0.0200	U	0.100	U		
7440-38-2	ARSENIC	0.0391		0.0500	U		
7440-39-3	BARIUM	0.753		0.747			
7440-41-7	BERYLLIUM	0.00500	U	0.0250	U		
7440-43-9	CADMIUM	0.00500	U	0.0250	U		
7440-70-2	CALCIUM	154		148			4
7440-47-3	CHROMIUM	0.0439		0.0500	U		
7440-48-4	COBALT	0.0367		0.0500	U		
7440-50-8	COPPER	0.0640		0.0528			
7439-89-6	IRON	119		110			7
7439-92-1	LEAD	0.0738		0.0758			3
7439-95-4	MAGNESIUM	35.5		35.3			0
7439-96-5	MANGANESE	1.47		1.49			1
7440-02-0	NICKEL	0.0676		0.100	U		
7440-09-7	POTASSIUM	9.44		6.17			
7782-49-2	SELENIUM	0.00500	U	0.0250	U		
7440-22-4	SILVER	0.0100	U	0.0500	U		
7440-23-5	SODIUM	1.89		5.00	U		
7440-28-0	THALLIUM	0.0100	U	0.0500	U		
7440-62-2	VANADIUM	0.107		0.105			2
7440-66-6	ZINC	0.250		0.252			1

20000808

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010

Serial Dilution

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 1003063

Client Name: Weston Solutions, Inc.

ClientProject ID: Paguate TO0019100202

Field ID: RP-SW-02
Lab ID: 1003063-4L

Run ID: IT100309-2A1
Date Analyzed: 09-Mar-10
Result Units: mg/l

CASNO	Target Analyte	Sample Result	Samp Qual	SD Result	SD Qual	EPA Qualifier	%D
7429-90-5	ALUMINUM	0.366		1.00	U		
7440-36-0	ANTIMONY	0.0200	U	0.100	U		
7440-38-2	ARSENIC	0.0100	U	0.0500	U		
7440-39-3	BARIUM	0.100	U	0.500	U		
7440-41-7	BERYLLIUM	0.00500	U	0.0250	U		
7440-43-9	CADMIUM	0.00500	U	0.0250	U		
7440-70-2	CALCIUM	137		136			1
7440-47-3	CHROMIUM	0.0100	U	0.0500	U		
7440-48-4	COBALT	0.0100	U	0.0500	U		
7440-50-8	COPPER	0.0100	U	0.0500	U		
7439-89-6	IRON	0.608		0.614			
7439-92-1	LEAD	0.00300	U	0.0150	U		
7439-95-4	MAGNESIUM	89.9		89.4			1
7439-96-5	MANGANESE	0.0867		0.0878			
7440-02-0	NICKEL	0.0200	U	0.100	U		
7440-09-7	POTASSIUM	7.52		5.00	U		
7782-49-2	SELENIUM	0.00500	U	0.0250	U		
7440-22-4	SILVER	0.0100	U	0.0500	U		
7440-23-5	SODIUM	120		118			2
7440-28-0	THALLIUM	0.0100	U	0.0500	U		
7440-62-2	VANADIUM	0.0100	U	0.0500	U		
7440-66-6	ZINC	0.0200	U	0.100	U		

20000809

Data Package ID: *IT1003063-1*

Prep Batch ID: IP100308-1

Start Date: 03/08/10
Start Time: 11:25
Prep Analyst: Preston Mathiesen

End Date: 03/08/10
End Time: 17:10

Concentration Method: NONE
Extract Method: SW3005A
Initial Volume Units: g
Final Volume Units: g

Batch Created By: plm
Date Created: 03/08/10
Time Created: 11:39
Validated By: plm
Date Validated: 03/08/10
Time Validated: 19:45

Comments:

QC Batch ID: IP100308-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP100308-1	RVS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003063
IP100308-1	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003063
IP100308-1	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1003063
1003063-4	MS	RP-SW-02	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-4	MSD	RP-SW-02	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-4	DUP	RP-SW-02	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-10	SMP	RP-JM-SW	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-11	SMP	RP-JM-SW-01	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-15	SMP	RM-JM-SW	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-17	SMP	RP-SW-01	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-18	SMP	RP-SW-01D	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-4	SMP	RP-SW-02	WATER	3/3/2010	50	50	NONE	1	1003063
1003063-7	SMP	JM-SW-02	WATER	3/3/2010	50	50	NONE	1	1003063

QC Types

CAR	Carrier reference sample		DUP	Laboratory Duplicate
LCS	Laboratory Control Sample		LCSD	Laboratory Control Sample Duplicat
MB	Method Blank		MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate		REP	Sample replicate
RVS	Reporting Level Verification Standar		SMP	Field Sample
SYS	Sample Yield Spike			

20000810

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Wednesday, March 10, 2010

Prep Batch ID: IP100308-4

Start Date: 03/08/10
Start Time: 15:20
Prep Analyst: Preston Mathiesen

End Date: 03/08/10
End Time: 18:45

Concentration Method: NONE
Extract Method: SW3050B
Initial Volume Units: g
Final Volume Units: ml

Batch Created By: plm
Date Created: 03/08/10
Time Created: 15:27
Validated By: plm
Date Validated: 03/08/10
Time Validated: 20:48

Comments:

QC Batch ID: IP100308-4-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP100308-4	RVS	XXXXXX	SEDIME	XXXXXX	1	100	NONE	1	1003063
IP100308-4	MB	XXXXXX	SEDIME	XXXXXX	1	100	NONE	1	1003063
IP100308-4	LCS	XXXXXX	SEDIME	XXXXXX	1	100	NONE	1	1003063
1003063-16	MS	RP-SED-02	SEDIME	3/3/2010	1.04	100	NONE	1	1003063
1003063-16	MSD	RP-SED-02	SEDIME	3/3/2010	1.004	100	NONE	1	1003063
1003063-16	DUP	RP-SED-02	SEDIME	3/3/2010	1.007	100	NONE	1	1003063
1003063-1	SMP	JM-SS-04	SOIL	3/3/2010	1.012	100	NONE	1	1003063
1003063-12	SMP	RP-SED-01	SEDIME	3/3/2010	1.023	100	NONE	1	1003063
1003063-13	SMP	RP-SED-01D	SEDIME	3/3/2010	1.125	100	NONE	1	1003063
1003063-14	SMP	JM-SS-01	SOIL	3/4/2010	1.015	100	NONE	1	1003063
1003063-16	SMP	RP-SED-02	SEDIME	3/3/2010	1.022	100	NONE	1	1003063
1003063-2	SMP	JM-SS-05	SOIL	3/3/2010	1.005	100	NONE	1	1003063
1003063-3	SMP	RM-JM-SED	SEDIME	3/3/2010	1.016	100	NONE	1	1003063
1003063-5	SMP	JM-SED-02	SOIL	3/3/2010	1.035	100	NONE	1	1003063
1003063-6	SMP	JM-SS-03	SOIL	3/3/2010	1.005	100	NONE	1	1003063
1003063-8	SMP	RP-JM-SED	SEDIME	3/3/2010	1.009	100	NONE	1	1003063
1003063-9	SMP	RP-JM-SED-01	SEDIME	3/3/2010	1.003	100	NONE	1	1003063

QC Types

CAR	Carrier reference sample		DUP	Laboratory Duplicate
LCS	Laboratory Control Sample		LCSD	Laboratory Control Sample Duplicat
MB	Method Blank		MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate		REP	Sample replicate
RVS	Reporting Level Verification Standar		SMP	Field Sample
SYS	Sample Yield Spike			

20000811

ALS Laboratory Group -- FC

LIMS Version: 6.335A

Date Printed: Wednesday, March 10, 2010

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: ICV
QC Type: Initial Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 11:12
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	25	26.2	0.2		105	90 - 110%
7440-36-0	ANTIMONY	0.25	0.261	0.02		105	90 - 110%
7440-38-2	ARSENIC	0.25	0.269	0.01		108	90 - 110%
7440-39-3	BARIUM	0.5	0.518	0.1		104	90 - 110%
7440-41-7	BERYLLIUM	0.25	0.265	0.005		106	90 - 110%
7440-43-9	CADMIUM	0.25	0.259	0.005		104	90 - 110%
7440-70-2	CALCIUM	25	26.2	1		105	90 - 110%
7440-47-3	CHROMIUM	0.5	0.527	0.01		105	90 - 110%
7440-48-4	COBALT	0.25	0.266	0.01		106	90 - 110%
7440-50-8	COPPER	0.5	0.533	0.01		107	90 - 110%
7439-89-6	IRON	10	10.7	0.1		107	90 - 110%
7439-92-1	LEAD	0.5	0.513	0.003		103	90 - 110%
7439-95-4	MAGNESIUM	25	26.6	1		106	90 - 110%
7439-96-5	MANGANESE	0.5	0.522	0.01		104	90 - 110%
7440-02-0	NICKEL	0.5	0.534	0.02		107	90 - 110%
7440-09-7	POTASSIUM	25	25.4	1		102	90 - 110%
7782-49-2	SELENIUM	0.5	0.526	0.005		105	90 - 110%
7440-22-4	SILVER	0.1	0.104	0.01		104	90 - 110%
7440-23-5	SODIUM	25	25.8	1		103	90 - 110%
7440-28-0	THALLIUM	0.25	0.267	0.01		107	90 - 110%
7440-62-2	VANADIUM	0.25	0.256	0.01		102	90 - 110%
7440-66-6	ZINC	0.5	0.544	0.02		109	90 - 110%

20000812

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV1
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 11:21
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.8	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.49	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.5	0.501	0.01		100	90 - 110%
7440-39-3	BARIUM	1	0.973	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.49	0.005		98	90 - 110%
7440-43-9	CADMIUM	0.5	0.488	0.005		98	90 - 110%
7440-70-2	CALCIUM	50	49.2	1		98	90 - 110%
7440-47-3	CHROMIUM	1	0.977	0.01		98	90 - 110%
7440-48-4	COBALT	0.5	0.492	0.01		98	90 - 110%
7440-50-8	COPPER	1	1	0.01		100	90 - 110%
7439-89-6	IRON	20	20.2	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.953	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	50.2	1		100	90 - 110%
7439-96-5	MANGANESE	1	0.97	0.01		97	90 - 110%
7440-02-0	NICKEL	1	0.982	0.02		98	90 - 110%
7440-09-7	POTASSIUM	50	49.8	1		100	90 - 110%
7782-49-2	SELENIUM	1	0.983	0.005		98	90 - 110%
7440-22-4	SILVER	0.2	0.197	0.01		99	90 - 110%
7440-23-5	SODIUM	50	49	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.5	0.01		100	90 - 110%
7440-62-2	VANADIUM	0.5	0.479	0.01		96	90 - 110%
7440-66-6	ZINC	1	1	0.02		100	90 - 110%

20000813

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV2
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 11:43
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.7	0.2		99	90 - 110%
7440-36-0	ANTIMONY	0.5	0.495	0.02		99	90 - 110%
7440-38-2	ARSENIC	0.5	0.508	0.01		102	90 - 110%
7440-39-3	BARIUM	1	0.973	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.499	0.005		100	90 - 110%
7440-43-9	CADMIUM	0.5	0.496	0.005		99	90 - 110%
7440-70-2	CALCIUM	50	50.1	1		100	90 - 110%
7440-47-3	CHROMIUM	1	0.992	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.5	0.01		100	90 - 110%
7440-50-8	COPPER	1	1.01	0.01		101	90 - 110%
7439-89-6	IRON	20	20.4	0.1		102	90 - 110%
7439-92-1	LEAD	1	0.972	0.003		97	90 - 110%
7439-95-4	MAGNESIUM	50	51	1		102	90 - 110%
7439-96-5	MANGANESE	1	0.979	0.01		98	90 - 110%
7440-02-0	NICKEL	1	1.01	0.02		101	90 - 110%
7440-09-7	POTASSIUM	50	49.7	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.993	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		100	90 - 110%
7440-23-5	SODIUM	50	48.4	1		97	90 - 110%
7440-28-0	THALLIUM	0.5	0.511	0.01		102	90 - 110%
7440-62-2	VANADIUM	0.5	0.484	0.01		97	90 - 110%
7440-66-6	ZINC	1	1.02	0.02		102	90 - 110%

20000814

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV3
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 12:05
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	48.9	0.2		98	90 - 110%
7440-36-0	ANTIMONY	0.5	0.487	0.02		97	90 - 110%
7440-38-2	ARSENIC	0.5	0.495	0.01		99	90 - 110%
7440-39-3	BARIUM	1	0.965	0.1		96	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.475	0.005		95	90 - 110%
7440-43-9	CADMIUM	0.5	0.487	0.005		97	90 - 110%
7440-70-2	CALCIUM	50	47.8	1		96	90 - 110%
7440-47-3	CHROMIUM	1	0.949	0.01		95	90 - 110%
7440-48-4	COBALT	0.5	0.48	0.01		96	90 - 110%
7440-50-8	COPPER	1	1	0.01		100	90 - 110%
7439-89-6	IRON	20	19.6	0.1		98	90 - 110%
7439-92-1	LEAD	1	0.917	0.003		92	90 - 110%
7439-95-4	MAGNESIUM	50	48.6	1		97	90 - 110%
7439-96-5	MANGANESE	1	0.939	0.01		94	90 - 110%
7440-02-0	NICKEL	1	0.979	0.02		98	90 - 110%
7440-09-7	POTASSIUM	50	49.6	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.958	0.005		96	90 - 110%
7440-22-4	SILVER	0.2	0.195	0.01		97	90 - 110%
7440-23-5	SODIUM	50	48.4	1		97	90 - 110%
7440-28-0	THALLIUM	0.5	0.494	0.01		99	90 - 110%
7440-62-2	VANADIUM	0.5	0.468	0.01		94	90 - 110%
7440-66-6	ZINC	1	0.95	0.02		95	90 - 110%

20000815

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV4
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 12:26
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	48.9	0.2		98	90 - 110%
7440-36-0	ANTIMONY	0.5	0.486	0.02		97	90 - 110%
7440-38-2	ARSENIC	0.5	0.498	0.01		100	90 - 110%
7440-39-3	BARIUM	1	0.964	0.1		96	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.483	0.005		97	90 - 110%
7440-43-9	CADMIUM	0.5	0.491	0.005		98	90 - 110%
7440-70-2	CALCIUM	50	48.9	1		98	90 - 110%
7440-47-3	CHROMIUM	1	0.966	0.01		97	90 - 110%
7440-48-4	COBALT	0.5	0.487	0.01		97	90 - 110%
7440-50-8	COPPER	1	0.998	0.01		100	90 - 110%
7439-89-6	IRON	20	19.9	0.1		99	90 - 110%
7439-92-1	LEAD	1	0.935	0.003		94	90 - 110%
7439-95-4	MAGNESIUM	50	49.5	1		99	90 - 110%
7439-96-5	MANGANESE	1	0.95	0.01		95	90 - 110%
7440-02-0	NICKEL	1	0.992	0.02		99	90 - 110%
7440-09-7	POTASSIUM	50	49.1	1		98	90 - 110%
7782-49-2	SELENIUM	1	0.962	0.005		96	90 - 110%
7440-22-4	SILVER	0.2	0.196	0.01		98	90 - 110%
7440-23-5	SODIUM	50	48	1		96	90 - 110%
7440-28-0	THALLIUM	0.5	0.506	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.474	0.01		95	90 - 110%
7440-66-6	ZINC	1	0.974	0.02		97	90 - 110%

20000816

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV5
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 12:48
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50.1	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.506	0.02		101	90 - 110%
7440-38-2	ARSENIC	0.5	0.516	0.01		103	90 - 110%
7440-39-3	BARIUM	1	0.986	0.1		99	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.493	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.508	0.005		102	90 - 110%
7440-70-2	CALCIUM	50	50	1		100	90 - 110%
7440-47-3	CHROMIUM	1	0.986	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.501	0.01		100	90 - 110%
7440-50-8	COPPER	1	1.03	0.01		103	90 - 110%
7439-89-6	IRON	20	20.3	0.1		102	90 - 110%
7439-92-1	LEAD	1	0.95	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	50.6	1		101	90 - 110%
7439-96-5	MANGANESE	1	0.967	0.01		97	90 - 110%
7440-02-0	NICKEL	1	1.04	0.02		104	90 - 110%
7440-09-7	POTASSIUM	50	50.2	1		100	90 - 110%
7782-49-2	SELENIUM	1	0.994	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.2	0.01		100	90 - 110%
7440-23-5	SODIUM	50	48.8	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.522	0.01		104	90 - 110%
7440-62-2	VANADIUM	0.5	0.484	0.01		97	90 - 110%
7440-66-6	ZINC	1	0.989	0.02		99	90 - 110%

20000817

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV6
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 13:10
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	50	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.488	0.02		98	90 - 110%
7440-38-2	ARSENIC	0.5	0.502	0.01		100	90 - 110%
7440-39-3	BARIUM	1	0.976	0.1		98	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.495	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.488	0.005		98	90 - 110%
7440-70-2	CALCIUM	50	49.6	1		99	90 - 110%
7440-47-3	CHROMIUM	1	0.986	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.497	0.01		99	90 - 110%
7440-50-8	COPPER	1	1.01	0.01		101	90 - 110%
7439-89-6	IRON	20	20.3	0.1		101	90 - 110%
7439-92-1	LEAD	1	0.963	0.003		96	90 - 110%
7439-95-4	MAGNESIUM	50	50.7	1		101	90 - 110%
7439-96-5	MANGANESE	1	0.977	0.01		98	90 - 110%
7440-02-0	NICKEL	1	0.989	0.02		99	90 - 110%
7440-09-7	POTASSIUM	50	49.6	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.994	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.197	0.01		99	90 - 110%
7440-23-5	SODIUM	50	49	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.503	0.01		101	90 - 110%
7440-62-2	VANADIUM	0.5	0.482	0.01		96	90 - 110%
7440-66-6	ZINC	1	1.01	0.02		101	90 - 110%

20000818

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV7
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 13:32
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.8	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.493	0.02		99	90 - 110%
7440-38-2	ARSENIC	0.5	0.509	0.01		102	90 - 110%
7440-39-3	BARIUM	1	0.974	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.5	0.005		100	90 - 110%
7440-43-9	CADMIUM	0.5	0.494	0.005		99	90 - 110%
7440-70-2	CALCIUM	50	50.2	1		100	90 - 110%
7440-47-3	CHROMIUM	1	0.995	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.502	0.01		100	90 - 110%
7440-50-8	COPPER	1	1.01	0.01		101	90 - 110%
7439-89-6	IRON	20	20.3	0.1		102	90 - 110%
7439-92-1	LEAD	1	0.969	0.003		97	90 - 110%
7439-95-4	MAGNESIUM	50	51.2	1		102	90 - 110%
7439-96-5	MANGANESE	1	0.978	0.01		98	90 - 110%
7440-02-0	NICKEL	1	1	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	49.4	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.991	0.005		99	90 - 110%
7440-22-4	SILVER	0.2	0.199	0.01		100	90 - 110%
7440-23-5	SODIUM	50	48.8	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.517	0.01		103	90 - 110%
7440-62-2	VANADIUM	0.5	0.485	0.01		97	90 - 110%
7440-66-6	ZINC	1	1.02	0.02		102	90 - 110%

20000819

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV8
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 13:52
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.8	0.2		100	90 - 110%
7440-36-0	ANTIMONY	0.5	0.493	0.02		99	90 - 110%
7440-38-2	ARSENIC	0.5	0.509	0.01		102	90 - 110%
7440-39-3	BARIUM	1	0.974	0.1		97	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.493	0.005		99	90 - 110%
7440-43-9	CADMIUM	0.5	0.495	0.005		99	90 - 110%
7440-70-2	CALCIUM	50	49.8	1		100	90 - 110%
7440-47-3	CHROMIUM	1	0.986	0.01		99	90 - 110%
7440-48-4	COBALT	0.5	0.497	0.01		99	90 - 110%
7440-50-8	COPPER	1	1.01	0.01		101	90 - 110%
7439-89-6	IRON	20	20.1	0.1		100	90 - 110%
7439-92-1	LEAD	1	0.957	0.003		96	90 - 110%
7439-95-4	MAGNESIUM	50	50.7	1		101	90 - 110%
7439-96-5	MANGANESE	1	0.966	0.01		97	90 - 110%
7440-02-0	NICKEL	1	1	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	49.6	1		99	90 - 110%
7782-49-2	SELENIUM	1	0.977	0.005		98	90 - 110%
7440-22-4	SILVER	0.2	0.2	0.01		100	90 - 110%
7440-23-5	SODIUM	50	48.8	1		98	90 - 110%
7440-28-0	THALLIUM	0.5	0.511	0.01		102	90 - 110%
7440-62-2	VANADIUM	0.5	0.481	0.01		96	90 - 110%
7440-66-6	ZINC	1	1	0.02		100	90 - 110%

20000820

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV9
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 14:17
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.3	0.2		99	90 - 110%
7440-36-0	ANTIMONY	0.5	0.465	0.02		93	90 - 110%
7440-38-2	ARSENIC	0.5	0.487	0.01		97	90 - 110%
7440-39-3	BARIUM	1	0.954	0.1		95	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.49	0.005		98	90 - 110%
7440-43-9	CADMIUM	0.5	0.46	0.005		92	90 - 110%
7440-70-2	CALCIUM	50	47.9	1		96	90 - 110%
7440-47-3	CHROMIUM	1	0.972	0.01		97	90 - 110%
7440-48-4	COBALT	0.5	0.486	0.01		97	90 - 110%
7440-50-8	COPPER	1	0.977	0.01		98	90 - 110%
7439-89-6	IRON	20	19.8	0.1		99	90 - 110%
7439-92-1	LEAD	1	0.954	0.003		95	90 - 110%
7439-95-4	MAGNESIUM	50	49.8	1		100	90 - 110%
7439-96-5	MANGANESE	1	0.966	0.01		97	90 - 110%
7440-02-0	NICKEL	1	0.924	0.02		92	90 - 110%
7440-09-7	POTASSIUM	50	48.7	1		97	90 - 110%
7782-49-2	SELENIUM	1	0.98	0.005		98	90 - 110%
7440-22-4	SILVER	0.2	0.193	0.01		97	90 - 110%
7440-23-5	SODIUM	50	48.5	1		97	90 - 110%
7440-28-0	THALLIUM	0.5	0.488	0.01		98	90 - 110%
7440-62-2	VANADIUM	0.5	0.474	0.01		95	90 - 110%
7440-66-6	ZINC	1	1.02	0.02		102	90 - 110%

20000821

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV10
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 14:38
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	49.7	0.2		99	90 - 110%
7440-36-0	ANTIMONY	0.5	0.482	0.02		96	90 - 110%
7440-38-2	ARSENIC	0.5	0.503	0.01		101	90 - 110%
7440-39-3	BARIUM	1	0.963	0.1		96	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.505	0.005		101	90 - 110%
7440-43-9	CADMIUM	0.5	0.474	0.005		95	90 - 110%
7440-70-2	CALCIUM	50	49.7	1		99	90 - 110%
7440-47-3	CHROMIUM	1	1	0.01		100	90 - 110%
7440-48-4	COBALT	0.5	0.501	0.01		100	90 - 110%
7440-50-8	COPPER	1	0.991	0.01		99	90 - 110%
7439-89-6	IRON	20	20.4	0.1		102	90 - 110%
7439-92-1	LEAD	1	0.978	0.003		98	90 - 110%
7439-95-4	MAGNESIUM	50	51.5	1		103	90 - 110%
7439-96-5	MANGANESE	1	0.99	0.01		99	90 - 110%
7440-02-0	NICKEL	1	0.963	0.02		96	90 - 110%
7440-09-7	POTASSIUM	50	48.7	1		97	90 - 110%
7782-49-2	SELENIUM	1	1	0.005		100	90 - 110%
7440-22-4	SILVER	0.2	0.198	0.01		99	90 - 110%
7440-23-5	SODIUM	50	48.6	1		97	90 - 110%
7440-28-0	THALLIUM	0.5	0.502	0.01		100	90 - 110%
7440-62-2	VANADIUM	0.5	0.484	0.01		97	90 - 110%
7440-66-6	ZINC	1	1.06	0.02		106	90 - 110%

20000822

Data Package ID:

ICP Metals

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCV11
QC Type: Continuing Calibration

File Name: 100309A.

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 14:49
Result Units: MG/L

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
7429-90-5	ALUMINUM	50	51.6	0.2		103	90 - 110%
7440-36-0	ANTIMONY	0.5	0.496	0.02		99	90 - 110%
7440-38-2	ARSENIC	0.5	0.52	0.01		104	90 - 110%
7440-39-3	BARIUM	1	1	0.1		100	90 - 110%
7440-41-7	BERYLLIUM	0.5	0.516	0.005		103	90 - 110%
7440-43-9	CADMIUM	0.5	0.49	0.005		98	90 - 110%
7440-70-2	CALCIUM	50	51	1		102	90 - 110%
7440-47-3	CHROMIUM	1	1.02	0.01		102	90 - 110%
7440-48-4	COBALT	0.5	0.515	0.01		103	90 - 110%
7440-50-8	COPPER	1	1.03	0.01		103	90 - 110%
7439-89-6	IRON	20	21	0.1		105	90 - 110%
7439-92-1	LEAD	1	1	0.003		100	90 - 110%
7439-95-4	MAGNESIUM	50	52.9	1		106	90 - 110%
7439-96-5	MANGANESE	1	1.01	0.01		101	90 - 110%
7440-02-0	NICKEL	1	1	0.02		100	90 - 110%
7440-09-7	POTASSIUM	50	50	1		100	90 - 110%
7782-49-2	SELENIUM	1	1.05	0.005		105	90 - 110%
7440-22-4	SILVER	0.2	0.202	0.01		101	90 - 110%
7440-23-5	SODIUM	50	49.8	1		100	90 - 110%
7440-28-0	THALLIUM	0.5	0.517	0.01		103	90 - 110%
7440-62-2	VANADIUM	0.5	0.498	0.01		100	90 - 110%
7440-66-6	ZINC	1	1.08	0.02		108	90 - 110%

20000823

Data Package ID:

ANTIMONY

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: IT100310-2A1
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
ICV	Initial Calibration	3/10/2010	10:42	0.25	0.252	0.02	N/A	101	90 - 110
CCV1	Continuing Calibration	3/10/2010	10:51	0.5	0.48	0.02	N/A	96	90 - 110
CCV2	Continuing Calibration	3/10/2010	11:13	0.5	0.486	0.02	N/A	97	90 - 110
CCV3	Continuing Calibration	3/10/2010	11:35	0.5	0.486	0.02	N/A	97	90 - 110
CCV4	Continuing Calibration	3/10/2010	11:57	0.5	0.481	0.02	N/A	96	90 - 110
CCV5	Continuing Calibration	3/10/2010	12:15	0.5	0.488	0.02	N/A	98	90 - 110
CCV6	Continuing Calibration	3/10/2010	13:37	0.5	0.468	0.02	N/A	94	90 - 110
CCV7	Continuing Calibration	3/10/2010	13:58	0.5	0.468	0.02	N/A	94	90 - 110
CCV8	Continuing Calibration	3/10/2010	14:20	0.5	0.477	0.02	N/A	95	90 - 110
CCV9	Continuing Calibration	3/10/2010	14:42	0.5	0.485	0.02	N/A	97	90 - 110
CCV10	Continuing Calibration	3/10/2010	15:03	0.5	0.476	0.02	N/A	95	90 - 110
CCV11	Continuing Calibration	3/10/2010	15:25	0.5	0.469	0.02	N/A	94	90 - 110
CCV12	Continuing Calibration	3/10/2010	15:48	0.5	0.477	0.02	N/A	95	90 - 110
CCV13	Continuing Calibration	3/10/2010	15:58	0.5	0.488	0.02	N/A	98	90 - 110

CALCIUM

Method SW6010

Calibration Verifications

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Run ID: IT100310-2A1
Result Units: MG/L

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
ICV	Initial Calibration	3/10/2010	10:42	25	24.7	1	N/A	99	90 - 110
CCV1	Continuing Calibration	3/10/2010	10:51	50	48.2	1	N/A	96	90 - 110
CCV2	Continuing Calibration	3/10/2010	11:13	50	48.8	1	N/A	98	90 - 110
CCV3	Continuing Calibration	3/10/2010	11:35	50	48.7	1	N/A	97	90 - 110
CCV4	Continuing Calibration	3/10/2010	11:57	50	48.7	1	N/A	97	90 - 110
CCV5	Continuing Calibration	3/10/2010	12:15	50	49.2	1	N/A	98	90 - 110
CCV6	Continuing Calibration	3/10/2010	13:37	50	47.8	1	N/A	96	90 - 110
CCV7	Continuing Calibration	3/10/2010	13:58	50	47.8	1	N/A	96	90 - 110
CCV8	Continuing Calibration	3/10/2010	14:20	50	48	1	N/A	96	90 - 110
CCV9	Continuing Calibration	3/10/2010	14:42	50	48.6	1	N/A	97	90 - 110
CCV10	Continuing Calibration	3/10/2010	15:03	50	47.8	1	N/A	96	90 - 110
CCV11	Continuing Calibration	3/10/2010	15:25	50	47.1	1	N/A	94	90 - 110
CCV12	Continuing Calibration	3/10/2010	15:48	50	48.5	1	N/A	97	90 - 110
CCV13	Continuing Calibration	3/10/2010	15:58	50	49	1	N/A	98	90 - 110

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: ICB
QC Type: Initial Calibration

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 11:13:00 AM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000826

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB1
QC Type: Continuing Calibration

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 11:24:00 AM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000827

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB2
QC Type: Continuing Calibration

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 11:45:00 AM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000828

Data Package ID: *IT1003063-1*

ICP Metals

Method SW6010

Calibration Blanks

Lab Name: ALS Laboratory Group -- FC
Work Order Number: 1003063
Client Name: Weston Solutions, Inc.
ClientProject ID: Paguate TO0019100202

Lab ID: CCB3
QC Type: Continuing Calibration

Run ID: IT100309-2A1
Date Analyzed: 03/09/2010
Time Analyzed: 12:06:00 PM
Result Units: MG/L

CASNO	Target Analyte	Result	Reporting Limit	Result Qualifier
7429-90-5	ALUMINUM	0.2	0.2	U
7440-36-0	ANTIMONY	0.02	0.02	U
7440-38-2	ARSENIC	0.01	0.01	U
7440-39-3	BARIUM	0.1	0.1	U
7440-41-7	BERYLLIUM	0.005	0.005	U
7440-43-9	CADMIUM	0.005	0.005	U
7440-70-2	CALCIUM	1	1	U
7440-47-3	CHROMIUM	0.01	0.01	U
7440-48-4	COBALT	0.01	0.01	U
7440-50-8	COPPER	0.01	0.01	U
7439-89-6	IRON	0.1	0.1	U
7439-92-1	LEAD	0.003	0.003	U
7439-95-4	MAGNESIUM	1	1	U
7439-96-5	MANGANESE	0.01	0.01	U
7440-02-0	NICKEL	0.02	0.02	U
7440-09-7	POTASSIUM	1	1	U
7782-49-2	SELENIUM	0.005	0.005	U
7440-22-4	SILVER	0.01	0.01	U
7440-23-5	SODIUM	1	1	U
7440-28-0	THALLIUM	0.01	0.01	U
7440-62-2	VANADIUM	0.01	0.01	U
7440-66-6	ZINC	0.02	0.02	U

20000829

Data Package ID: *IT1003063-1*