Groundwater Monitoring Report

2012 Additional Groundwater Sampling Event

West Lake Landfill Operable Unit-1

Prepared for

The United States Environmental Protection Agency Region VII

Prepared on behalf of

The West Lake Landfill OU-1 Respondents

Prepared by

Engineering Management Support, Inc.
7220 West Jefferson Avenue, Suite 406
Lakewood, Colorado 80235

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EXECUTIVE SUMMARY

In May 2012 the U.S. Environmental Protection Agency, Region VII (EPA) directed the West Lake Landfill Operable Unit-1 (OU-1) Respondents to perform an additional round of groundwater sampling at the West Lake Landfill Superfund Site (site). EPA indicated that, following consultation with the National Remedy Review Board, it believed additional groundwater monitoring was necessary to verify that current groundwater conditions are consistent with prior sampling performed in 1995, 1996, and 1997 as part of the Remedial Investigation, and in 2004 as part of the Feasibility Study. These prior rounds of groundwater sampling formed part of the basis for EPA's May 2008 Record of Decision (ROD) concerning the site, which at pages 20-21 determined that:

> The alluvial groundwater underlying and in the immediate vicinity of [OU-1] Areas 1 and 2 and other [OU-2] landfill units have been sampled and analyzed over time. For radionuclides and metals, both filtered and unfiltered samples were analyzed to evaluate dissolved versus colloidal transport. The results generally show sporadic and isolated detections of a small number of contaminants at relatively low concentration levels. These results are not indicative of on-site contaminant plumes, radial migration, or other forms of contiguous groundwater contamination that might be attributable to the landfill units being investigated. . . .

This Groundwater Monitoring Report summarizes the results of the 2012 additional groundwater sampling event. The new event sampled all available groundwater monitoring wells at the site, including wells for OU-1 (the areas of the site containing radiologically-impacted material [RIM]), and for OU-2 (the remainder of the site which contains landfilled solid waste but not RIM). The sampling tested for three "radiological" materials (uranium, thorium and radium), and three types of "conventional" landfill contaminants (priority pollutant trace metals, volatile organic compounds [VOCs], and semivolatile organic compounds [SVOCs]).

The results of this new 2012 sampling event support EPA's May 2008 ROD conclusion: isolated and sporadic detections of a small number of radiological and conventional contaminants exist in site groundwater, but no contiguous plumes of radiological or conventional groundwater contaminants are present underneath the site or migrating from the site.

With respect to radionuclides, uranium is not present in site groundwater above its respective EPA-established Maximum Contaminant Level (MCL), and thorium is also present only at low levels.

Two forms of radium are present in the site groundwater: Radium-226 and Radium-228. EPA's MCL for radium is set at 5 picocuries per liter for the combination of Radium-226 plus Radium-228. Both Radium-228 and Radium-226 naturally occur in soil and rock, and published scientific studies indicate that the highest levels of combined radium found in national groundwater sampling events are located in a five state region which includes Missouri. Radium-228 generally is not present at levels above background in the RIM previously sampled at OU-1, and therefore any elevated levels of Radium-228 found in site groundwater are not attributable to the OU-1 RIM. With respect to Radium-226, the highest levels of Radium-226

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were found in bedrock monitoring wells upgradient of those areas of the site which contain RIM. The absence of any spatial relationship between the RIM locations and the radium exceedances indicates that the Radium-226 and Radium-228 found in site groundwater are of natural origin. There are no locations where multiple wells placed near each other all displayed high radium levels or where the sampling results produced a pattern of spatially-linked increasing or decreasing radium results that would suggest a discrete source or sources for radium other than the site's natural media – i.e, the rock and soil surrounding the landfills.

Similarly, although there were isolated occurrences of trace metal, VOC and SVOC exceedances, the spatial pattern and lack of repeated, increasing or decreasing levels of these substances indicate that there is no distinct plume or area of groundwater impacts from conventional contaminants.

Accordingly, EPA's May 2008 ROD analysis of site groundwater sampling results remains valid: "The results generally show sporadic and isolated detections of a small number of contaminants at relatively low concentration levels. These results are not indicative of on-site contaminant plumes, radial migration, or other forms of contiguous groundwater contamination that might be attributable to the landfill units being investigated."

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1. INTRODUCTION

In May 2012 the U.S. Environmental Protection Agency, Region VII (EPA) directed the West Lake Landfill Operable Unit-1 (OU-1) Respondents to perform an additional round of groundwater sampling at the West Lake Landfill Superfund Site. Engineering Management Support Inc. (EMSI), on behalf of Cotter Corporation (N.S.L.), Bridgeton Landfill, LLC and Rock Road Industries, Inc., and with funding provided by the United States Department of Energy (collectively, the OU-1 Respondents), prepared this report presenting the results of that additional groundwater sampling.

EPA indicated in May 2012 that, following consultation with the National Remedy Review Board, it believed additional groundwater monitoring was necessary to verify that current groundwater quality is consistent with conditions characterized during sampling performed in 1995, 1996, and 1997 as part of the Remedial Investigation (EMSI, 2000), and in 2004 as part of the Feasibility Study (EMSI, 2006) activities for OU-1. EPA required that all available groundwater monitoring wells at the West Lake Landfill Superfund Site be included in the groundwater sampling event, including wells for OU-1 (Radiological Areas 1 and 2 which contain radiologically-impacted materials [RIM]) and OU-2 (the remainder of the Site which did not receive RIM, including the Inactive Sanitary Landfill, the Closed Demolition Landfill, and the former Permitted Landfill's North and South Quarry units). EPA further directed that the samples obtained from these wells be analyzed for uranium, thorium and radium radioisotopes (both total [unfiltered samples] and dissolved [filtered samples] phases); total and dissolved phase trace metals; volatile organic compounds (VOCs); and semivolatile organic compounds (SVOCs).

This report presents the results of those additional groundwater monitoring activities and contains the following information:

- Description of the field and sample collection activities;
- Results of the laboratory analyses of the groundwater samples; and
- Evaluation of the sample results.

This report also contains copies of the various field data sheets (Appendix A), the analytical laboratory reports (Appendix B), and the data validation reports and resultant database (Appendix C). Due to the size of these documents, the appendices are contained on the included compact disk.

2. FIELD AND SAMPLE COLLECTION ACTIVITIES

A Sampling and Analysis Plan (SAP) and associated planning documents were prepared to describe the proposed monitoring locations, sample collection procedures, analyte list, laboratory analyses, quality assurance/quality control samples and procedures, investigative-derived waste

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management, health and safety procedures, data evaluation and management procedures, and a tentative schedule for the work (EMSI, 2012). EPA approved the SAP by letter dated July 3, 2012.

Upon receipt of EPA approval of the SAP and prior to sample collection, limited brush clearing was performed to assist in locating the various groundwater monitoring wells and to provide physical access to the monitoring well locations. In addition, shallow excavations of very limited extent were performed in the areas where monitoring wells were suspected to present at the Site, but may have been buried during Site grading activities. Finally, repairs were made to the surface and/or shallow subsurface portions of those well casings that had been found to be damaged during the initial well inspection. All of these activities were consistent with EPA's instructions to include the maximum number of wells in the sampling event.

The groundwater sampling event began on July 30, 2012 with well inspections and collection of a complete set of water level measurements from 76 of the 77 monitoring wells that had been located during the initial inspection. A water level could not be obtained from well PZ-108-SS due to ongoing post-closure landfill cover construction activities in the vicinity of this well. Additionally, monitoring well D-14 had not been located during the initial inspection but was subsequently found during the groundwater sampling activities, and a water level measurement was obtained from this well on August 7, 2012. Table 1 presents a summary of the groundwater level measurement data obtained from all of the wells. Copies of the well inspection and groundwater elevation measurement and the groundwater monitoring well condition report forms are contained in Appendix A.

The location and elevation of the monitoring wells were re-surveyed as part of the additional groundwater sampling event. Surveying was performed by a Missouri licensed land surveyor provided by AquaTerra. The results of the well survey are contained in Appendix A. A base map showing the locations of the monitoring wells and various Site features is presented on Figure 1.

Collection of groundwater samples began on July 31, 2012, and continued on a daily basis five days a week until sampling activities were completed on August 16, 2012. Groundwater samples were collected by Herst & Associates personnel in accordance with the procedures set forth in the SAP. Copies of the Field Information Logs from the groundwater sampling activities are contained in Appendix A. Copies of the chain of custody forms are also included in Appendix A.

Groundwater samples were obtained from 75 (of 78 total located) monitoring wells or piezometers at the Site (Table 2). Two wells (S-53 and PZ-302AS) near the southern portion of the Inactive Sanitary Landfill were dewatered during well purging activities but the water levels in these wells did not recover sufficiently to allow collection of groundwater samples. Additionally, due to insufficient water, only a partial list of analyses could be completed on the samples obtained from wells S-82 (radionuclides and VOCs only) and D-14 (total phase radionuclides only). Finally, neither a water level nor a groundwater sample could be obtained from well PZ-108-SS due to ongoing cover construction activities in the vicinity of this well. This well is routinely sampled (although not for radionuclides) as part of the permitted landfill

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groundwater monitoring program. Eight field duplicate groundwater samples were also obtained during the course of the groundwater sampling activities (Table 2).

EPA was present for sampling activities conducted the afternoon of August 6 and all day on August 7 and 8, 2012. During this period EPA obtained split samples from eleven wells (Table 2). MDNR and EMSI personnel were also present to observe the sampling activities on August 6 and 7, 2012. MDNR was again present on August 14, 2012 and obtained split samples from five wells on that date (Table 2).

3. LABORATORY ANALYSES

Samples for radionuclide analyses were shipped by Federal Express to Eberline Services Oak Ridge, TN laboratory (Eberline). The sampling crews delivered samples directly to the Test America St. Louis laboratory (Test America) for chemical analyses.

Eberline analyzed the samples for Radium-226 using EPA Modified Method 903.0; for Radium-228 using EPA Modified Method 904.0; for Thorium-228, -230 and -232 using EML Modified Method Th-01; and for Uranium-234, -235, and 238 using EML Modified Method U-02. The Eberline Analytical Reports are contained in Appendix B. The Eberline analytical laboratory reports include the laboratory results, the combined standard uncertainty (CSU), the minimum detectable activity (MDA) levels, and associated laboratory documentation related to sample receipt, handling, preparation and analysis.

EPA along with other agencies has developed the Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) Manual to address the need for a nationally consistent approach to producing radioanalytical laboratory data (EPA, 2004). MARLAP states that an important aspect of sampling and measurement is uncertainty. The Combined Standard Uncertainty (CSU) can be viewed as the statistical standard deviation of an individual radiological result (McCurdy et al., 2008). The concentration of a radiological constituent in a sample is typically calculated using a mathematical equation that includes such parameters as the measured signal response of a radiation detector (events per time unit), the detector background signal response, the detector efficiency for the radiation emission producing the response, sample aliquant size processed, chemical yield of the radiochemical process, and decay and ingrowth factors based on the half-life of the radionuclide or its decay product. Each measurement parameter in the equation has its own uncertainty defined as a standard uncertainty. The CSU of the final result is determined using the common statistical approach that the variance (squared CSU) of a function of several variables can be approximated by applying the function to the variance of each variable component (for example, MARLAP, chapter 19 [EPA, 2004]). Using this logic, the CSU of a radiological result is the square root of a sum of variances. When a concentration and its associated CSU are reported, a confidence interval can be calculated that defines the range of concentration (the lower and upper concentration) for the "true concentration" with a certain confidence. For this project, Eberline calculated and reported the CSU at the 95%-percent or 2-sigma confidence level (analogous to the standard confidence level used when reporting the standard deviation for other water-quality results). The confidence level that is used when

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interpreting or publishing radiological results is dependent on the Data Quality Objectives (DQOs) of the project. Reporting the concentration with its corresponding CSU (as provided in the data) provides the 95-percent confidence interval.

Test America analyzed the samples for VOCs by gas chromatography/mass spectrometry (GC/MS) using EPA Method 8260C; for SVOCs by GC/MS using EPA Method 8270D; for the Target Analyte List (TAL) trace metals by Inductively Coupled Plasma (ICP) using EPA Method 6010C; and for Mercury by Cold Vapor Atomic Adsorption (CVAA) using EPA Method 7470A. The Test America Analytical Reports are included in Appendix B.

In addition to the analyses requested by EPA, the samples were analyzed for chemistry characterizations: major anions by Ion Chromatography (IC) using SW-846 Method 300.0; major cations by ICP using EPA Method 6010C; alkalinity by SW-846 Method 310.1; and bromide and iodide by IC using SW-846 Method 300.0. Results of these analyses can also be found in the Test America Analytical Reports included in Appendix B.

4. DATA VALIDATION

A Level III validation was performed consisting of manually examining data deliverables to determine data quality. All data were validated using method applicable guidelines and in accordance with the requirements of the National Functional Guidelines for Organic and Inorganic Data Review (EPA, 2008a and 2010) and by SW-846 guidelines specific to the method. Radionuclides were validated according to the guidelines and criteria specified in the MARLAP Manual (EPA, 2004). Data validation included application of data qualifiers to the analytical results based on adherence to method protocols and project-specific QA/QC limits. The data validation reports for each sample delivery group are included in Appendix C.

Method protocols reviewed included:

- Analytical holding times,
- Method blanks (MB),
- Trip blanks (TB),
- Equipments Blanks (EBs),
- Matrix spikes/matrix spike duplicates (MS/MSDs),
- Laboratory control samples (LCSs),
- Shipping cooler temperatures,
- Laboratory duplicates,
- Internal Standards (ISs),
- Surrogates, and
- Chemical recovery (radionuclides).

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Based on the data validation, the appropriate data qualifiers, if any, were added to the analytical results. An analytical database that includes the applied data qualifiers is included in Appendix C.

Data quality assessment (DQA) criteria were used to evaluate the quality of the field sampling efforts and laboratory results for compliance with project DQOs. The DQA criteria are expressed in terms of analytical precision, accuracy, representativeness, completeness, and comparability (PARCC).

Precision is the measure of variability between individual sample measurements under prescribed conditions. The relative percent difference (RPD) for the field duplicate, matrix spike/matrix spike duplicate (MS/MSD), and laboratory duplicate analyses demonstrate the precision of the analytical methods. An RPD within the method-specific control limit indicates satisfactory precision in a measurement system. For this sampling event, duplicate results were predominantly in control.

Accuracy is the degree of agreement of a measurement with an accepted reference or true value. The results of surrogate, MS/MSD, chemical recovery, and LCS analyses, when expressed in terms of percent recovery, demonstrate the accuracy of the method. Accuracy results for all methods and matrices are predominantly in control. The accuracy results which were out-of-control are not significant for any one compound, method, or matrix and do not represent a negative impact to data quality. Therefore, overall accuracy for this sampling event was acceptable.

Representativeness. S ample data are believed to be representative of the site conditions prevailing at the time of sample collection because most of the samples were properly collected, stored, and preserved. One SDG (160-428) was qualified as estimated because the cooler temperature was above 6ºC. VOCs in one SDG (160-420) were qualified as estimated because the sample pH was greater than 2 and the samples were analyzed one day out of the 7-day unpreserved holding time. Although blank contamination did occur (mostly with common lab contaminants), sample data quality was not adversely affected.

Comparability. All samples were reported in industry-standard units. Water reporting units were micrograms per liter (µg/L), milligrams per liter (mg/L) or picocuries per liter (pCi/L). Analytical protocols for the methods were adhered to (with the exceptions noted in this report) and analytical results are considered comparable.

Completeness is defined as the percentage of laboratory measurements judged to be valid on a method-by-method basis. Valid data are defined as all data and/or qualified data which meet the DQOs for this project. Data completeness is expressed as percent complete (PC), which is calculated as follows: (the number of rejected samples per compound ÷ total number of samples per compound) X 100. Completeness is 100%, understanding that all results qualified with U, UJ or J are usable to meet the project objectives of this sampling event. The goal for meeting analytical holding times was l00% and was not met for only one set of VOC samples.

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Sensitivity was evaluated using the RLs and MDLs for each sample as compared to project maximum allowable RLs. The laboratory RLs met required RL limits for most compounds except when adjusted for sample dilution. For radionuclides, when the sample results are greater than the MDA but have a combined standard uncertainty less than 50% of the sample activity, the sample is qualified with a J. This is an indication that the value is near the MDA and has a relatively large combined standard uncertainty compared to the sample result.

The groundwater data are of acceptable quality and are considered usable to support the project objectives for this sampling event. Samples are representative of the Site when used in accordance with the validation qualifiers.

5. GROUNDWATER LEVELS

Groundwater is present within the alluvium and bedrock deposits beneath the Site. The edge of the geomorphic floodplain for the Missouri River was evaluated as part of the Supplemental Feasibility Study (EMSI, 2011) and was determined to be located beneath the southeastern portion of the Site (Figure 2). To the northwest of this boundary, the uppermost (shallowest) groundwater occurs within the alluvial deposits. Because alluvium is not present beneath the southeastern portion of the Site, the uppermost groundwater is found in bedrock of the St. Louis Formation.

Water level measurements were obtained from the monitoring wells (Table 1), and these data were used to develop a potentiometric surface (water level) map for the Site (Figure 2). Groundwater within the St. Louis Formation beneath the southeastern boundary of the Site displays the highest water level elevations [generally from 440 to 460 feet (ft) above mean sea level (amsl)], whereas the lowest groundwater elevations (approximately 429 to 429.5 ft amsl) are present within the alluvial deposits along the northern portion of the Site. These data indicate that the overall direction of the hydraulic gradient in the area of the Site is to the northwest, towards the Missouri River.

The water level data also indicate that overall, groundwater within the bedrock generally discharges to the alluvial deposits at the Site (Figure 2). With the exception of the area immediately around the quarry landfills, the water levels in the bedrock (e.g., PZ-208-SS, PZ-201A-SS, PZ-102-SS and PZ-102R-SS) are substantially higher (i.e., 440 to 450 ft amsl) than the water levels in the alluvial deposits (i.e., 430 ft amsl), indicating that groundwater flows from the bedrock into the alluvium. In addition, water level data obtained from co-located alluvial and bedrock wells support the conclusion that groundwater within the bedrock discharges to the alluvium. The water level data indicate that the water levels within the bedrock wells are generally higher than the water levels in the nearby alluvial wells indicating that beneath the Site an upward gradient generally exists from the bedrock to the alluvium. For example, compare the water level elevations between St. Louis Formation well PZ-205-SS (430.22) to that of the co-located alluvial well PZ-205-AS (429.67), or compare the water level elevations between St. Louis Formation well PZ-113-SS (429.92) to that of the co-located alluvial wells PZ-113-AS (429.85) and PZ-113-AD (429.86) (Table 3 and Figure 2).

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A downward gradient is present within the bedrock in the immediate area of the permitted quarry landfills (outside of the OU-1 areas) where ongoing extraction of groundwater and leachate from the permitted North and South Quarry Landfills has created a localized depression in the St. Louis Formation potentiometric (water level) surface (Figure 2). Pumping from the quarry landfills is performed to maintain an inward hydraulic gradient into the quarry landfills. The extracted water is discharged to the Metropolitan St. Louis Sewer District (MSD), a Publicly Owned Treatment Works (POTW), in accordance with all required permits. The presence of a hydraulic gradient towards the quarry landfills is demonstrated by the presence of lower water levels in wells PZ-115-SS and PZ-101-SS which are located close to the quarry landfills as compared to the water levels in other St. Louis Formation wells such as PZ-208-SS and PZ-102R-SS. Although a localized depression exists in the potentiometric surface of the St. Louis Formation in this area, the limited extent of this localized depression combined with the absence of alluvium in this area indicates that this pumping does not result in a downward gradient from the alluvial aquifer to the bedrock in this area.

Review of water level data obtained from well clusters completed within the alluvial deposits beneath the northern portion of the Site (Table 3) indicates that, in general, the highest water levels are found in the shallower alluvial wells that are completed in the upper portion of the alluvium and lower water levels are generally present in the deeper alluvial wells that are completed near the base of the alluvial deposits (e.g., compare water levels from S-5, I-4, D-3 and S-84 and D-85 well clusters near OU-1 Area 1, the S-10, I-11 and D-12; S-82, I-9 and D-93; S-61, MW-102 and D-6, and I-62 and D-83 well clusters near Area 2). These data indicate that a slight downward hydraulic gradient is present within much of the alluvial deposits beneath the northern portion of the Site.

The hydraulic gradient within the bedrock wells in the southern portion of the Site is relatively steep (as much as 50 ft per 500 ft or 0.1 ft/ft) near the North and South Quarry Landfills, reflecting the effects of ongoing pumping from the landfills. The hydraulic gradient within the alluvial deposit beneath the northern portion of the Site is very flat (approximately 0.5 ft per 1,250 ft or 0.0004 ft/ft). These values are within the range of values reported in the RI (EMSI, 2000). Based on reported average values of 3×10^{-2} to 3×10^{-3} cm/sec (85 to 8.5 ft/day) for the hydraulic conductivity of the alluvium (EMSI, 2000) and a hydraulic gradient of 0.0004 ft/ft, the overall velocity of groundwater flow within the alluvium would be approximately 0.0034 to 0.034 ft/day or 1.2 to 12 ft/year.

Table 4 presents a comparison of the 2012 groundwater levels to groundwater levels measured in 2011 and 1997. These data indicate that water levels within the alluvium were on average approximately one foot higher in 2011 compared to 1997. The 2011 and 2012 water levels within the bedrock monitoring wells were significantly higher than those observed in the same monitoring wells in 1997. An increase in the water level elevations from 1997 to 2011-2012 is consistent with expectations because of groundwater pumping in 1997 for quarry pit operations. By 2011-2012, disposal operations at the Permitted Landfills had ceased. The Permitted Landfills were then in closure mode, which requires much less groundwater pumping to achieve hydraulic control of groundwater and leachate. The water levels in the alluvium observed in

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2012 were, on average, close to two feet lower than were observed in 1997 and were on average, two and three-quarters feet lower than were observed in 2011.

The lower water levels observed in 2012 may reflect a drier than average precipitation level for 2012. Table 5 presents the annual precipitation amounts as measured at Lambert St. Louis Airport. Figure 3 presents a graph of these same data. As shown on this figure, although the 2012 precipitation value (through December 9, 2012) was less than the precipitation amounts recorded in the prior four years, the 2012 value is well within the range of precipitation values measured over the last 75 years and does not represent an anomalously dry year.

Fluctuations in groundwater levels are expected given variations in precipitation amounts, evapotranspiration, and patterns and variations in the rates of pumping from the Permitted Landfills. Furthermore, the observed variations in water levels are relatively small considering the comparatively larger saturated thickness (as much as 50 to 100 feet) within the alluvium. Consequently, variations in water level elevations are not expected to significantly affect the representativeness of the groundwater samples.

6. GROUNDWATER SAMPLE RESULTS

This section summarizes the analytical laboratory results for the groundwater samples.

6.1 Radionuclides

The results of the laboratory analyses of the uranium, thorium and radium isotopes are summarized on Tables 6, 7 and 8. Radium was the only radionuclide detected above State or federal water quality or drinking water standards and, as discussed below, most of these results fell within the range of reported background levels of radium. Lucas (1985) reported that *"The largest single area in the United States where significant radium concentrations have been reported is within the five-state area that includes Minnesota, Wisconsin, Iowa, Illinois, and Missouri."*

6.1.1 Uranium

Uranium is a naturally-occurring element found at low levels in virtually all rock, soil, and water (EPA, 2012a). A study conducted by the U.S. Geological Survey as part of the National Water Quality Assessment Program reported naturally occurring levels of uranium in groundwater in terms of units of mass ranging from non-detect up to as much as 550 ug/L, with a median value of 0.52 ug/L (Ayotte, et. al., 2011).

Table 6 presents a summary of the analytical results of the uranium isotopes. The reported results are presented in units of activity (picocuries per liter or pCi/L) which were converted to units of mass (ug/L) using the procedure defined by EPA (2000). The levels of uranium detected

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in the various groundwater monitoring wells were for the most part consistent with naturally-occurring (background) levels of uranium (Ayotte, et al., 2011). None of the calculated total uranium mass concentrations exceed the EPA Maximum Contaminant Level (MCL) of 30 ug/L (Table 6). The highest levels of uranium detected in the Site groundwater were found in monitoring wells completed in the deeper bedrock formations at locations upgradient of OU-1 Radiological Areas 1 and 2. As previously discussed, groundwater within the bedrock in this area discharges to the alluvium. Therefore, the source of uranium occurrences in alluvial groundwater beneath and downgradient of Radiological Areas 1 and 2 is not from leaching from Areas 1 and 2 but reflect natural occurrences of uranium within the alluvial and bedrock groundwater.

6.1.2 Thorium

Thorium is a naturally-occurring radioactive metal found at very low levels in soil, rocks, and water (EPA, 2012b). Table 7 presents a summary of the analytical results of the Site groundwater samples for the thorium isotopes. Overall, only low levels (less than 1 pCi/L) of the thorium isotopes were detected in the majority of the wells. There are no federal or State drinking water or other water quality standards for any of the thorium isotopes or total thorium.

6.1.3 Radium

Radium is a naturally-occurring radioactive metal (EPA, 2012c). Radium is a radionuclide formed by the decay of uranium and thorium in the environment. It occurs at low levels in virtually all rock, soil, water, plants, and animals (EPA, 2012c).

Table 8 summarizes the analytical results for the radium isotopes (Radium-226 and Radium-228) for the 2012 groundwater samples. The occurrences and the activity levels of these isotopes in the Site groundwater samples are consistent with natural occurrences of these isotopes in alluvial and bedrock groundwater in the area. Specifically, the highest reported levels of these isotopes were found in monitoring wells completed in the bedrock formations in areas located upgradient of the OU-1 Radiological Areas 1 and 2. The presence and levels of radium in these wells is consistent with naturally-occurring levels of radium in groundwater in the general area of the Site (see discussion in Section 6.1.3.7 below) as reported in published technical reports (Lucas, 1985 and Szabo, 2012).

Furthermore, most of the groundwater samples contained equal to greater parts of Radium-228 compared to Radium-226. The RIM in OU-1 Radiological Areas 1 and 2 consist primarily of Radium-226 and its parent isotope Thorium-230. With the exception of one sample each from soil borings WL-209 and WL-234 in Area 2, Radium-228 was not detected in any of the OU-1 soil samples at levels above background. Additionally, with the exception of soil borings WL-209 and WL-210, Thorium-232, the parent isotope of Radium-228, also was not detected at levels above background. Furthermore, all of the Thorium-232 and Radium-228 results in the soil samples were significantly lower than the Thorium-230 and Radium-226 results obtained from the same samples. Therefore, based on the overall low levels in groundwater, the fact that

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the highest levels in groundwater were found in upgradient bedrock wells, and the general absence of Radium-228 in the source RIM at levels above background, occurrences of Radium-228 in the groundwater reflect natural, background occurrences of this isotope.

6.1.3.1 Radium-226

Radium-226 was reported as being present in 98% of the total fraction (unfiltered) samples and 93% of the dissolved fraction (filtered) samples obtained from the alluvial monitoring wells at the Site (Table 9). The overall average reported level of Radium-226 in the groundwater samples obtained from alluvial monitoring wells was 1.74 pCi/L for the total fraction samples and 1.35 pCi/L for the dissolved fraction samples (Table 9). The median values were 1.29 and 3.38 pCi/L for the total and dissolved fractions, respectively. The highest level of Radium-226 detected in total fraction samples obtained from all of the alluvial wells was 6.84 pCi/L (D-85) (Figure 4). The highest reported level in the dissolved fraction samples was 4.51 pCi/L (PZ-113-AD) (Figure 5).

Radium-226 was reported as being present in 94% of the total fraction samples and 91% of the dissolved fraction samples obtained from the bedrock monitoring wells at the Site (Table 9). The overall average level of Radium-226 in the bedrock groundwater samples was 2.93 pCi/L for the total fraction samples and 3.35 pCi/L for the dissolved fraction samples (Table 9). The median values were 2.16 and 1.94 pCi/L for the total and dissolved fractions, respectively. The highest level of Radium-226 detected in the total fraction samples obtained from the bedrock wells was 12.52 pCi/L in upgradient well PZ-101-SS (Figure 4). The highest reported level in the dissolved fraction samples was 28.87 pCi/L in the same upgradient well (PZ-101-SS) (Figure 5). Well PZ-101-SS is a St. Louis Formation bedrock well located along the south side of the North Quarry Landfill, 500 to 750 feet upgradient from OU-1 Area 1 and approximately 2,000 feet upgradient from Area 2 (Figure 5).

Figures 4 and 5 present the total and dissolved fraction Radium-226 results plotted on the Site base map. Overall these data display a very high degree of spatial variability and do not indicate the presence of contiguous occurrences of Radium-226 indicative of a distinct plume(s) or area(s) of Radium-226 in groundwater. Rather, as can be seen on these figures, occurrences of the highest levels of Radium-226 are present in bedrock monitoring wells located at least 500 feet and in some instances as much as 3,000 feet upgradient of OU-1 Areas 1 and 2.

6.1.3.2 Radium-228

Radium-228 was reported as being present in 74% of the total fraction samples and 64% of the dissolved fraction samples obtained from the alluvial monitoring wells at the Site (Table 9). The overall average reported level of Radium-228 in the groundwater samples obtained from alluvial monitoring wells was 3.57 pCi/L for the total fraction samples and 3.46 pCi/L for the dissolved fraction samples (Table 9). The median values were 3.36 and 3.45 pCi/L for the total and dissolved fractions, respectively. The highest level of Radium-228 detected in the total fraction samples obtained from all of the alluvial wells was 7.71 pCi/L in well PZ-113-AD (Figure 6),

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which is upgradient of OU-1 Area 2. The highest reported level in the dissolved fraction samples was 7.70 pCi/L in the same upgradient well (PZ-113-AD) (Figure 7).

Radium-228 was detected in 47% of the total fraction samples and 53% of the dissolved fraction samples obtained from the bedrock monitoring wells at the Site (Table 9). The overall average level of Radium-228 in the bedrock groundwater samples was 2.19 pCi/L for the total fraction samples and 2.11 pCi/L for the dissolved fraction samples (Table 9). The median values were 2.08 and 1.94 pCi/L for the total and dissolved fractions, respectively. The highest level of Radium-228 detected in the total fraction samples obtained from the bedrock wells was 3.68 pCi/L in upgradient well PZ-101-SS. The highest reported level in the dissolved fraction samples was 4.68 pCi/L in upgradient well PZ-104-SD. These wells are located on the south sides of the North and South Quarry Landfills, far upgradient from OU-1 Areas 1 and 2.

Figures 6 and 7 present the total and dissolved fraction Radium-228 results plotted on the Site base map. Overall these data display a very high degree of spatial variability and do not indicate the presence of contiguous occurrences of Radium-228 indicative of a distinct plume(s) or area(s) of Radium-228 in groundwater. Levels of Radium-228 detected in groundwater near or downgradient of OU-1 Areas 1 and 2 are similar to the levels of Radium-228 detected in the bedrock monitoring wells located upgradient of Areas 1 and 2. Further, as discussed above, due to the relative absence of Radium-228 or its source materials in the wastes at the Site, the Radium-228 occurrences in groundwater are considered to be naturally occurring.

6.1.3.3 Combined Radium-226 and -228

Figures 8 and 9 present the combined Radium-226 plus Radium-228 results for the total and dissolved fraction samples, respectively, plotted on the Site base map. The average combined Radium-226 plus Radium-228 for the alluvial monitoring wells was 4.39 pCi/L for the total (unfiltered) fraction samples and 3.73 for the dissolved (filtered) sample fractions (Table 9). The maximum combined radium values detected in the alluvial wells were 13.79 pCi/L (D-85) and 12.20 pCi/L (PZ-113-AD, which is upgradient of OU-1 Area 2) for the total and dissolved fractions, respectively. A total of 28 (61%) of the 46 samples obtained from the alluvial monitoring wells contained combined total fraction (unfiltered samples) Radium-226 plus Radium-228 levels that were above the EPA MCL of 5 pCi/L for radium (Table 8). A total of 29 (64%) of the 45 dissolved fraction samples obtained from the alluvial wells contained combined Radium-226 plus Radium-228 at levels above the MCL (Table 8).

The average combined Radium-226 plus Radium-228 for the bedrock monitoring wells was 4.02 pCi/L for the total (unfiltered) fraction samples and 4.44 pCi/L for the dissolved (filtered) sample fractions (Table 9). The maximum combined radium values detected in bedrock wells were 16.19 and 32.01 pCi/L for the total and dissolved fractions, respectively. Both of these values were detected in bedrock well PZ-101-SS, which is upgradient of OU-1 Areas 1 and 2. A total of 22 (65%) of the 34 samples obtained from the bedrock monitoring wells contained combined total (unfiltered samples) Radium-226 plus Radium-228 levels that were above the MCL of 5 pCi/L for radium (Table 8). A total of 24 (75%) of the 34 dissolved fraction samples obtained

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from the bedrock wells contained combined Radium-226 plus Radium-228 at levels above the MCL (Table 8).

6.1.3.4 Duplicate Sample Results for Radium

Eight duplicate samples were collected as part of the field effort (Tables 2, 10 and 11).

Comparison of the duplicate sample results for total Radium-226 is presented on Table 10. When the combined standard uncertainty values of the sample results are considered, the total Radium-226 results obtained from the duplicate samples were generally equivalent to the original samples with the possible exception of the results for the duplicate pair obtained from PZ-113-AD.

The dissolved Radium-226 results obtained from the duplicate samples are also presented on Table 10. When the combined standard uncertainty values of the sample results are considered, the dissolved Radium-226 results obtained from the duplicate samples were generally equivalent to the original samples with the possible exception of the results for the duplicate pair obtained from PZ-113-AD.

The duplicate sample results for total and dissolved Radium-228 are summarized on Table 11. When the combined standard uncertainty values of the sample results are considered, the total and dissolved Radium-228 results obtained from the duplicate samples were generally equivalent to the original samples again with the possible exception of the results for the duplicate pair obtained from PZ-113-AD.

6.1.3.5 Split Sample Results

Both EPA and MDNR obtained splits of some of the groundwater samples. EPA obtained splits of twelve samples and MDNR obtained splits of five samples (Table 2). EPA directed the Respondents to prepare the report without inclusion of EPA's split sample results.

MDNR analyzed its split samples for radionuclides using the same analytical laboratory (Eberline) used by the OU-1 Respondents. MDNR provided a copy of the analytical results for its split samples. Similar to the results obtained for the OU-1 samples, the MDNR split samples only contained trace or non-detectable levels of uranium and thorium isotopes. Those isotopes therefore are not discussed further.

Table 12 presents a comparison of the radium results from the MDNR split samples to the results obtained from the corresponding original OU-1 samples. Considering the combined standard uncertainty values of the sample results, there is generally good agreement between the original and MDNR split samples results for the total and dissolved fractions for both Radium-226 and Radium-228.

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6.1.3.6 Comparison to RI/FS Sampling Results

Table 13 presents a summary of the Radium-226 results obtained during the 2012 groundwater sampling event along with the Radium-226 results obtained during the OU-1 RI/FS sampling (McLaren Hart, 1996, and EMSI, 2000 and 2006), and the OU-2 RI/FS sampling (Herst & Associates, 2005). Because the OU-2 RI/FS samples were only analyzed for Radium-226 (the RIM-associated radium isotope), this summary only includes results for Radium-226. Figures 10 and 11 present the total and dissolved Radium-226 results obtained for samples collected during the OU-1 and OU-2 RI/FS investigations. Overall, the locations where Radium-226 was found to be present and the levels of the Radium-226 detected in the 2012 groundwater samples were similar to those identified during the prior RI/FS sampling, especially after consideration of the combined standard uncertainty values associated with the various sample results.

6.1.3.7 Comparison to Published Background Levels of Radium

Missouri generally, and the Site specifically, are located within the Ozark Plateau Cambro-Ordivician (MCOO) aquifer system. Szabo, et al. (2012) found that the median level of combined Radium-226 and Radium-228 in dissolved phase samples obtained from water supply wells (untreated water) in the MCOO aquifer system is 5.9 pCi/L. The maximum reported value for combined Radium-226 and Radium-228 identified in this study was 11.32 pCi/L. The MCOO principal aquifer system had the highest levels of radium of any of the 15 principal aquifers investigated as part of this report (Szabo, et al., 2012).

An earlier study by Lucas (1985), reported that *"The largest single area in the United States where significant radium concentrations have been reported is within the five-state area that includes Minnesota, Wisconsin, Iowa, Illinois, and Missouri."* It was not uncommon for water supply wells in Missouri to have levels of combined Radium-226 and Radium-228 above 5 and even 10 pCi/L (Lucas, 1985). This earlier work by Lucas (1985) is generally consistent with the findings of Szabo (2012) described above.

The median level of 5.9 pCi/L reported by Szabo et al. (2012) for the MCOO aquifer system is *higher* than the median total concentration of combined Radium-226 and Radium-228 found in either bedrock or alluvial monitoring wells at the Site (Table 9). This indicates that the levels of radium detected in the monitoring wells reflect natural occurrences of radium. The fact that levels of combined radium within the bedrock and alluvial groundwater are so similar is to be expected given that groundwater within the bedrock flows into the alluvial aquifer.

6.2 Trace Metals

The groundwater samples were analyzed for 19 trace metals, exclusive of the major chemistry cations (e.g., calcium, magnesium, sodium and potassium). All of the samples contained non-detectable levels of beryllium, selenium, and silver. Cadmium, copper and thallium were only detected in six to thirteen of the wells. Results obtained for the other thirteen trace metals are summarized on Table 14.

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Arsenic was detected in one or both of the sample fractions (total or dissolved) obtained from 31 of the 73 monitoring wells analyzed for trace metals. The majority of the detected results exceed the drinking water standard of 10 ug/L for arsenic. The highest reported arsenic concentrations (170 to 230 ug/L) were found in alluvial wells S-82, PZ-114-AS, PZ-112-AS and PZ-304-AS (Table 14). Results obtained from nearby wells and from wells located adjacent to these wells but screened at deeper intervals contained substantially lower levels of arsenic, indicating that the arsenic occurrences are generally isolated and do not represent a plume or large areas of elevated arsenic concentrations.

The most frequently detected trace metals were iron and manganese which were detected in nearly all of the monitoring wells (Table 14). Nearly all of the iron results exceed the drinking water standard (secondary standard based on aesthetic considerations) of 300 ug/L. The highest levels of iron were found in the total sample fractions obtained from alluvial wells D-85, MW-103, PZ-114-AS, and PZ-302-AS. The dissolved fraction results for wells D-85 and MW-103 contained substantially lower (non-detectable in the case of MW-103) iron concentrations indicating that the majority of the total iron in these wells occurs in the form of suspended sediment.

Nearly all of the manganese results exceed the drinking water standard (secondary standard based on aesthetic considerations) of 50 ug/L. The highest levels of manganese were found in the total (unfiltered) sample fractions obtained from alluvial wells D-85, MW-104, PZ-114-AS, and PZ-305-AI. The dissolved (filtered) fraction results for well D-85 contained a substantially lower manganese concentration indicating that the majority of the total manganese in this well occurs in the form of suspended sediment.

It should be noted that the solubility of arsenic, iron and manganese is largely controlled by their oxidation states, with the reduced form of these metals possessing higher solubility values. Consequently, these metals are commonly detected at solid waste landfills where anaerobic biodegradation of organic matter and decreased infiltration of typically oxygen-rich precipitation (recharge) due to the presence of lower permeability landfill cover results in the creation of reducing conditions. The presence of these trace metals can reflect dissolution of these metals from either the waste materials or dissolution of naturally occurring arsenic, iron and manganese within cover soil material contained in the waste materials or in the soil and bedrock adjacent to the waste deposits.

6.3 Volatile Organic Compounds

Table 15 presents a summary of the primary VOCs that were detected in the groundwater samples. The most commonly detected VOC was benzene, which was reported to be present in 28 of the 74 wells sampled for VOCs. Other VOCs that were detected in the groundwater samples included cis-1,2-dichloroethene (detected in 26 of the samples), chlorobenzene (detected in 24 of the samples), methyl-tert-butyl ether [MTBE] (detected in 22 of the samples), acetone (a common laboratory contaminant reportedly detected in 18 of the samples), 1,1,-dichloroethane (detected in ten of the samples), isopropyl benzene (detected in 11 of the samples), and 1,4-

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dichlorobenzene (detected in 13 of the samples). Other VOCs that were detected in the groundwater samples included 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichloroethane, 2-butanone (aka methyl ethyl ketone or MEK), 2-hexanone, bromomethane, carbon disulfide, chloroform, cyclohexane, dichlorodifluoromethane, ethylbenzene, methylcyclohexane, methylene chloride (a common laboratory contaminant that was also detected in some of the trip blank samples), xylenes, tetrachloroethene, toluene, trans-1,2-dichloroethene, and vinyl chloride, which were detected in one to eight of the 74 groundwater monitoring wells sampled for VOCs. With the exception of two occurrences of chlorobenzene (PZ-112-AS and LR-105) and two occurrences of vinyl chloride (I-9 and I-73), all of these compounds were detected at concentrations less than the Missouri water quality standards.

Benzene was detected in nine monitoring wells at concentrations greater than its water quality standard of 5 ug/L. Occurrences of benzene at concentrations above its water quality standard were found in the southern portion of the Inactive Sanitary Landfill (possibly as a result of a release from an underground storage tank associated with the concrete/asphalt plants, see Herst & Associates, 2005), to the west of OU-1 Area 1 (possibly as a result of historic releases from the underground storage tank located in the northern portion of Area 1), and along the south side of the South Quarry Landfill (likely due to releases from offsite facilities located upgradient of the Site).

6.4 Semi-Volatile Organic Compounds

Only a very few semi-volatile organic compounds (SVOCs) were detected. Detected SVOC results are included on Table 16. The most commonly detected SVOC was 1,4-dichlorobenzene which was detected in 11 of the 73 monitoring wells that were sampled and analyzed for SVOCs. The highest detected concentration of 1,4-dichlorobenzene was 19 ug/L in LR-105, which is less than the Missouri water quality standard of 75 ug/L. The next most frequently detected SVOC was bis (2-ethylhexyl) phthalate which was found to be present in the groundwater samples obtained from nine wells. The highest reported concentration of bis(2-ethylhezyl) phthalate was 120 ug/L in LR-100. The next highest reported concentration of bis(2-ethylhezyl) phthalate was 28 ug/L in PZ-207-AS. These results, along with the results from wells S-5, MW-103, and LR-105, exceeded the Missouri water quality standard of 6 ug/L.

Naphthalene and phenol were each detected in five wells. The highest reported concentration of naphthalene was 220 ug/L in PZ-112-AS. The next highest detected concentration was 56 ug/L in MW-103. These two results are greater than the Missouri water quality standard of 20 ug/L. The other three reported detections of naphthalene were less than the State standard. All five of the detected results for phenol were substantially less than the State standard of 300 ug/L.

Other SVOCs that were detected included 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 2,4-dimethylphenol, 2-chlorophenol, 2-methylnaphthalene, 2-methylphenol, 3 & 4 methylphenol, benzo(b)fluoranthene, butyl benzyl phthalate, dimethyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, fluoranthene, indeno[1,2,3-cd]pyrene, N-nitrosodiphenylamine, phenanthrene, and pyrene. These chemicals were detected in only one to four of the 73

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monitoring wells sampled for SVOCs. With the exception of the single detection of 2-chlorophenol and some of the poly nuclear aromatic hydrocarbons, the results for all of these chemicals were less than the Missouri water quality standards, where established.

7. SUMMARY AND CONCLUSIONS

The results of this sampling event are consistent with past groundwater sampling and support EPA's conclusions in the May 2008 Record of Decision that isolated and sporadic detections of a small number of radiological and conventional contaminants do exist in Site groundwater, but there are no contiguous plumes of radiological or conventional groundwater contamination present underneath the Site or migrating from the Site.

Groundwater flow in the Site area occurs in a generally southeast to northwesterly direction representing the flow of groundwater from the bedrock and terrace deposits upgradient of the Site into the bedrock and alluvial deposits beneath the Site. The hydraulic data indicate that groundwater within the bedrock and alluvium located offsite and beneath the upgradient southern portions of the Site flows into the alluvial deposits located beneath the northwestern two-thirds of the Site, including the areas around OU-1 Radiological Areas 1 and 2.

Review of the analytical results does not indicate that any significant leaching or other contributions of Radium-226 to groundwater are occurring from OU-1 Areas 1 and 2. The levels of radionuclides detected in groundwater beneath and downgradient of the two radiological areas are consistent with the levels of radionuclides detected upgradient of these areas, indicating that the two radiological areas do not contribute radionuclides above background levels. Overall, the highest levels of both total (unfiltered) and dissolved (filtered) Radium-226 were detected in bedrock wells (e.g. PZ-101-SS, PZ-104-SD, PZ-107-SS and PZ-102-SS) located upgradient of OU-1 Areas 1 and 2. The highest levels of Radium-226 in both the total and dissolved fraction samples were found in bedrock wells located anywhere from 500 to as much as 3,000 feet upgradient from OU-1 Areas 1 and 2. This condition indicates that the occurrences of radium isotopes in the groundwater are not the result of leaching from the radiologically-impacted materials in OU-1 Areas 1 and 2, but instead reflect naturally occurring (background) levels of the radium isotopes emanating from the bedrock. The consistency of the Site values with regional background levels of Radium-226 and Radium-228, as reported by Szabo (2012) and Lucas (1985), further supports this conclusion.

The absence of spatial relationship between the RIM occurrences in Areas 1 and 2 and the locations of the highest occurrences of Radium in groundwater indicates that the levels of Radium-226 and Radium-228 found in the area of the Site are of natural origin.
Combined radium occurrences above the EPA MCL are found throughout the Site (Figures 8 and 9), including within the bedrock formations and the alluvial deposits upgradient of the two OU-1 areas where RIM is present. In addition, the levels of combined Radium-226 plus Radium-228 measured in the August 2012 groundwater sampling event do not display higher concentrations in the immediate vicinity of OU-1 Areas 1 and 2 or downgradient of Areas 1 and 2.

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The highest total and dissolved levels of Radium-228 were detected in alluvial wells located adjacent to OU-1 Areas 1 and 2 (e.g., D-3, D-85, PZ-113-AD but not confirmed by the duplicate sample from this location, and S-61) or the Inactive Sanitary Landfill (e.g., MW-103). Although Radium-228 was found at higher levels in the groundwater samples taken near Areas 1 and 2, the soil data indicate that the Radium-228 does not originate within the RIM in Areas 1 and 2. The analytical results for the soil samples obtained from Areas 1 and 2 indicate that only very low to trace levels of Radium-228 or its parent Thorium-232 are present in the RIM. Furthermore, the occurrence of the highest levels of Radium-228 in the deeper alluvial wells (Figures 6 and 7), rather than in the shallower wells located closer to the RIM, also indicates that an alternate mechanism is responsible for the Radium-228 occurrences in the alluvial groundwater. This information indicates that occurrences of Radium-228 result from the discharge of bedrock groundwater containing Radium-228 to the basal portions of the alluvial aquifer. Consequently the Radium-228 occurrences detected in the groundwater samples represent background conditions.

No contiguous occurrences of radionuclides or chemical constituents indicative of a distinct plume or area of groundwater contamination were found to be present at the Site. In addition to radium generally being located in upgradient bedrock wells, monitoring wells with the highest levels of radium were generally surrounded by monitoring wells with substantially lower levels of radium. No locations with multiple wells displaying higher radium levels or patterns of spatially-correlated increasing or decreasing trends indicative of a source area were identified. Similarly, the groundwater sample results did not indicate the presence of a distinct plume or areas of groundwater impacts of trace metals and VOCs consistent with the observations and conclusions reached during the RI/FS.

The results of the 2012 groundwater sampling event are consistent with and further support the conclusions previously reached regarding Site conditions. The 2012 results generally show sporadic and isolated detections of a small number of contaminants at relatively low concentration levels. These results are not indicative of on-Site contaminant plumes, radial migration, or other forms of contiguous groundwater contamination that might be attributable to the OU-1 Radiological Areas 1 and 2. The groundwater results show no evidence of significant leaching and migration of radionuclides from Areas 1 and 2. Significant leaching and migration of radionuclides or chemicals (e.g., trace metals or VOCs) to perched water or groundwater have not occurred despite landfilled waste materials having been exposed to worst-case leaching conditions from surface water infiltration over a period of decades. The absence of radionuclide contamination in groundwater at the Site is consistent with the relatively low solubility of most radionuclides in water and their affinity to adsorb onto the soil matrix.

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Tables

Table 1: Groundwater Level Measurements, July 30, 2012

Well	Top of Casing (TOC) Elevation (ft. amsl)**	Water Level (ft. below TOC)	Water Level Elevation (ft. amsl)	Notes:
D-3	467.92	38.11	429.81	
D-6	447.09	18.01	429.08	
D-12	479.67	50.26	429.41	
D-13	470.53	40.90	429.63	
D-14	483.09	30.79	452.30	Measured on 8/7/2012
D-81	450.87	21.02	429.85	
D-83	448.55	18.99	429.56	
D-85	457.06	27.29	429.77	
D-87	464.41	34.72	429.69	
D-93	450.76	21.34	429.42	I-9 and D-93 may be mis-labeled based on total depths.
I-4	466.18	36.00	430.18	
I-9	449.84	20.35	429.49	I-9 and D-93 may be mis-labeled based on total depths.
I-11	480.01	50.57	429.44	
I-62	446.37	16.70	429.67	
I-65	441.53	12.25	429.28	
I-66	441.87	12.20	429.67	
I-67	441.78	12.18	429.60	
I-68	450.39	20.63	429.76	
I-73	461.40	28.25	433.15	
LR-100	468.14	17.40	450.74	
LR-103	470.54	40.70	429.84	
LR-104	459.38	29.11	430.27	
LR-105	485.36	31.38	453.98	
MW-102	447.90	18.53	429.37	
MW-103	437.47	9.50	427.97	
MW-104	440.91	11.09	429.82	
MW-1204	485.53	33.20	452.33	
PZ-100-KS	485.61	30.41	455.20	
PZ-100-SD	485.72	52.93	432.79	
PZ-100-SS	485.75	47.50	438.25	
PZ-101-SS	491.26	72.73	418.53	
PZ-102-SS	483.90	44.80	439.10	
PZ-102R-SS	485.62	37.78	447.84	
PZ-103-SS	483.56	42.74	440.82	
PZ-104-KS	483.95	22.40	461.55	
PZ-104-SD	483.51	23.80	459.71	
PZ-104-SS	483.45	23.48	459.97	
PZ-105-SS	483.51	27.74	455.77	
PZ-106-KS	464.20	6.82	457.38	
PZ-106-SD	463.36	18.20	445.16	
PZ-106-SS	462.71	16.92	445.79	
PZ-107-SS	464.56	34.40	430.16	
PZ-109-SS	458.55	59.91	398.64	
PZ-110-SS	461.15	33.21	427.94	

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Table 1: Groundwater Level Measurements, July 30, 2012

Well	Top of Casing (TOC) Elevation (ft. amsl)**	Water Level (ft. below TOC)	Water Level Elevation (ft. amsl)	Notes:
PZ-111-KS	465.56	10.71	454.85	
PZ-111-SD	466.46	35.93	430.53	
PZ-112-AS	462.50	32.78	429.72	
PZ-113-AD	461.54	31.68	429.86	
PZ-113-AS	461.40	31.55	429.85	
PZ-113-SS	461.77	31.85	429.92	
PZ-114-AS	451.26	21.35	429.91	
PZ-115-SS	452.27	36.93	415.34	
PZ-116-SS	484.85	31.80	453.05	
PZ-200-SS	485.57	45.58	439.99	
PZ-201A-SS	480.20	33.55	446.65	
PZ-202-SS	481.02	17.78	463.24	
PZ-203-SS	486.44	27.80	458.64	
PZ-204A-SS	462.60	7.31	455.29	
PZ-204-SS	464.79	12.85	451.94	
PZ-205-AS	459.95	30.28	429.67	
PZ-205-SS	461.73	31.51	430.22	
PZ-206-SS	460.29	34.70	425.59	
PZ-207-AS	462.49	32.75	429.74	
PZ-208-SS	474.19	26.01	448.18	
PZ-302-AI	450.17	21.22	428.95	
PZ-302-AS	451.33	21.28	430.05	
PZ-303-AS	453.08	23.42	429.66	
PZ-304-AI	453.86	24.19	429.67	
PZ-304-AS	453.61	23.90	429.71	
PZ-305-AI	459.83	29.60	430.23	
S-5	466.45	36.01	430.44	
S-8	443.83	14.49	429.34	
S-10	480.06	50.54	429.52	
S-53	444.18	14.27	429.91	
S-61	449.52	20.17	429.35	
S-82	449.94	20.48	429.46	
S-84	456.78	26.98	429.80	

** Survey data provided by Aquaterra in a spreadsheet dated 9/14/2012.
amsl = above mean sea level

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Table 2: Wells Sampled During the Additional OU-1 Groundwater Monitoring Effort

Well	Well
PZ-100-SS	LR-100
PZ-100-SD	LR-103
PZ-100-KS	LR-104
PZ-101-SS	LR-105
PZ-102-SS	
PZ-102R-SS	MW-102
PZ-103-SS	MW-103
PZ-104-SS	MW-104
PZ-104-SD	MW-1204
PZ-104-KS	
PZ-105-SS	S-5
PZ-106-SS	S-8
PZ-106-SD	S-10
PZ-106-KS	S-61
PZ-107-SS	S-82
PZ-109-SS	S-84
PZ-110-SS	
PZ-111-SD	I-4
PZ-111-KS	I-9
PZ-112-AS	I-11
PZ-113-AS	I-62
PZ-113-AD	I-65
PZ-113-SS	I-66
PZ-114-AS	I-67
PZ-115-SS	I-68
PZ-116-SS	I-73
PZ-200-SS	
PZ-201A-SS	D-3
PZ-202-SS	D-6
PZ-203-SS	D-12
PZ-204-SS	D-13
PZ-204A-SS	D-14
PZ-205-AS	D-81
PZ-205-SS	D-83
PZ-206-SS	D-85
PZ-207-AS	D-87
PZ-208-SS	D-93
PZ-302-AI	
PZ-303-AS	
PZ-304-AS	Total = 75 wells
PZ-304-AI	
PZ-305-AI	

Duplicate Samples	
DUP-01	PZ-201A-SS
DUP-02	PZ-200-SS
DUP-03	PZ-113-AD
DUP-04	D-6
DUP-05	D-3
DUP-06	D-13
DUP-07	LR-104
DUP-08	I-9

EPA Split Samples
PZ-101-SS
PZ-112-AS
PZ-113-AS
PZ-206-SS
PZ-207-AS
PZ-305-AI
MW-102
S-61
I-11
D-3
D-6
D-6 duplicate
D-12

MDNR Split Samples
PZ-106-KS
S-5
I-4
I-9
D-93

Well Legend	
S prefix or AS suffix	Shallow alluvial well
I prefix or AI suffix	Intermediate alluvial well
D prefix or AD suffix	Deep intermediate well
SS suffix	St. Louis Fm. bedrock well
SD suffix	Salem Fm. bedrock well
KS suffix	Keokuk Fm. Bedrock well

12/14/2012

Table 3: Vertical Groundwater Gradients, July 30, 2012

Well	Water Level Elevation (ft amsl)	Original Top of Screen Elevation (ft amsl)	Original Bottom of Screen Elevation (ft amsl)	Midpoint Elevation of Screen Interval (ft amsl)	Head Difference (ft)	Difference in Screen Midpoint Elevations (ft)	Vertical Gradient (ft/ft)
Alluvial Well Clusters							
S-5	430.44	435.70	425.70	430.70	0.26	36.20	0.0072
I-4	430.18	399.50	389.50	394.50	0.37	28.80	0.0128
D-3	429.81	370.70	360.70	365.70	0.63	65.00	0.0097
MW-102	429.37	432.18	422.18	427.18	0.29	84.28	0.0034
D-6	429.08	347.90	337.90	342.90			
S-10	429.52	445.50	425.50	435.50	0.08	43.40	0.0018
I-11	429.44	397.10	387.10	392.10	0.03	53.40	0.0006
D-12	429.41	343.70	333.70	338.70	0.11	96.80	0.0011
S-8	429.34	434.80	414.80	424.80	-0.33	19.70	-0.0168
I-62	429.67	410.10	400.10	405.10	0.11	231.40	0.0005
D-83	429.56	0.00	347.40	173.70	-0.22	251.10	-0.0009
S-84	429.80	432.00	422.00	427.00	0.03	241.45	0.0001
D-85	429.77	0.00	371.10	185.55			
S-82	429.46	0.00	422.20	211.10	-0.03	-189.30	0.0002
I-9	429.49	405.40	395.40	400.40	0.07	29.70	0.0024
D-93	429.42	380.70	360.70	370.70	0.04	-159.60	-0.0003
PZ-302-AS	430.05	-408.77	427.50	9.37	1.10	9.43	0.1166
PZ-302-AI	428.95	-407.73	407.60	-0.06			
PZ-304-AI	429.67	412.60	402.80	407.70	-0.04	-21.70	0.0018
PZ-304-AS	429.71	434.30	424.50	429.40			
Alluvial and Bedrock Well Clusters							
PZ-113-AS	429.85	431.00	421.20	426.10	-0.01	69.70	-0.0001
PZ-113-AD	429.86	361.30	351.50	356.40	-0.06	49.87	-0.0012
PZ-113-SS	429.92	311.43	301.63	306.53	-0.07	119.57	-0.0006
PZ-205-AS	429.67	420.75	410.95	415.85	-0.55	49.82	-0.0110
PZ-205-SS	430.22	370.93	361.13	366.03			

Notes: Positve values for vertical gradient indicate a downward gradient whereas negative values indicate an upward gradient.

Table 4: Comparison of 2012, 2011 and 1997 Groundwater Levels

Monitoring point	August/ November 1997	December 2011	July 30, 2012	2011 - 1997 Difference (ft)	2012 - 1997 Difference (ft)	2012 - 2011 Difference (ft)
Allvuial Wells						
S-5	432.27	434.81	430.44	2.54	-1.83	-4.37
S-84	431.47	430.92	429.80	-0.55	-1.67	-1.12
I-4	432.11	434.56	430.18	2.45	-1.93	-4.38
I-68	432.31	430.25	429.76	-2.06	-2.55	-0.49
I-73	431.89	437.48	433.15	5.59	1.26	-4.33
D-3	432	434.57	429.81	2.57	-2.19	-4.76
D-85	432.13	434.56	429.77	2.43	-2.36	-4.79
LR-104	431.89	432.59	430.27	0.7	-1.62	-2.32
PZ-112-AS	431.83	429.6	429.72	-2.23	-2.11	0.12
PZ-113-AS	431.82	432.24	429.85	0.42	-1.97	-2.39
PZ-113-SS	431.42	432.29	429.92	0.87	-1.5	-2.37
PZ-114-AS	432.42	432.37	429.91	-0.05	-2.51	-2.46
PZ-205-AS	431.81	432.24	429.67	0.43	-2.14	-2.57
PZ-207-AS	431.97	433.36	429.74	1.39	-2.23	-3.62
PZ-305-AI	431.88	431.67	430.23	-0.21	-1.65	-1.44
		Average difference		0.95	-1.80	-2.75
Bedrock Wells						
PZ-115-SS	419.23	405.4	415.34	-13.83	-3.89	9.94
PZ-116-SS	396.03	445.66	453.05	49.63	57.02	7.39
PZ-100-KS	442.65	449.85	455.20	7.2	12.55	5.35
PZ-100-SD	384.77	410.63	432.79	25.86	48.02	22.16
PZ-100-SS	413.28	418.31	438.25	5.03	24.97	19.94
PZ-101-SS	391.62	386.56	418.53	-5.06	26.91	31.97
PZ-102R-SS	401.07	439.67	447.84	38.6	46.77	8.17
PZ-103-SS	379.65	415.27	440.82	35.62	61.17	25.55
PZ-104-KS	449.62	460.04	461.55	10.42	11.93	1.51
PZ-104-SD	399.64	454.29	459.71	54.65	60.07	5.42
PZ-104-SS	395.94	450.83	459.97	54.89	64.03	9.14
PZ-105-SS	398.45	450.79	455.77	52.34	57.32	4.98
PZ-106-KS	446.98	455.77	457.38	8.79	10.4	1.61
PZ-106-SD	388.07	434.61	445.16	46.54	57.09	10.55
PZ-106-SS	389.64	435.73	445.79	46.09	56.15	10.06
PZ-107-SS	431.12	432.18	430.16	1.06	-0.96	-2.02
PZ-109-SS	380.78	375.53	398.64	-5.25	17.86	23.11
PZ-110-SS	411.39	427.04	427.94	15.65	16.55	0.9
PZ-200-SS	412.08	419.81	439.99	7.73	27.91	20.18
PZ-201A-SS	413.95	432.19	446.65	18.24	32.7	14.46
PZ-202-SS	449.63	460.65	463.24	11.02	13.61	2.59
PZ-203-SS	400.35	454.13	458.64	53.78	58.29	4.51
PZ-204A-SS	404.8	459.41	455.29	54.61	50.49	-4.12
PZ-205-SS	421.98	428.28	430.22	6.3	8.24	1.94
PZ-208-SS	431.69	445.19	448.18	13.5	16.49	2.99
		Average difference		23.7	33.3	9.5

12/14/2012

Table 5: Annual Precipitation - St Louis Lambert Field

Year	Total Precipitation (inches)*	Year	Total Precipitation (inches)*
1937	36.85	1975	40.21
1938	37.49	1976	23.46
1939	36.56	1977	43.41
1940	24.73	1978	37.71
1941	31.37	1979	29.48
1942	41.64	1980	27.48
1943	37.53	1981	45.52
1944	34.90	1982	54.97
1945	47.55	1983	44.80
1946	50.31	1984	51.65
1947	35.78	1985	50.73
1948	42.26	1986	34.88
1949	45.68	1987	38.38
1950	37.63	1988	33.93
1951	36.37	1989	28.60
1952	25.67	1990	45.09
1953	20.69	1991	33.48
1954	27.61	1992	33.49
1955	31.33	1993	54.76
1956	34.43	1994	34.70
1957	47.16	1995	41.68
1958	37.38	1996	43.67
1959	28.31	1997	31.23
1960	31.78	1998	43.62
1961	41.20	1999	34.06
1962	34.63	2000	37.37
1963	28.62	2001	35.29
1964	32.16	2002	40.95
1965	28.26	2003	46.06
1966	32.34	2004	42.27
1967	41.30	2005	37.85
1968	32.49	2006	29.93
1969	43.72	2007	30.57
1970	36.20	2008	57.96
1971	33.73	2009	50.92
1972	33.74	2010	39.07
1973	39.82	2011	47.17
1974	36.83	2012	33.9

Notes:
2012 total is through December 9, 2012
*Data collected at St Louis Lambert Field

Table 6: Summary of Uranium Results from OU-1 Additional Groundwater Sampling

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
S-5 DIS	8/14/2012	0.29	0.32	0.43	UJ	0.09	0.25	0.53	UJ	0.11	0.21	0.37	UJ	ND	*	1.36
S-8 DIS	8/9/2012	0.79	0.33	0.22		0.29	0.22	0.17	J	0.74	0.32	0.18		1.82		2.33
S-10 DIS	8/8/2012	0.73	0.37	0.21	J	0.16	0.21	0.32	UJ	0.78	0.39	0.26	J	1.51	*	2.49
S-61 DIS	8/7/2012	1.32	0.44	0.16		0.22	0.19	0.16	J	0.86	0.35	0.19		2.40		2.68
S-82 DIS	8/10/2012	0.34	0.30	0.32	J	0.04	0.16	0.40	UJ	0.17	0.21	0.27	UJ	0.34	*	1.00
S-84 DIS	8/6/2012	0.09	0.11	0.13	U	-0.01	0.08	0.19	U	0.01	0.07	0.18	U	ND		0.63
I-4 DIS	8/14/2012	0.12	0.34	0.73	UJ	0.00	0.42	0.90	UJ	0.00	0.34	0.73	UJ	ND		2.59
I-9 DIS	8/14/2012	0.37	0.29	0.24	J	0.00	0.19	0.40	UJ	0.00	0.15	0.33	UJ	0.37	*	1.16
I-9 DUP DIS	8/14/2012	0.32	0.24	0.19	J	-0.04	0.11	0.30	UJ	0.02	0.09	0.22	UJ	0.32	*	0.78
I-11 DIS	8/8/2012	0.58	0.31	0.18	J	0.04	0.10	0.22	U	0.73	0.35	0.17		1.31	*	2.28
I-62 DIS	8/9/2012	0.31	0.20	0.19	J	0.13	0.14	0.16	U	0.19	0.15	0.13	J	0.50	*	0.65
I-65 DIS	8/6/2012	0.82	0.30	0.18	J	0.05	0.08	0.14	UJ	0.71	0.28	0.16	J	1.53	*	2.18
I-66 DIS	8/10/2012	0.71	0.28	0.15	J	0.06	0.09	0.14	UJ	0.29	0.18	0.15	J	1.00	*	0.92
I-67 DIS	8/10/2012	0.75	0.31	0.17	J	0.00	0.10	0.21	UJ	0.82	0.32	0.15	J	1.57	*	2.53
I-68 DIS	8/6/2012	1.24	0.46	0.20		0.19	0.20	0.25	U	0.89	0.38	0.24		2.13	*	2.77
I-73 DIS	8/4/2012	1.32	0.45	0.14		0.02	0.08	0.21	U	0.76	0.33	0.15		2.08	*	2.37
D-3 DIS	8/8/2012	0.08	0.14	0.26	UJ	0.03	0.13	0.32	UJ	0.14	0.17	0.22	UJ	ND		0.80
D-3 DUP DIS	8/8/2012	0.17	0.17	0.20	UJ	-0.01	0.09	0.19	UJ	0.07	0.10	0.15	UJ	ND		0.55
D-6 DIS	8/7/2012	0.25	0.22	0.26	U	0.03	0.10	0.24	U	0.05	0.21	0.43	U	ND		1.39
D-6 DUP DIS	8/7/2012	0.33	0.22	0.20	J	0.11	0.14	0.18	U	0.14	0.15	0.19	U	0.33	*	0.66
D-12 DIS	8/8/2012	0.12	0.16	0.23	U	-0.02	0.10	0.25	U	0.21	0.19	0.20	J	0.21	*	0.75
D-13 DIS	8/10/2012	0.27	0.23	0.24	J	0.10	0.18	0.31	UJ	-0.01	0.08	0.19	UJ	0.27	*	0.71
D-13 DUP DIS	8/10/2012	0.11	0.15	0.22	UJ	0.08	0.15	0.27	UJ	0.07	0.12	0.19	UJ	ND		0.68
D-81 DIS	8/9/2012	1.67	0.49	0.15	J	0.33	0.23	0.22	J	1.22	0.41	0.15	J	3.21		3.78
D-83 DIS	8/9/2012	0.05	0.18	0.40	UJ	0.15	0.25	0.44	UJ	-0.08	0.13	0.42	UJ	ND		1.45
D-85 DIS	8/6/2012	0.16	0.14	0.17	UJ	0.07	0.10	0.15	UJ	0.03	0.08	0.17	UJ	ND		0.59

Table 6: Summary of Uranium Results from OU-1 Additional Groundwater Sampling

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
D-87 DIS	8/1/2012	0.11	0.16	0.24	UJ	-0.01	0.11	0.23	UJ+	0.08	0.13	0.19	UJ	ND		0.66
D-93 DIS	8/14/2012	0.21	0.20	0.25	UJ	0.05	0.14	0.31	UJ	0.16	0.17	0.19	UJ	ND		0.70
LR-100 DIS	8/13/2012	0.10	0.17	0.30	UJ	-0.03	0.12	0.30	UJ	-0.04	0.11	0.36	UJ	ND		1.22
LR-103 DIS	8/13/2012	0.30	0.24	0.20	J	0.10	0.16	0.25	UJ	0.11	0.16	0.23	UJ	0.30	*	0.81
LR-104 DIS	8/13/2012	2.14	0.78	0.35	J	0.84	0.51	0.43	J	2.21	0.79	0.29	J	5.19		6.99
LR-104 DUP DIS	8/13/2012	2.88	0.85	0.24	J	0.48	0.34	0.30	J	2.14	0.70	0.21	J	5.51		6.61
LR-105 DIS	8/1/2012	0.02	0.14	0.38	UJ	-0.06	0.17	0.47	UJ+	-0.01	0.15	0.45	UJ	ND		1.55
MW-102 DIS	8/7/2012	2.14	0.59	0.21	J	0.12	0.15	0.23	U	1.85	0.55	0.29		3.99	*	5.62
MW-103 DIS	8/11/2012	5.20	1.11	0.21		0.17	0.19	0.26	U	3.12	0.78	0.18		8.32	*	9.42
MW-104 DIS	8/9/2012	0.46	0.33	0.32	J	0.12	0.19	0.30	UJ	0.32	0.27	0.25	J	0.77	*	1.08
MW-1204 DIS	8/2/2012	0.15	0.16	0.22	UJ	0.10	0.12	0.17	UJ	0.11	0.13	0.19	UJ	ND		0.65
PZ-100-KS DIS	8/16/2012	0.05	0.15	0.32	UJ	-0.04	0.13	0.36	UJ	0.03	0.11	0.27	UJ	ND		0.96
PZ-100-SD DIS	7/31/2012	0.27	0.19	0.17	J	0.03	0.08	0.16	U	0.38	0.22	0.13	J	0.65	*	1.20
PZ-100-SS DIS	7/31/2012	5.41	1.12	0.20		0.16	0.18	0.24	U	2.05	0.58	0.14		7.46	*	6.22
PZ-101-SS DIS	8/7/2012	1.33	0.93	0.74	J	0.14	0.35	0.72	UJ	1.35	0.93	0.67	J	2.68	*	4.35
PZ-102R-SS DIS	8/13/2012	4.61	0.92	0.12	J	0.33	0.21	0.15	J	3.69	0.78	0.12	J	8.63		11.16
PZ-102-SS DIS	8/13/2012	3.35	0.75	0.15		0.49	0.27	0.21	J	2.10	0.55	0.15	J	5.93		6.47
PZ-103-SS DIS	8/7/2012	0.11	0.11	0.13	UJ	0.08	0.10	0.13	UJ	0.09	0.10	0.10	UJ	ND		0.36
PZ-104-KS DIS	8/13/2012	0.21	0.17	0.18	J	0.04	0.10	0.22	U	0.11	0.12	0.14	UJ	0.21	*	0.51
PZ-104-SD DIS	8/1/2012	1.02	0.95	0.98	J	-0.04	0.46	0.96	UJ	0.15	0.37	0.78	UJ	1.02	*	2.76
PZ-104-SS DIS	8/1/2012	0.91	0.31	0.15	J	0.07	0.10	0.13	UJ	0.50	0.22	0.12	J	1.41	*	1.56
PZ-105-SS DIS	8/1/2012	3.06	0.70	0.19		0.19	0.16	0.16	J+	1.88	0.51	0.14		5.14		5.70
PZ-106-KS DIS	8/14/2012	2.34	0.65	0.20		0.12	0.15	0.19	U	0.83	0.36	0.20		3.17	*	2.56
PZ-106-SD DIS	7/31/2012	0.12	0.13	0.18	UJ	0.02	0.07	0.17	UJ	0.05	0.08	0.14	UJ	ND		0.50
PZ-106-SS DIS	7/31/2012	1.14	0.45	0.18	J	0.00	0.13	0.28	UJ	0.57	0.31	0.23	J	1.72	*	1.84
PZ-107-SS DIS	8/4/2012	1.88	0.53	0.18		0.13	0.15	0.19	U	1.37	0.44	0.17		3.25	*	4.18

Table 6: Summary of Uranium Results from OU-1 Additional Groundwater Sampling

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
PZ-109-SS DIS	8/2/2012	1.43	0.57	0.23	J	0.06	0.17	0.36	UJ	0.96	0.46	0.29	J	2.39	*	3.03
PZ-110-SS DIS	8/2/2012	0.18	0.17	0.21	U	-0.01	0.09	0.21	U	-0.01	0.07	0.17	U	ND		0.60
PZ-111-K3 DIS	8/13/2012	8.33	1.63	0.17		0.74	0.39	0.28	J	2.80	0.75	0.17	J	11.87		8.68
PZ-111-SD DIS	8/1/2012	0.32	0.20	0.16	J	0.06	0.10	0.15	UJ+	0.34	0.21	0.17	J	0.67	*	1.09
PZ-112-AS DIS	8/8/2012	0.03	0.10	0.21	UJ	0.04	0.12	0.25	U	-0.02	0.07	0.18	U	ND		0.65
PZ-113 AD DUP DIS	8/3/2012	1.36	0.61	0.39	J	0.62	0.43	0.34	J	0.31	0.28	0.30	J	2.29		1.22
PZ-113-AD DIS	8/3/2012	-0.03	0.12	0.31	UJ	0.06	0.14	0.30	UJ	-0.01	0.12	0.24	UJ	ND		0.87
PZ-113-AS DIS	8/8/2012	1.02	0.51	0.32	J	-0.03	0.14	0.36	UJ	0.71	0.41	0.25	J	1.73	*	2.28
PZ-113-SS DIS	8/4/2012	1.57	0.46	0.18	J	0.18	0.17	0.20	UJ	0.84	0.32	0.14	J	2.41	*	2.60
PZ-114-AS DIS	7/31/2012	0.19	0.18	0.20	UJ	0.05	0.14	0.30	UJ	0.07	0.14	0.27	UJ	ND		0.94
PZ-115-SS DIS	7/31/2012	1.90	0.62	0.20		0.10	0.17	0.30	U	1.26	0.49	0.24		3.16	*	3.89
PZ-116-SS DIS	8/3/2012	6.40	1.26	0.17		1.25	0.48	0.17		2.20	0.61	0.21		9.85		7.12
PZ-200 SS DUP DIS	8/2/2012	0.69	0.33	0.20		0.12	0.15	0.18	U	0.22	0.19	0.21	J	0.91	*	0.74
PZ-200-SS DIS	8/2/2012	0.18	0.17	0.22	U	0.01	0.08	0.22	U	0.55	0.28	0.18	J	0.55	*	1.76
PZ-201A-SS DIS	8/1/2012	1.96	0.49	0.10	J	0.01	0.06	0.15	UJ+	1.16	0.35	0.11	J	3.12	*	3.52
PZ-201A-SS DUP DIS	8/1/2012	2.05	0.53	0.14	J	0.09	0.11	0.13	UJ+	1.65	0.46	0.12	J	3.70	*	4.99
PZ-202-SS DIS	8/2/2012	1.15	0.38	0.21		0.16	0.15	0.14	J	0.57	0.26	0.15	J	1.88		1.77
PZ-203-SS DIS	8/1/2012	3.37	0.69	0.14	J	0.15	0.14	0.15	J+	0.66	0.26	0.13	J	4.19		2.05
PZ-204A-SS DIS	8/2/2012	1.98	0.60	0.15		0.21	0.20	0.21	U	1.66	0.54	0.20		3.64	*	5.05
PZ-204-SS DIS	8/3/2012	3.88	0.78	0.10	J	0.39	0.23	0.18	J	2.95	0.65	0.15	J	7.22		8.96
PZ-205-AS DIS	8/3/2012	0.68	0.37	0.27	J	0.17	0.22	0.33	UJ	0.11	0.16	0.24	UJ	0.68	*	0.86
PZ-205-SS DIS	8/3/2012	0.35	0.20	0.15	J	-0.02	0.07	0.18	UJ	0.31	0.19	0.17	J	0.66	*	1.01
PZ-206-SS DIS	8/7/2012	0.27	0.19	0.17	J	0.04	0.10	0.22	UJ	0.04	0.08	0.15	UJ	0.27	*	0.56
PZ-207-AS DIS	8/8/2012	0.06	0.14	0.27	UJ	0.04	0.10	0.21	UJ	0.08	0.13	0.23	UJ	ND		0.78
PZ-208-SS DIS	8/2/2012	1.88	0.55	0.20		0.15	0.16	0.19	UJ+	0.82	0.37	0.34		2.70	*	2.52
PZ-302-AI DIS	8/9/2012	5.50	1.25	0.18	J	0.09	0.14	0.23	UJ	4.01	1.00	0.18	J	9.51	*	12.04

Table 6: Summary of Uranium Results from OU-1 Additional Groundwater Sampling

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
PZ-303-AS DIS	8/10/2012	-0.01	0.18	0.53	UJ	0.10	0.27	0.59	UJ	-0.16	0.21	0.72	UJ	ND		2.42
PZ-304-AI DIS	8/10/2012	1.27	0.56	0.36	J	0.00	0.18	0.39	UJ	0.58	0.41	0.48	J	1.85	*	1.91
PZ-304-AS DIS	8/10/2012	0.07	0.35	0.83	UJ	-0.14	0.31	0.90	UJ	0.03	0.25	0.67	UJ	ND		2.43
PZ-305-AI DIS	8/8/2012	0.07	0.11	0.19	U	0.20	0.22	0.30	U	-0.01	0.09	0.26	U	ND		0.92
S-5 TOT	8/14/2012	0.99	0.72	0.66	J	0.00	0.38	0.81	UJ	0.19	0.31	0.49	UJ	0.99	*	1.84
S-8 TOT	8/9/2012	1.79	0.91	0.50	J	0.06	0.25	0.62	UJ	2.36	1.06	0.50	J	4.15	*	7.31
S-10 TOT	8/8/2012	1.00	0.44	0.22	J	0.20	0.21	0.22	UJ	0.83	0.39	0.20	J	1.84	*	2.59
S-61 TOT	8/7/2012	1.47	0.46	0.18		0.04	0.10	0.22	U	1.28	0.42	0.13		2.76	*	3.93
S-82 TOT	8/10/2012	1.21	0.52	0.29	J	0.06	0.17	0.37	UJ	0.98	0.46	0.22	J	2.18	*	3.08
S-84 TOT	8/6/2012	0.57	0.30	0.21	J	0.06	0.12	0.23	UJ	0.33	0.22	0.20	J	0.89	*	1.07
I-4 TOT	8/14/2012	0.22	0.38	0.67	UJ	0.00	0.38	0.83	UJ	0.11	0.31	0.67	UJ	ND		2.37
I-9 TOT	8/14/2012	0.20	0.17	0.16	J	0.04	0.12	0.26	U	0.11	0.14	0.21	UJ	0.20	*	0.75
I-9 DUP TOT	8/14/2012	0.37	0.24	0.18	J	-0.02	0.09	0.23	U	0.11	0.14	0.22	U	0.37	*	0.76
I-11 TOT	8/8/2012	1.19	0.53	0.23	J	0.06	0.18	0.39	UJ	0.94	0.47	0.31	J	2.13	*	2.97
I-62 TOT	8/9/2012	0.37	0.24	0.21	J	0.08	0.12	0.20	U	0.31	0.23	0.24	J	0.68	*	1.02
I-65 TOT	8/6/2012	1.34	0.41	0.11	J	0.05	0.09	0.17	UJ	1.10	0.36	0.13	J	2.44	*	3.35
I-66 TOT	8/10/2012	0.88	0.35	0.14		0.03	0.08	0.17	U	0.55	0.27	0.18		1.43	*	1.72
I-67 TOT	8/10/2012	0.85	0.34	0.20		0.07	0.13	0.22	U	0.74	0.32	0.21		1.59	*	2.32
I-68 TOT	8/6/2012	2.47	1.49	1.05	J	-0.11	0.44	1.13	UJ	3.04	1.67	0.91	J	5.52	*	9.60
I-73 TOT	8/4/2012	1.39	0.50	0.16	J	0.12	0.16	0.22	UJ	0.99	0.41	0.21	J	2.39	*	3.06
D-3 TOT	8/8/2012	0.19	0.26	0.40	UJ	-0.04	0.16	0.41	UJ	0.16	0.26	0.45	UJ	ND		1.52
D-3 DUP TOT	8/8/2012	0.16	0.22	0.34	UJ	0.18	0.23	0.32	UJ	-0.20	0.15	0.56	UJ	ND		1.83
D-6 TOT	8/7/2012	0.19	0.17	0.16	J	0.13	0.17	0.25	U	0.07	0.12	0.21	U	0.19	*	0.73
D-6 DUP TOT	8/7/2012	0.36	0.21	0.13	J	-0.01	0.07	0.16	U	0.17	0.15	0.17	J	0.53	*	0.58
D-12 TOT	8/8/2012	0.05	0.11	0.22	U	0.19	0.19	0.20	U	0.12	0.16	0.24	U	ND		0.80

Table 6: Summary of Uranium Results from OU-1 Additional Groundwater Sampling

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
D-13 TOT	8/10/2012	0.17	0.15	0.17	J	-0.01	0.07	0.16	U	0.04	0.08	0.16	U	0.17	*	0.56
D-13 DUP TOT	8/10/2012	0.12	0.13	0.18	U	0.02	0.07	0.19	U	0.10	0.13	0.20	U	ND		0.69
D-14 TOT	8/10/2012	1.36	0.68	0.43	J	0.00	0.25	0.55	UJ	1.51	0.72	0.39	J	2.87	*	4.77
D-81 TOT	8/9/2012	1.92	0.61	0.21		0.12	0.17	0.25	U	1.36	0.50	0.21		3.28	*	4.16
D-83 TOT	8/9/2012	-0.07	0.11	0.33	UJ	0.00	0.12	0.36	UJ	0.06	0.13	0.27	UJ	ND		0.96
D-85 TOT	8/6/2012	3.68	0.80	0.19	J	0.32	0.22	0.21	J	4.50	0.92	0.15	J	8.51		13.57
D-87 TOT	8/1/2012	0.14	0.16	0.22	U	0.04	0.12	0.27	UJ+	0.28	0.20	0.15	J	0.28	*	0.96
D-93 TOT	8/14/2012	0.78	0.44	0.26	J	0.04	0.15	0.37	U	0.20	0.23	0.30	UJ	0.78	*	1.05
LR-100 TOT	8/13/2012	1.24	0.88	0.77	J	0.09	0.34	0.86	UJ	0.20	0.38	0.69	UJ	1.24	*	2.46
LR-103 TOT	8/13/2012	0.77	0.48	0.39	J	0.23	0.29	0.38	UJ	0.64	0.44	0.35	J	1.41	*	2.09
LR-104 DUP TOT	8/13/2012	2.88	0.76	0.22		0.04	0.12	0.27	U	2.54	0.70	0.16	J	5.42	*	7.68
LR-104 TOT	8/13/2012	2.99	0.91	0.32	J	0.45	0.36	0.36	J	2.44	0.80	0.26	J	5.88		7.49
LR-105 TOT	8/1/2012	0.01	0.17	0.48	UJ	0.05	0.20	0.52	UJ+	0.00	0.00	0.22	UJ	ND		0.88
MW-102 TOT	8/7/2012	3.31	0.84	0.17	J	0.24	0.23	0.27	U	2.40	0.68	0.17		5.71	*	7.29
MW-103 TOT	8/11/2012	6.96	1.37	0.16		0.34	0.26	0.26	J	6.21	1.26	0.15		13.51		18.66
MW-104 TOT	8/9/2012	1.34	0.63	0.36	J	0.02	0.16	0.45	UJ	1.09	0.56	0.36	J	2.43	*	3.44
MW-1204 TOT	8/2/2012	0.14	0.21	0.31	UJ	-0.05	0.19	0.49	UJ	0.12	0.21	0.36	UJ	ND		1.30
PZ-100-KS TOT	8/16/2012	0.23	0.16	0.14	J	0.07	0.11	0.20	UJ	-0.01	0.06	0.14	UJ	0.23	*	0.51
PZ-100-SD TOT	7/31/2012	0.59	0.40	0.37	J	-0.02	0.15	0.35	UJ	0.07	0.30	0.61	UJ	0.59	*	1.98
PZ-100-SS TOT	7/31/2012	5.06	0.91	0.13	J	0.06	0.09	0.17	UJ	2.35	0.54	0.12	J	7.41	*	7.08
PZ-101-SS TOT	8/7/2012	0.53	0.46	0.44	J	0.00	0.32	0.69	UJ	-0.02	0.20	0.61	UJ	0.53	*	2.13
PZ-102R-SS TOT	8/13/2012	2.10	0.51	0.11	J	0.23	0.17	0.17	J	1.21	0.37	0.14	J	3.55		3.72
PZ-102-SS TOT	8/13/2012	1.24	0.43	0.19		0.16	0.17	0.23	U	1.00	0.38	0.14	J	2.24	*	3.09
PZ-103-SS TOT	8/7/2012	0.15	0.12	0.10	J	0.06	0.09	0.13	UJ	0.40	0.21	0.15	J	0.55	*	1.25
PZ-104-KS TOT	8/13/2012	0.56	0.23	0.12	J	0.08	0.11	0.17	UJ	0.37	0.19	0.13	J	0.93	*	1.18
PZ-104-SD TOT	8/1/2012	0.53	0.36	0.32	J	0.07	0.18	0.39	UJ	0.58	0.36	0.22	J	1.11	*	1.90

Table 6: Summary of Uranium Results from OU-1 Additional Groundwater Sampling

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
PZ-104-SS TOT	8/1/2012	0.86	0.32	0.18	J	0.08	0.11	0.18	UJ	0.63	0.27	0.15	J	1.49	*	1.98
PZ-105-SS TOT	8/1/2012	3.42	0.77	0.20		0.05	0.10	0.20	UJ+	1.84	0.52	0.16		5.26	*	5.56
PZ-106-KS TOT	8/14/2012	2.41	0.65	0.15		0.32	0.23	0.19	J	0.90	0.37	0.20		3.63		2.84
PZ-106-SD TOT	7/31/2012	0.54	0.49	0.52	J	-0.02	0.24	0.51	UJ	0.00	0.21	0.62	UJ	0.54	*	2.07
PZ-106-SS TOT	7/31/2012	1.12	0.38	0.12		0.03	0.10	0.21	U	0.31	0.19	0.17	J	1.42	*	1.01
PZ-107-SS TOT	8/4/2012	2.50	0.73	0.31	J	0.53	0.33	0.20	J	2.35	0.69	0.22	J	5.38		7.23
PZ-109-SS TOT	8/2/2012	1.31	0.53	0.20	J	0.06	0.16	0.35	UJ	0.75	0.40	0.28	J	2.06	*	2.39
PZ-110-SS TOT	8/2/2012	0.10	0.13	0.20	UJ	-0.01	0.10	0.20	UJ	0.08	0.14	0.24	UJ	ND		0.82
PZ-111-K3 TOT	8/13/2012	6.95	1.28	0.13	J	0.75	0.34	0.16	J	2.94	0.70	0.17	J	10.64		9.10
PZ-111-SD TOT	8/1/2012	0.38	0.24	0.21	J	0.05	0.12	0.24	UJ+	0.28	0.20	0.17	J	0.66	*	0.93
PZ-112-AS TOT	8/8/2012	0.12	0.15	0.19	UJ	0.05	0.15	0.31	UJ	0.03	0.09	0.19	UJ	ND		0.71
PZ-113 AD DUP TOT	8/3/2012	0.58	0.28	0.20		0.08	0.13	0.21	U	0.13	0.13	0.17	U	0.58	*	0.59
PZ-113-AD TOT	8/3/2012	0.14	0.19	0.28	UJ	0.00	0.16	0.35	UJ	-0.01	0.09	0.20	UJ	ND		0.74
PZ-113-AS TOT	8/8/2012	0.77	0.41	0.29	J	0.00	0.17	0.37	UJ	0.64	0.37	0.22	J	1.41	*	2.07
PZ-113-SS TOT	8/4/2012	3.65	1.13	0.46	J	1.85	0.80	0.36	J	1.26	0.60	0.40	J	6.75		4.60
PZ-114-AS TOT	7/31/2012	0.10	0.15	0.25	UJ	0.18	0.22	0.30	UJ	0.12	0.18	0.29	UJ	ND		0.99
PZ-115-SS TOT	7/31/2012	1.93	0.74	0.30	J	0.20	0.24	0.30	UJ	0.67	0.41	0.27	J	2.60	*	2.13
PZ-116-SS TOT	8/3/2012	5.93	1.03	0.14	J	0.31	0.19	0.17	J	1.76	0.45	0.09	J	7.99		5.39
PZ-200 SS DUP TOT	8/2/2012	0.32	0.20	0.18	J	0.07	0.12	0.20	UJ	0.34	0.20	0.14	J	0.66	*	1.09
PZ-200-SS TOT	8/2/2012	0.54	0.27	0.18	J	0.04	0.10	0.22	UJ	0.59	0.27	0.13	J	1.14	*	1.87
PZ-201A-SS DUP TOT	8/1/2012	1.64	0.70	0.31	J	0.08	0.22	0.47	UJ+	1.58	0.70	0.42	J	3.23	*	4.93
PZ-201A-SS TOT	8/1/2012	2.09	0.51	0.10	J	0.08	0.10	0.14	UJ+	1.56	0.42	0.13	J	3.66	*	4.72
PZ-202-SS TOT	8/2/2012	1.18	0.73	0.64	J	0.08	0.23	0.55	UJ	0.88	0.61	0.49	J	2.06	*	2.88
PZ-203-SS TOT	8/1/2012	4.11	0.77	0.16	J	0.02	0.05	0.11	UJ+	0.55	0.22	0.12	J	4.67	*	1.70
PZ-204A-SS TOT	8/2/2012	1.71	0.56	0.22	J	0.16	0.18	0.24	UJ	1.27	0.47	0.21	J	2.98	*	3.89
PZ-204-SS TOT	8/3/2012	3.81	0.84	0.18		0.26	0.21	0.22	J	2.28	0.60	0.14		6.34		6.90

Table 6: Summary of Uranium Results from OU-1 Additional Groundwater Sampling

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
PZ-205-AS TOT	8/3/2012	0.17	0.15	0.16	J	0.03	0.07	0.16	U	0.12	0.12	0.13	U	0.17	*	0.45
PZ-205-SS TOT	8/3/2012	0.44	0.27	0.22	J	-0.02	0.09	0.24	U	0.34	0.23	0.19	J	0.79	*	1.14
PZ-206-SS TOT	8/7/2012	0.25	0.18	0.19	J	0.04	0.10	0.21	UJ	0.21	0.17	0.20	J	0.47	*	0.74
PZ-207-AS TOT	8/8/2012	0.16	0.30	0.55	UJ	0.07	0.27	0.67	UJ	0.16	0.30	0.54	UJ	ND		1.94
PZ-208-SS TOT	8/2/2012	2.04	0.62	0.18		0.37	0.28	0.28	J+	1.64	0.54	0.22		4.04		5.04
PZ-302-AI TOT	8/9/2012	5.02	1.01	0.13		0.32	0.23	0.24	J	3.57	0.80	0.13		8.91		10.80
PZ-303-AS TOT	8/10/2012	0.48	0.38	0.32	J	-0.06	0.18	0.50	UJ	0.12	0.20	0.31	UJ	0.48	*	1.17
PZ-304-AI TOT	8/10/2012	2.71	1.40	0.65	J	0.41	0.63	1.03	UJ	1.55	1.01	0.64	J	4.25	*	5.08
PZ-304-AS TOT	8/10/2012	0.03	0.19	0.51	UJ	0.19	0.31	0.49	UJ	-0.02	0.18	0.39	UJ	ND		1.39
PZ-305-AI TOT	8/8/2012	0.88	0.41	0.24	J	0.07	0.15	0.30	UJ	0.81	0.40	0.28	J	1.69	*	2.55

Notes:
All values are in units of picoCuries per liter (pCi/l), except as noted.
DIS = dissolved sample (field filtered sample); TOT = total sample (unfiltered sample)
DUP = Duplicate samples; Field duplicates were collected from the following locations: DUP 01 = PZ-201A-SS, DUP 02 = PZ-200-SS, DUP 03 = PZ-113-AD, DUP-04 = D-6, DUP-05 = D-3, DUP 06 = D-13, DUP 07 = LR-104, and DUP 08 = I-9.
CSU = Combined Standard Uncertainty (2-sigma)
Data Validation Qualifiers (Final Q) include: U = Non-detect at the reported value;
UJ = Non-Detect at the estimated reported value; UJ+ = Non-Detect at the estimated reported value which may be biased high;
J = estimated result; J+ = estimated result which may be biased high.
Total U-238 + U-235 +U-234 based on sum of detected values only. The * flag indicates one or more of the individual isotopes was non-detect.
Total uranium values in ug/l based on use of Minimum Detectable Activity (MDA) values for non-detect results.
MCL = Maximum Contaminant Level for drinking water systems of 30 ug/l for total Uranium

Table 7: Summary of Thorium Isotope Results from OU-1 Additional Groundwater Sampling

		Thorium-228				Thorium-230				Thorium-232				TOTAL THORIUM-	
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	228 + 230 + 232	
S-5 TOT	8/14/2012	0.13	0.17	0.27	U	0.45	0.32	0.35	J+	0.13	0.17	0.26	U	0.45	*
S-8 TOT	8/9/2012	0.48	0.25	0.13		0.20	0.16	0.17	J	0.07	0.10	0.15	U	0.67	*
S-10 TOT	8/8/2012	0.06	0.16	0.33	U	0.53	0.36	0.22	J	-0.08	0.12	0.38	U	0.53	*
S-61 TOT	8/7/2012	0.02	0.22	0.50	UJ	2.11	0.84	0.29	J	0.10	0.18	0.33	UJ	2.11	*
S-82 TOT	8/10/2012	0.86	0.34	0.20	J	0.29	0.18	0.13	J-	0.24	0.16	0.13	J	1.40	
S-84 TOT	8/6/2012	0.18	0.27	0.46	UJ	1.33	0.58	0.27	J	0.36	0.28	0.30	J	1.68	*
I-4 TOT	8/14/2012	0.49	0.26	0.18	J	0.83	0.35	0.15	J+	0.04	0.08	0.15	UJ	1.33	*
I-9 TOT	8/14/2012	0.07	0.18	0.36	U	0.12	0.16	0.24	UJ+	-0.01	0.08	0.25	U	ND	*
I-9 DUP TOT	8/14/2012	-0.01	0.04	0.10	UJ	0.11	0.11	0.13	UJ+	0.04	0.07	0.13	UJ	ND	*
I-11 TOT	8/8/2012	0.19	0.22	0.29	UJ	0.21	0.22	0.28	UJ	0.04	0.10	0.21	UJ	ND	*
I-62 TOT	8/9/2012	0.19	0.22	0.30	UJ	0.22	0.21	0.21	J	0.18	0.19	0.21	UJ	0.22	*
I-65 TOT	8/6/2012	0.60	0.37	0.34	J	0.20	0.19	0.20	UJ	0.20	0.19	0.18	J	0.00	*
I-66 TOT	8/10/2012	0.09	0.12	0.18	UJ	0.34	0.20	0.13	J-	0.01	0.05	0.13	UJ	0.34	*
I-67 TOT	8/10/2012	0.11	0.12	0.18	UJ	1.53	0.48	0.14	J-	-0.01	0.05	0.11	UJ	1.53	*
I-68 TOT	8/6/2012	2.08	0.65	0.14		1.82	0.61	0.19		0.70	0.32	0.13		4.60	
I-73 TOT	8/4/2012	0.08	0.11	0.15	U	0.43	0.25	0.13	J	0.15	0.14	0.15	U	0.43	*
D-3 TOT	8/8/2012	0.08	0.13	0.21	U	0.25	0.21	0.22	J	0.00	0.10	0.21	U	0.25	*
D-3 DUP TOT	8/8/2012	0.11	0.11	0.12	UJ	0.22	0.17	0.16	J	0.05	0.09	0.16	UJ	0.22	*
D-6 TOT	8/7/2012	0.22	0.22	0.27	UJ	0.11	0.15	0.23	UJ	0.13	0.18	0.26	UJ	ND	*
D-6 DUP TOT	8/7/2012	0.29	0.26	0.31	UJ	0.37	0.27	0.22	J	0.11	0.15	0.22	UJ	0.37	*
D-12 TOT	8/8/2012	0.09	0.12	0.16	U	0.27	0.21	0.21	J	0.02	0.10	0.23	U	0.27	*
D-13 TOT	8/10/2012	0.34	0.23	0.16		0.44	0.26	0.15	J	0.09	0.12	0.15	U	0.78	*
D-13 DUP TOT	8/10/2012	0.52	0.35	0.29	J	0.30	0.27	0.31	UJ-	0.05	0.14	0.30	UJ	0.00	*
D-14 TOT	8/10/2012	1.95	0.70	0.28		2.19	0.77	0.21		1.91	0.68	0.21		6.06	
D-81 TOT	8/9/2012	0.05	0.10	0.19	UJ	0.33	0.19	0.15	J	0.08	0.09	0.12	UJ	0.33	*
D-83 TOT	8/9/2012	0.22	0.20	0.25	U	0.26	0.19	0.15	J	0.02	0.07	0.17	U	0.26	*
D-85 TOT	8/6/2012	4.49	1.15	0.13		7.84	1.92	0.13		4.54	1.14	0.13		16.87	
D-87 TOT	8/1/2012	0.09	0.13	0.22	U	0.17	0.14	0.11	J+	0.10	0.10	0.11	U	0.17	*

Table 7: Summary of Thorium Isotope Results from OU-1 Additional Groundwater Sampling

		Thorium-228				Thorium-230				Thorium-232				TOTAL THORIUM-	
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	228 + 230 + 232	
D-93 TOT	8/14/2012	0.15	0.14	0.18	UJ	0.17	0.14	0.15	J+	0.06	0.08	0.12	UJ	0.17	*
LR-100 TOT	8/13/2012	0.11	0.11	0.13	UJ	0.29	0.19	0.14	J+	0.11	0.12	0.17	UJ	0.29	*
LR-103 TOT	8/13/2012	0.15	0.13	0.12	J	0.51	0.25	0.15	J+	0.15	0.13	0.15	J	0.81	
LR-104 DUP TOT	8/13/2012	0.06	0.08	0.13	UJ	0.28	0.17	0.11	J+	0.07	0.09	0.14	UJ	0.28	*
LR-104 TOT	8/13/2012	0.10	0.12	0.17	UJ	0.31	0.21	0.19	J+	-0.09	0.08	0.26	UJ	0.31	*
LR-105 TOT	8/1/2012	0.07	0.10	0.15	U	0.83	0.39	0.15	J+	0.14	0.15	0.15	U	0.83	*
MW-102 TOT	8/7/2012	0.20	0.24	0.35	UJ	0.40	0.29	0.21	J	0.12	0.16	0.24	UJ	0.40	*
MW-103 TOT	8/11/2012	3.50	0.94	0.14		3.78	1.04	0.18	J-	3.40	0.91	0.14		10.68	
MW-104 TOT	8/9/2012	0.99	0.38	0.20	J	0.89	0.35	0.16	J	0.85	0.33	0.12	J	2.73	
MW-1204 TOT	8/2/2012	0.17	0.18	0.26	U	0.00	0.00	0.40	UJ-	-0.02	0.06	0.16	U	ND	*
PURGE TANK TOT	8/16/2012	0.15	0.25	0.43	UJ	0.88	0.46	0.21	J	0.42	0.31	0.28	J	1.31	*
PZ-100-KS TOT	8/16/2012	0.02	0.08	0.20	U	0.11	0.15	0.22	UJ+	-0.02	0.08	0.19	U	ND	*
PZ-100-SD TOT	7/31/2012	-0.02	0.10	0.29	UJ	1.05	0.43	0.18	J	0.05	0.09	0.17	UJ	1.05	*
PZ-100-SS TOT	7/31/2012	-0.02	0.07	0.21	U	0.10	0.12	0.14	UJ	0.02	0.06	0.12	U	ND	*
PZ-101-SS TOT	8/7/2012	0.08	0.12	0.18	U	0.13	0.13	0.14	U	0.00	0.09	0.20	U	ND	*
PZ-102R-SS TOT	8/13/2012	-0.01	0.06	0.13	UJ	0.13	0.12	0.12	J-	0.10	0.11	0.12	UJ	0.13	*
PZ-102-SS TOT	8/13/2012	0.64	0.30	0.19	J	0.72	0.33	0.15	J+	0.66	0.30	0.15	J	2.02	
PZ-103-SS TOT	8/7/2012	0.33	0.23	0.18	J	0.88	0.39	0.16		0.20	0.18	0.20		1.41	
PZ-104-KS TOT	8/13/2012	0.02	0.06	0.13	UJ	0.18	0.15	0.14	J+	0.14	0.14	0.17	UJ	0.18	*
PZ-104-SD TOT	8/1/2012	0.11	0.13	0.16	U	0.19	0.19	0.23	UJ	0.07	0.11	0.16	U	ND	*
PZ-104-SS TOT	8/1/2012	-0.02	0.07	0.18	U	0.30	0.21	0.14	J	0.03	0.09	0.20	U	0.30	*
PZ-105-SS TOT	8/1/2012	0.00	0.11	0.27	U	0.20	0.19	0.25	UJ+	0.05	0.11	0.22	U	ND	*
PZ-106-KS TOT	8/14/2012	0.07	0.11	0.18	UJ	0.21	0.18	0.20	J+	0.00	0.11	0.28	UJ	0.21	*
PZ-106-SD TOT	7/31/2012	0.17	0.17	0.20	U	1.39	0.54	0.15	J	0.18	0.17	0.15	J	1.57	*
PZ-106-SS TOT	7/31/2012	0.08	0.10	0.12	U	0.11	0.11	0.12	UJ	0.05	0.08	0.12	U	ND	*
PZ-107-SS TOT	8/4/2012	0.41	0.23	0.16	J	0.69	0.30	0.11	J	1.06	0.38	0.11	J	2.16	
PZ-109-SS TOT	8/2/2012	0.03	0.11	0.23	UJ	0.13	0.13	0.16	UJ-	0.03	0.08	0.16	UJ	ND	*
PZ-110-SS TOT	8/2/2012	-0.02	0.06	0.16	UJ	0.29	0.20	0.15	J-	0.09	0.12	0.18	UJ	0.29	*

Table 7: Summary of Thorium Isotope Results from OU-1 Additional Groundwater Sampling

		Thorium-228				Thorium-230				Thorium-232				TOTAL THORIUM-	
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	228 + 230 + 232	
PZ-111-K3 TOT	8/13/2012	0.07	0.09	0.14	UJ	0.29	0.19	0.16	J+	-0.01	0.05	0.14	UJ	0.29	*
PZ-111-SD TOT	8/1/2012	0.10	0.12	0.15	UJ	0.14	0.13	0.12	J+	0.05	0.08	0.12	UJ	0.14	*
PZ-112-AS TOT	8/8/2012	0.21	0.19	0.20	J	0.10	0.13	0.17	UJ	0.03	0.08	0.17	UJ	0.00	*
PZ-113-AD DUP TOT	8/3/2012	0.21	0.16	0.14	J	0.67	0.30	0.11	J	0.02	0.05	0.11	UJ	0.87	*
PZ-113-AD TOT	8/3/2012	0.07	0.12	0.22	UJ	0.11	0.12	0.14	UJ	0.02	0.06	0.12	UJ	ND	*
PZ-113-AS TOT	8/8/2012	0.06	0.11	0.21	UJ	0.07	0.09	0.14	UJ	0.04	0.08	0.14	UJ	ND	*
PZ-113-SS TOT	8/4/2012	0.01	0.09	0.24	UJ	0.15	0.16	0.17	UJ	-0.06	0.09	0.29	UJ	ND	*
PZ-114-AS TOT	7/31/2012	0.00	0.00	0.08	U	0.68	0.32	0.14	J	0.06	0.08	0.13	U	0.68	*
PZ-115-SS TOT	7/31/2012	0.18	0.21	0.31	U	0.75	0.40	0.25	J	0.01	0.09	0.23	U	0.75	*
PZ-116-SS TOT	8/3/2012	0.03	0.11	0.23	UJ	0.02	0.09	0.21	UJ	0.01	0.07	0.18	UJ	ND	*
PZ-200-SS DUP TOT	8/2/2012	0.01	0.12	0.31	UJ	0.31	0.24	0.19	J-	0.07	0.11	0.17	UJ	0.31	*
PZ-200-SS TOT	8/2/2012	0.14	0.15	0.23	UJ	0.40	0.21	0.14	J-	0.11	0.11	0.15	UJ	0.40	*
PZ-201A-SS DUP TOT	8/1/2012	0.06	0.09	0.13	U	0.19	0.17	0.19	J+	-0.01	0.06	0.13	U	0.19	*
PZ-201A-SS TOT	8/1/2012	0.13	0.17	0.25	U	0.18	0.18	0.23	UJ+	-0.03	0.08	0.22	U	ND	*
PZ-202-SS TOT	8/2/2012	0.81	0.35	0.22		0.44	0.24	0.14	J-	0.90	0.36	0.12		2.15	
PZ-203-SS TOT	8/1/2012	0.17	0.19	0.28	U	0.20	0.19	0.23	UJ+	0.05	0.10	0.20	U	ND	*
PZ-204A-SS TOT	8/2/2012	0.35	0.22	0.21	J	0.42	0.24	0.17	J-	0.06	0.10	0.16	UJ	0.77	*
PZ-204-SS TOT	8/3/2012	0.11	0.15	0.24	UJ	0.11	0.13	0.20	UJ	0.13	0.13	0.17	UJ	ND	*
PZ-205-AS TOT	8/3/2012	0.15	0.15	0.22	UJ	0.15	0.13	0.11	J	0.07	0.09	0.11	UJ	0.15	*
PZ-205-SS TOT	8/3/2012	0.18	0.21	0.27	UJ	2.76	1.01	0.21	J-	-0.01	0.10	0.21	UJ	2.76	*
PZ-206-SS TOT	8/7/2012	0.14	0.14	0.19	UJ	0.41	0.22	0.15	J	0.07	0.09	0.11	UJ	0.41	*
PZ-207-AS TOT	8/8/2012	0.08	0.14	0.24	U	0.23	0.21	0.24	U	0.00	0.12	0.29	U	ND	*
PZ-208-SS TOT	8/2/2012	0.07	0.10	0.16	U	0.47	0.25	0.12	J+	0.06	0.10	0.18	U	0.47	*
PZ-302-AI TOT	8/9/2012	0.11	0.14	0.23	U	0.29	0.20	0.21	J	0.06	0.10	0.17	U	0.29	*
PZ-303-AS TOT	8/10/2012	0.02	0.10	0.24	U	0.44	0.28	0.27	J	0.19	0.17	0.18	J	0.62	*
PZ-304-AI TOT	8/10/2012	0.18	0.15	0.18	UJ	0.38	0.20	0.11	J-	-0.01	0.05	0.13	UJ	0.38	*

Table 7: Summary of Thorium Isotope Results from OU-1 Additional Groundwater Sampling

		Thorium-228				Thorium-230				Thorium-232				TOTAL THORIUM-	
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	228 + 230 + 232	
PZ-304-AS TOT	8/10/2012	0.13	0.15	0.22	U	0.21	0.16	0.16	J-	-0.01	0.05	0.14	U	0.21	*
PZ-305-AI TOT	8/8/2012	0.61	0.27	0.12	J	0.71	0.30	0.11	J	0.63	0.27	0.12	J	1.94	
														0.00	
S-5 DIS	8/14/2012	0.06	0.11	0.20	U	-0.04	0.07	0.22	UJ+	-0.05	0.07	0.23	U	ND	*
S-8 DIS	8/9/2012	-0.01	0.07	0.15	U	0.09	0.11	0.14	U	0.06	0.09	0.14	U	ND	*
S-10 DIS	8/8/2012	0.05	0.10	0.19	U	0.28	0.21	0.15	J	0.07	0.12	0.22	U	0.28	*
S-61 DIS	8/7/2012	-0.03	0.09	0.24	UJ	0.20	0.15	0.15	J	0.00	0.05	0.16	UJ	0.20	*
S-82 DIS	8/10/2012	0.02	0.06	0.14	U	0.18	0.15	0.14	J-	0.08	0.11	0.14	U	0.18	*
S-84 DIS	8/6/2012	0.01	0.10	0.23	UJ	0.15	0.13	0.11	J	0.07	0.09	0.11	UJ	0.15	*
I-4 DIS	8/14/2012	0.23	0.21	0.26	U	0.55	0.32	0.20	J+	1.48	0.56	0.23		2.04	*
I-9 DIS	8/14/2012	0.00	0.14	0.33	U	0.06	0.13	0.23	UJ+	-0.04	0.08	0.23	U	ND	*
I-9 DUP DIS	8/14/2012	0.09	0.12	0.15	U	0.26	0.20	0.20	J+	-0.01	0.07	0.15	U	0.26	*
I-11 DIS	8/8/2012	-0.01	0.08	0.17	U	0.22	0.19	0.17	J	0.03	0.08	0.17	U	0.22	*
I-62 DIS	8/9/2012	0.10	0.13	0.21	UJ	0.11	0.11	0.15	UJ	0.04	0.07	0.13	UJ	ND	*
I-65 DIS	8/6/2012	0.03	0.10	0.21	U	0.03	0.07	0.14	U	0.06	0.10	0.14	U	ND	*
I-66 DIS	8/10/2012	-0.04	0.07	0.22	UJ	0.15	0.16	0.24	UJ-	-0.01	0.06	0.16	UJ	ND	*
I-67 DIS	8/10/2012	0.08	0.19	0.37	U	0.20	0.20	0.25	UJ-	0.15	0.18	0.26	U	ND	*
I-68 DIS	8/6/2012	0.04	0.11	0.22	U	0.36	0.24	0.15	J	-0.06	0.08	0.26	U	0.36	*
I-73 DIS	8/4/2012	0.03	0.07	0.14	U	0.33	0.23	0.20	J	0.03	0.07	0.14	U	0.33	*
D-3 DIS	8/8/2012	0.13	0.15	0.20	U	0.07	0.11	0.20	U	-0.03	0.08	0.25	U	ND	*
D-3 DUP DIS	8/8/2012	0.09	0.12	0.19	U	0.20	0.17	0.16	J	0.03	0.09	0.18	U	0.20	*
D-6 DIS	8/7/2012	0.22	0.25	0.32	UJ	0.24	0.27	0.36	UJ	0.10	0.17	0.29	UJ	ND	*
D-6 DUP DIS	8/7/2012	0.09	0.14	0.24	U	0.20	0.20	0.27	U	0.02	0.07	0.17	U	ND	*
D-12 DIS	8/8/2012	-0.01	0.09	0.18	UJ	0.34	0.25	0.18	J	-0.01	0.09	0.18	UJ	0.34	*
D-13 DIS	8/10/2012	0.07	0.11	0.18	UJ	0.27	0.20	0.19	J	0.03	0.08	0.18	UJ	0.27	*
D-13 DUP DIS	8/10/2012	0.03	0.08	0.17	UJ	0.33	0.21	0.17	J-	0.00	0.08	0.21	UJ	0.33	*
D-81 DIS	8/9/2012	0.02	0.12	0.27	U	0.16	0.14	0.15	J	0.00	0.08	0.17	U	0.16	*
D-83 DIS	8/9/2012	0.15	0.22	0.36	UJ	0.03	0.11	0.28	UJ	0.03	0.11	0.28	UJ	ND	*

Table 7: Summary of Thorium Isotope Results from OU-1 Additional Groundwater Sampling

		Thorium-228				Thorium-230				Thorium-232				TOTAL THORIUM-	
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	228 + 230 + 232	
D-85 DIS	8/6/2012	-0.02	0.13	0.31	UJ	0.12	0.18	0.26	UJ	0.04	0.13	0.30	UJ	ND	*
D-87 DIS	8/1/2012	-0.05	0.10	0.36	UJ	0.88	0.44	0.21	J+	-0.01	0.09	0.19	UJ	0.88	*
D-93 DIS	8/14/2012	0.16	0.16	0.23	U	0.46	0.23	0.11	J+	0.03	0.07	0.15	U	0.46	*
LR-100 DIS	8/13/2012	0.06	0.10	0.17	UJ	0.36	0.22	0.17	J+	0.05	0.08	0.12	UJ	0.36	*
LR-103 DIS	8/13/2012	0.05	0.09	0.14	U	0.27	0.19	0.18	J+	0.02	0.06	0.13	U	0.27	*
LR-104 DIS	8/13/2012	-0.02	0.07	0.19	U	0.24	0.19	0.19	J+	0.05	0.09	0.17	U	0.24	*
LR-104 DUP DIS	8/13/2012	-0.02	0.08	0.25	U	0.26	0.20	0.19	J+	0.06	0.09	0.15	U	0.26	*
LR-105 DIS	8/1/2012	0.23	0.20	0.20	J	1.05	0.47	0.17	J+	-0.01	0.08	0.19	UJ	1.28	*
MW-102 DIS	8/7/2012	0.20	0.29	0.47	UJ	0.24	0.28	0.36	UJ	-0.03	0.14	0.36	UJ	ND	*
MW-103 DIS	8/11/2012	0.06	0.10	0.18	U	0.30	0.20	0.17	J-	0.05	0.08	0.13	U	0.30	*
MW-104 DIS	8/9/2012	-0.03	0.10	0.28	U	0.27	0.20	0.19	J	0.02	0.09	0.20	U	0.27	*
MW-1204 DIS	8/2/2012	0.15	0.71	1.65	UJ	0.23	0.69	1.48	UJ-	0.04	0.49	1.41	UJ	ND	*
PZ-100-KS DIS	8/16/2012	-0.01	0.06	0.15	U	0.20	0.16	0.17	J+	0.00	0.08	0.17	U	0.20	*
PZ-100-SD DIS	7/31/2012	0.12	0.18	0.30	UJ	0.91	0.45	0.27	J	-0.04	0.09	0.26	UJ	0.91	*
PZ-100-SS DIS	7/31/2012	0.08	0.16	0.30	U	1.11	0.47	0.16	J	0.01	0.08	0.22	U	1.11	*
PZ-101-SS DIS	8/7/2012	0.06	0.09	0.13	U	0.34	0.22	0.19	J	0.03	0.09	0.19	U	0.34	*
PZ-102R-SS DIS	8/13/2012	0.12	0.13	0.18	U	0.35	0.22	0.18	J-	0.03	0.11	0.22	U	0.35	*
PZ-102-SS DIS	8/13/2012	0.05	0.09	0.18	UJ	0.68	0.29	0.13	J+	0.03	0.07	0.15	UJ	0.68	*
PZ-103-SS DIS	8/7/2012	0.01	0.13	0.30	U	0.15	0.17	0.25	U	0.00	0.10	0.21	U	ND	*
PZ-104-KS DIS	8/13/2012	0.12	0.13	0.18	U	0.21	0.17	0.18	J+	0.02	0.06	0.13	U	0.21	*
PZ-104-SD DIS	8/1/2012	0.05	0.12	0.25	UJ	0.24	0.20	0.17	J	0.00	0.00	0.11	UJ	0.24	*
PZ-104-SS DIS	8/1/2012	0.16	0.19	0.23	UJ	0.27	0.27	0.32	UJ	0.00	0.15	0.32	UJ	ND	*
PZ-105-SS DIS	8/1/2012	0.13	0.18	0.29	U	0.98	0.45	0.23	J+	0.05	0.11	0.22	U	0.98	*
PZ-106-KS DIS	8/14/2012	0.04	0.09	0.19	U	0.25	0.18	0.14	J+	0.05	0.09	0.16	U	0.25	*
PZ-106-SD DIS	7/31/2012	0.08	0.09	0.11	UJ	0.07	0.09	0.14	UJ	-0.01	0.05	0.16	UJ	ND	*
PZ-106-SS DIS	7/31/2012	0.02	0.07	0.16	U	0.13	0.13	0.14	UJ	0.02	0.07	0.16	U	ND	*
PZ-107-SS DIS	8/4/2012	0.14	0.13	0.12	J	0.13	0.12	0.12	J	0.08	0.10	0.12	U	0.27	*
PZ-109-SS DIS	8/2/2012	-0.07	0.06	0.24	UJ	0.06	0.09	0.14	UJ-	-0.03	0.05	0.16	UJ	ND	*

Table 7: Summary of Thorium Isotope Results from OU-1 Additional Groundwater Sampling

		Thorium-228				Thorium-230				Thorium-232				TOTAL THORIUM-	
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	228 + 230 + 232	
PZ-110-SS DIS	8/2/2012	-0.04	0.06	0.22	UJ	0.11	0.13	0.19	UJ-	0.00	0.07	0.15	UJ	ND	*
PZ-111-KS DIS	8/13/2012	-0.02	0.07	0.17	U	0.26	0.20	0.19	J+	0.03	0.09	0.19	U	0.26	*
PZ-111-SD DIS	8/1/2012	0.07	0.12	0.20	U	0.33	0.26	0.26	J+	0.03	0.12	0.28	U	0.33	*
PZ-112-AS DIS	8/8/2012	0.03	0.09	0.20	UJ	0.09	0.15	0.26	UJ	-0.01	0.09	0.20	UJ	ND	*
PZ-113-AD DIS	8/3/2012	0.15	0.15	0.21	UJ	0.16	0.14	0.12	J	0.01	0.06	0.16	UJ	0.16	*
PZ-113-AD DUP DIS	8/3/2012	0.02	0.06	0.14	UJ	0.19	0.16	0.18	J	-0.04	0.06	0.19	UJ	0.19	*
PZ-113-AS DIS	8/8/2012	0.11	0.11	0.13	UJ	0.13	0.13	0.13	J	-0.01	0.06	0.13	UJ	0.13	*
PZ-113-SS DIS	8/4/2012	0.01	0.06	0.15	U	0.28	0.19	0.12	J	0.03	0.08	0.17	U	0.28	*
PZ-114-AS DIS	7/31/2012	0.12	0.20	0.34	U	0.52	0.32	0.31	J	-0.02	0.08	0.27	U	0.52	*
PZ-115-SS DIS	7/31/2012	0.04	0.18	0.40	UJ	0.43	0.32	0.32	J	-0.03	0.10	0.27	UJ	0.43	*
PZ-116-SS DIS	8/3/2012	0.01	0.09	0.21	UJ	0.35	0.21	0.17	J	-0.02	0.06	0.16	UJ	0.35	*
PZ-200-SS DIS	8/2/2012	0.11	0.16	0.26	U	0.43	0.24	0.13	J-	0.06	0.09	0.13	U	0.43	*
PZ-200-SS DUP DIS	8/2/2012	-0.03	0.07	0.24	U	0.18	0.15	0.13	J-	-0.02	0.06	0.18	U	0.18	*
PZ-201A-SS DIS	8/1/2012	-0.05	0.07	0.23	U	0.21	0.17	0.15	J+	0.00	0.00	0.08	U	0.21	*
PZ-201A-SS DUP DIS	8/1/2012	0.09	0.12	0.17	U	0.17	0.14	0.12	J+	0.04	0.10	0.20	U	0.17	*
PZ-202-SS DIS	8/2/2012	0.00	0.12	0.29	U	0.28	0.22	0.27	J-	0.02	0.10	0.23	U	0.28	*
PZ-203-SS DIS	8/1/2012	0.01	0.10	0.24	UJ	0.21	0.16	0.15	J+	0.13	0.13	0.15	UJ	0.21	*
PZ-204A-SS DIS	8/2/2012	-0.04	0.09	0.30	U	0.17	0.18	0.24	UJ-	0.08	0.13	0.20	U	ND	*
PZ-204-SS DIS	8/3/2012	-0.05	0.08	0.30	U	0.19	0.17	0.18	J	-0.02	0.07	0.18	U	0.19	*
PZ-205-AS DIS	8/3/2012	0.00	0.12	0.31	U	0.80	0.39	0.19		0.03	0.08	0.16	U	0.80	*
PZ-205-SS DIS	8/3/2012	0.12	0.15	0.21	UJ	1.23	0.54	0.27	J-	0.03	0.12	0.29	UJ	1.23	*
PZ-206-SS DIS	8/7/2012	0.00	0.13	0.30	U	0.10	0.13	0.20	U	-0.04	0.07	0.22	U	ND	*
PZ-207-AS DIS	8/8/2012	0.05	0.09	0.13	U	0.11	0.12	0.13	U	-0.01	0.06	0.13	U	ND	*
PZ-208-SS DIS	8/2/2012	-0.01	0.13	0.26	UJ	0.37	0.34	0.37	J+	0.00	0.17	0.37	UJ	0.37	*
PZ-302-AI DIS	8/9/2012	-0.04	0.07	0.23	UJ	0.19	0.15	0.15	J	0.01	0.06	0.15	UJ	0.19	*
PZ-303-AS DIS	8/10/2012	0.03	0.11	0.23	UJ	0.34	0.21	0.15	J	0.02	0.06	0.15	UJ	0.34	*
PZ-304-AI DIS	8/10/2012	0.09	0.13	0.22	U	0.37	0.23	0.17	J-	0.11	0.13	0.17	U	0.37	*

Table 7: Summary of Thorium Isotope Results from OU-1 Additional Groundwater Sampling

		Thorium-228				Thorium-230				Thorium-232				TOTAL THORIUM-	
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	228 + 230 + 232	
PZ-304-AS DIS	8/10/2012	-0.01	0.11	0.26	UJ	0.31	0.20	0.14	J-	0.03	0.08	0.16	UJ	0.31	*
PZ-305-AI DIS	8/8/2012	-0.01	0.07	0.15	U	0.76	0.37	0.22	J	-0.01	0.07	0.15	U	0.76	*

Notes:
All values are in units of picoCuries per liter (pCi/l)
DIS = dissolved sample (field filtered sample); TOT = total sample (unfiltered sample)
DUP = Duplicate samples; Field duplicates were collected from the following locations: DUP 01 = PZ-201A-SS, DUP 02 = PZ-200-SS, DUP 03 = PZ-113-AD, DUP-04 = D-6, DUP-05 = D-3, DUP 06 = D-13, DUP 07 = LR-104, and DUP 08 = I-9.
CSU = Combined Standard Uncertainty (2-sigma); MDA = Minimum Detectable Activity
Data Validation Qualifiers (Final Q) include: U = Non-detect at the reported value;
UJ = Non-Detect at the estimated reported value; UJ+ = Non-Detect at the estimated reported value which may be biased high;
UJ- = Non-Detect at the estimated reported value which may be biased low;
J = estimated result; J+ = estimated result which may be biased high; J- = estimated result which may be biased low
Total Thorium - 228 + 230 +232 based on sum of detected values. ND indicates that results for all Thorium isotopes were non-detect and a * flag indicates that only one or two of the isotopes were detected.

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Table 8: Summary of Radium Isotope Results from Additional OU-1 Groundwater Sampling

Sample ID	Sample Date	Analyte	Result	CSU	MDA	FINAL Q	Analyte	Result	CSU	MDA	FINAL Q	Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
S-5 TOT	8/14/12	Radium-226	0.67	0.61	0.63	J	Radium-228	2.25	1.39	2.51	UJ	0.67	*	Less Than MCL
S-8 TOT	8/9/12	Radium-226	0.65	0.35	0.26	J	Radium-228	1.70	0.83	1.39	J+	2.34		Less Than MCL
S-10 TOT	8/8/12	Radium-226	0.14	0.18	0.29	U	Radium-228	0.55	0.60	1.19	UJ	Non-Detect		Less Than MCL
S-61 TOT	8/7/12	Radium-226	0.55	0.30	0.26	J	Radium-228	0.80	0.68	1.30	U	0.55	*	Less Than MCL
S-82 TOT	8/10/12	Radium-226	3.11	1.03	0.34		Radium-228	6.89	1.94	1.83	J	10.00		Exceeds MCL
S-84 TOT	8/6/12	Radium-226	1.29	0.52	0.25		Radium-228	1.98	0.95	1.59	J	3.26		Less Than MCL
I-4 TOT	8/14/12	Radium-226	2.83	0.98	0.39		Radium-228	3.68	1.45	2.15	J	6.51		Exceeds MCL
I-9 TOT	8/14/12	Radium-226	2.35	0.80	0.19		Radium-228	4.48	1.35	1.40		6.83		Exceeds MCL
I-9 TOT (DUP)	8/14/12	Radium-226	2.22	0.75	0.18		Radium-228	3.81	1.36	1.84		6.03		Exceeds MCL
I-11 TOT	8/8/12	Radium-226	1.31	0.52	0.22		Radium-228	3.55	1.11	1.26		4.86		Less Than MCL
I-62 TOT	8/9/12	Radium-226	0.83	0.38	0.20	J	Radium-228	0.75	0.68	1.33	UJ+	0.83	*	Less Than MCL
I-65 TOT	8/6/12	Radium-226	0.88	0.41	0.25		Radium-228	2.73	1.02	1.45	J	3.61		Less Than MCL
I-66 TOT	8/10/12	Radium-226	0.26	0.22	0.24	J	Radium-228	1.24	0.82	1.51	UJ	0.26	*	Less Than MCL
I-67 TOT	8/10/12	Radium-226	0.60	0.36	0.29	J	Radium-228	0.46	0.69	1.41	U	0.60	*	Less Than MCL
I-68 TOT	8/6/12	Radium-226	2.12	0.72	0.22		Radium-228	2.60	1.06	1.61	J	4.72		Less Than MCL
I-73 TOT	8/4/12	Radium-226	0.95	0.42	0.15		Radium-228	1.17	0.85	1.59	U	0.95	*	Less Than MCL
D-3 TOT	8/8/12	Radium-226	4.17	1.29	0.35		Radium-228	6.05	1.66	1.42		10.22		Exceeds MCL
D-3 TOT (DUP)	8/8/12	Radium-226	2.52	0.88	0.30	J	Radium-228	4.13	1.21	1.27		6.65		Exceeds MCL
D-6 TOT	8/7/12	Radium-226	3.39	1.05	0.23		Radium-228	4.76	1.38	1.31	J	8.15		Exceeds MCL
D-6 TOT (DUP)	8/7/12	Radium-226	3.26	1.03	0.26		Radium-228	3.24	1.11	1.46		6.50		Exceeds MCL
D-12 TOT	8/8/12	Radium-226	0.80	0.39	0.25		Radium-228	1.13	0.63	1.10	J	1.93		Less Than MCL
D-13 TOT	8/10/12	Radium-226	1.41	0.54	0.23		Radium-228	4.49	1.35	1.45	J+	5.90		Exceeds MCL
D-13 TOT (DUP_	8/10/12	Radium-226	0.63	0.34	0.30	J	Radium-228	2.04	0.94	1.52	J	2.67		Less Than MCL
D-14 TOT	8/10/12	Radium-226	2.18	0.75	0.33	J	Radium-228	2.99	1.34	2.15	J+	5.17		Exceeds MCL
D-81 TOT	8/9/12	Radium-226	0.63	0.33	0.21		Radium-228	3.41	1.10	1.26	J+	4.03		Less Than MCL
D-83 TOT	8/9/12	Radium-226	2.80	0.93	0.25	J	Radium-228	3.21	1.07	1.33	J+	6.01		Exceeds MCL
D-85 TOT	8/6/12	Radium-226	6.84	1.92	0.31	J	Radium-228	6.95	2.45	3.30	J	13.79		Exceeds MCL
D-87 TOT	8/1/12	Radium-226	1.70	0.60	0.24	J+	Radium-228	3.99	1.15	1.09	J+	5.69		Exceeds MCL
D-93 TOT	8/14/12	Radium-226	1.22	0.53	0.23		Radium-228	1.81	0.97	1.68	J	3.03		Less Than MCL
LR-100 TOT	8/13/12	Radium-226	0.54	0.34	0.35	J	Radium-228	1.06	1.01	1.97	UJ	0.54	*	Less Than MCL

Table 8: Summary of Radium Isotope Results from Additional OU-1 Groundwater Sampling

Sample ID	Sample Date	Analyte	Result	CSU	MDA	FINAL Q	Analyte	Result	CSU	MDA	FINAL Q	Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
LR-103 TOT	8/13/12	Radium-226	1.44	0.62	0.32		Radium-228	1.03	1.01	1.98	UJ	1.44	*	Less Than MCL
LR-104 TOT	8/13/12	Radium-226	0.53	0.34	0.36	J	Radium-228	2.14	1.00	1.65		2.67		Less Than MCL
LR-104 TOT (DUP)	8/13/12	Radium-226	0.52	0.33	0.31	J	Radium-228	1.16	0.77	1.41	U	0.52	*	Less Than MCL
LR-105 TOT	8/1/12	Radium-226	0.91	0.44	0.29	J+	Radium-228	0.76	0.95	1.91	UJ+	0.91	*	Less Than MCL
MW-102 TOT	8/7/12	Radium-226	0.53	0.29	0.15	J	Radium-228	1.31	0.80	1.45	U	0.53	*	Less Than MCL
MW-103 TOT	8/11/12	Radium-226	5.44	1.57	0.37	J	Radium-228	5.36	1.83	2.38	J	10.79		Exceeds MCL
MW-104 TOT	8/9/12	Radium-226	1.59	0.65	0.29	J	Radium-228	3.34	1.44	2.26	J+	4.93		Less Than MCL
MW-1204 TOT	8/2/12	Radium-226	4.24	1.24	0.21	J	Radium-228	2.44	0.99	1.48		6.68		Exceeds MCL
PZ-100-KS TOT	8/16/12	Radium-226	0.55	0.31	0.22	J	Radium-228	0.70	1.04	2.13	U	0.55	*	Less Than MCL
PZ-100-SD TOT	7/31/12	Radium-226	2.74	0.88	0.31		Radium-228	1.03	0.60	1.05	U	2.74	*	Less Than MCL
PZ-100-SS TOT	7/31/12	Radium-226	2.95	0.89	0.21	J	Radium-228	1.28	0.65	1.09	J	4.23		Less Than MCL
PZ-101-SS TOT	8/7/12	Radium-226	12.52	2.99	0.24	J	Radium-228	3.68	1.11	1.17		16.19		Exceeds MCL
PZ-102R-SS TOT	8/13/12	Radium-226	2.65	0.82	0.15	J	Radium-228	1.87	0.76	1.14		4.52		Less Than MCL
PZ-102-SS TOT	8/13/12	Radium-226	5.96	1.76	0.38	J	Radium-228	3.42	1.52	2.43	J	9.38		Exceeds MCL
PZ-103-SS TOT	8/7/12	Radium-226	4.72	1.39	0.22		Radium-228	1.34	0.73	1.25	J	6.06		Exceeds MCL
PZ-104-KS TOT	8/13/12	Radium-226	0.17	0.18	0.20	U	Radium-228	0.29	1.08	2.28	UJ	Non-Detect		Less Than MCL
PZ-104-SD TOT	8/1/12	Radium-226	4.50	1.26	0.18		Radium-228	0.52	0.89	1.83	U	4.50	*	Less Than MCL
PZ-104-SS TOT	8/1/12	Radium-226	1.62	0.57	0.14		Radium-228	1.47	0.79	1.35	J	3.09		Less Than MCL
PZ-105-SS TOT	8/1/12	Radium-226	1.84	0.62	0.18	J+	Radium-228	1.01	0.65	1.17	UJ+	1.84	*	Less Than MCL
PZ-106-KS TOT	8/14/12	Radium-226	0.23	0.24	0.33	U	Radium-228	1.46	0.99	1.83	UJ	Non-Detect		Less Than MCL
PZ-106-SD TOT	7/31/12	Radium-226	1.06	0.44	0.18		Radium-228	0.94	0.62	1.14	U	1.06	*	Less Than MCL
PZ-106-SS TOT	7/31/12	Radium-226	3.93	1.13	0.18		Radium-228	1.27	0.70	1.22	J	5.20		Exceeds MCL
PZ-107-SS TOT	8/4/12	Radium-226	6.33	1.73	0.33		Radium-228	2.62	1.13	1.78	J	8.95		Exceeds MCL
PZ-109-SS TOT	8/2/12	Radium-226	2.58	0.83	0.22	J	Radium-228	2.72	0.98	1.28	J	5.30		Exceeds MCL
PZ-110-SS TOT	8/2/12	Radium-226	4.38	1.18	0.21	J	Radium-228	2.21	0.88	1.27		6.59		Exceeds MCL
PZ-111-KS TOT	8/13/12	Radium-226	0.63	0.34	0.21	J	Radium-228	0.96	0.84	1.62	UJ	0.63	*	Less Than MCL
PZ-111-SD TOT	8/1/12	Radium-226	1.34	0.52	0.21	J+	Radium-228	0.34	0.70	1.45	UJ+	1.34	*	Less Than MCL
PZ-112-AS TOT	8/8/12	Radium-226	2.76	1.01	0.40	J	Radium-228	2.86	1.03	1.42	J	5.62		Exceeds MCL
PZ-113-AS TOT	8/8/12	Radium-226	0.64	0.36	0.27		Radium-228	1.37	0.84	1.53	U	0.64	*	Less Than MCL
PZ-113-SS TOT	8/4/12	Radium-226	1.91	0.67	0.21		Radium-228	-0.32	0.88	1.91	U	1.91	*	Less Than MCL

Table 8: Summary of Radium Isotope Results from Additional OU-1 Groundwater Sampling

Sample ID	Sample Date	Analyte	Result	CSU	MDA	FINAL Q	Analyte	Result	CSU	MDA	FINAL Q	Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
PZ-113-AD TOT	8/3/12	Radium-226	3.41	1.19	0.44	J	Radium-228	7.71	2.05	1.62	J	11.12		Exceeds MCL
PZ-113-AD TOT (DUP)	8/3/12	Radium-226	1.05	0.51	0.30	J	Radium-228	1.01	0.68	1.26	U	1.05	*	Less Than MCL
PZ-114-AS TOT	7/31/12	Radium-226	0.41	0.25	0.22	J	Radium-228	0.82	0.78	1.52	UJ	0.41	*	Less Than MCL
PZ-115-SS TOT	7/31/12	Radium-226	6.20	1.63	0.21		Radium-228	0.59	0.64	1.28	U	6.20	*	Exceeds MCL
PZ-116-SS TOT	8/3/12	Radium-226	0.54	0.32	0.23	J	Radium-228	0.83	0.67	1.28	U	0.54	*	Less Than MCL
PZ-200-SS TOT	8/2/12	Radium-226	4.94	1.42	0.37	J	Radium-228	2.80	1.01	1.37		7.74		Exceeds MCL
PZ-200-SS TOT (DUP)	8/2/12	Radium-226	4.69	1.32	0.23	J	Radium-228	1.95	0.90	1.46		6.65		Exceeds MCL
PZ-201A-SS TOT	8/1/12	Radium-226	0.31	0.22	0.20	J+	Radium-228	0.87	0.67	1.27	UJ+	0.31	*	Less Than MCL
PZ-201A-SS TOT (DUP	8/1/12	Radium-226	0.29	0.17	0.09	J+	Radium-228	1.40	0.77	1.33	J+	1.69		Less Than MCL
PZ-202-SS TOT	8/2/12	Radium-226	1.97	0.70	0.24	J	Radium-228	2.61	1.02	1.47		4.58		Less Than MCL
PZ-203-SS TOT	8/1/12	Radium-226	0.95	0.40	0.25	J+	Radium-228	1.89	0.72	1.01	J+	2.84		Less Than MCL
PZ-204A-SS TOT	8/2/12	Radium-226	2.34	0.78	0.21	J	Radium-228	0.19	0.93	1.97	UJ	2.34	*	Less Than MCL
PZ-204-SS TOT	8/3/12	Radium-226	1.10	0.54	0.40		Radium-228	0.63	0.77	1.55	U	1.10	*	Less Than MCL
PZ-205-AS TOT	8/3/12	Radium-226	1.20	0.51	0.28		Radium-228	1.51	0.82	1.43	J	2.70		Less Than MCL
PZ-205-SS TOT	8/3/12	Radium-226	1.73	0.64	0.24	J	Radium-228	1.30	0.92	1.72	UJ	1.73	*	Less Than MCL
PZ-206-SS TOT	8/7/12	Radium-226	1.44	0.52	0.22		Radium-228	1.12	0.72	1.31	U	1.44	*	Less Than MCL
PZ-207-AS TOT	8/8/12	Radium-226	0.66	0.36	0.24	J	Radium-228	2.50	0.89	1.20		3.16		Less Than MCL
PZ-208-SS TOT	8/2/12	Radium-226	0.83	0.37	0.18	J+	Radium-228	0.26	0.76	1.58	UJ+	0.83	*	Less Than MCL
PZ-302-AI TOT	8/9/12	Radium-226	1.08	0.48	0.25		Radium-228	2.22	0.85	1.20	J+	3.30		Less Than MCL
PZ-303-AS TOT	8/10/12	Radium-226	0.63	0.35	0.25	J	Radium-228	3.82	1.32	1.75	J+	4.46		Less Than MCL
PZ-304-AI TOT	8/10/12	Radium-226	1.52	0.69	0.51		Radium-228	4.84	1.34	1.12		6.35		Exceeds MCL
PZ-304-AS TOT	8/10/12	Radium-226	2.19	0.84	0.35		Radium-228	3.38	1.13	1.39	J	5.56		Exceeds MCL
PZ-305-AI TOT	8/8/12	Radium-226	2.18	0.79	0.27		Radium-228	2.10	0.88	1.35	J	4.28		Less Than MCL
S-5 DIS	8/14/12	Radium-226	1.29	0.85	0.90	J	Radium-228	2.03	1.25	2.26	UJ	1.29	*	Less Than MCL
S-8 DIS	8/9/12	Radium-226	0.56	0.32	0.25	J	Radium-228	2.02	0.80	1.16	J+	2.58		Less Than MCL
S-10 DIS	8/8/12	Radium-226	0.06	0.13	0.25	U	Radium-228	0.67	0.61	1.18	UJ	Non-Detect		Less Than MCL
S-61 DIS	8/7/12	Radium-226	0.35	0.23	0.20	J	Radium-228	1.26	0.72	1.25	J	1.61		Less Than MCL
S-82 DIS	8/10/12	Radium-226	1.32	0.57	0.31		Radium-228	6.08	1.72	1.62	J	7.40		Exceeds MCL
S-84 DIS	8/6/12	Radium-226	0.51	0.32	0.24	J	Radium-228	1.67	1.02	1.83	UJ	0.51	*	Less Than MCL

Table 8: Summary of Radium Isotope Results from Additional OU-1 Groundwater Sampling

Sample ID	Sample Date	Analyte	Result	CSU	MDA	FINAL Q	Analyte	Result	CSU	MDA	FINAL Q	Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
I-4 DIS	8/14/12	Radium-226	1.94	0.72	0.27		Radium-228	4.23	1.40	1.73		6.17		Exceeds MCL
I-9 DIS	8/14/12	Radium-226	2.14	0.76	0.20		Radium-228	4.21	1.40	1.75	J	6.34		Exceeds MCL
I-9 DIS (DUP)	8/14/12	Radium-226	2.38	0.80	0.18		Radium-228	5.06	1.59	1.82	J	7.44		Exceeds MCL
I-11 DIS	8/8/12	Radium-226	1.01	0.45	0.22		Radium-228	2.99	1.03	1.34		3.99		Less Than MCL
I-62 DIS	8/9/12	Radium-226	0.32	0.22	0.20	J	Radium-228	2.03	0.80	1.16	J+	2.35		Less Than MCL
I-65 DIS	8/6/12	Radium-226	0.22	0.20	0.25	U	Radium-228	0.96	0.73	1.38	UJ	Non-Detect		Less Than MCL
I-66 DIS	8/10/12	Radium-226	0.12	0.17	0.28	UJ	Radium-228	0.46	0.73	1.49	U	Non-Detect		Less Than MCL
I-67 DIS	8/10/12	Radium-226	0.55	0.33	0.27	J	Radium-228	0.64	0.68	1.34	U	0.55	*	Less Than MCL
I-68 DIS	8/6/12	Radium-226	0.52	0.30	0.23	J	Radium-228	3.46	1.09	1.24		3.98		Less Than MCL
I-73 DIS	8/4/12	Radium-226	0.71	0.39	0.27	J	Radium-228	0.97	0.97	1.92	UJ	0.71	*	Less Than MCL
D-3 DIS	8/8/12	Radium-226	2.55	0.91	0.31		Radium-228	5.06	1.50	1.54	J	7.61		Exceeds MCL
D-3 DIS (DUP)	8/8/12	Radium-226	3.06	1.06	0.39		Radium-228	6.72	1.74	1.15	J	9.78		Exceeds MCL
D-6 DIS	8/7/12	Radium-226	2.54	0.83	0.24		Radium-228	3.71	1.15	1.29	J	6.25		Exceeds MCL
D-6 DIS (DUP)	8/7/12	Radium-226	3.09	0.99	0.30	J	Radium-228	3.81	1.12	1.09		6.90		Exceeds MCL
D-12 DIS	8/8/12	Radium-226	0.68	0.36	0.22		Radium-228	0.51	0.59	1.17	UJ	0.68	*	Less Than MCL
D-13 DIS	8/10/12	Radium-226	1.21	0.49	0.17		Radium-228	2.19	0.90	1.36	J+	3.40		Less Than MCL
D-13 DIS (DUP)	8/10/12	Radium-226	0.93	0.41	0.22	J	Radium-228	5.34	1.46	1.21		6.27		Exceeds MCL
D-81 DIS	8/9/12	Radium-226	0.62	0.33	0.19	J	Radium-228	2.04	0.88	1.37	J+	2.66		Less Than MCL
D-83 DIS	8/9/12	Radium-226	3.23	1.00	0.27		Radium-228	3.48	1.15	1.42	J+	6.70		Exceeds MCL
D-85 DIS	8/6/12	Radium-226	1.65	0.65	0.28		Radium-228	2.80	1.04	1.45	J	4.45		Less Than MCL
D-87 DIS	8/1/12	Radium-226	1.42	0.56	0.20	J+	Radium-228	3.93	1.19	1.27	J+	5.35		Exceeds MCL
D-93 DIS	8/14/12	Radium-226	1.79	0.66	0.25		Radium-228	3.45	1.34	2.00		5.24		Exceeds MCL
LR-100 DIS	8/13/12	Radium-226	0.83	0.40	0.28		Radium-228	0.89	0.92	1.82	UJ	0.83	*	Less Than MCL
LR-103 DIS	8/13/12	Radium-226	1.10	0.51	0.24		Radium-228	1.62	0.92	1.62	J	2.73		Less Than MCL
LR-104 DIS	8/13/12	Radium-226	0.48	0.33	0.33	J	Radium-228	1.62	0.86	1.49	J	2.10		Less Than MCL
LR-104 DIS (DUP)	8/13/12	Radium-226	0.71	0.37	0.25	J	Radium-228	1.21	0.82	1.52	UJ	0.71	*	Less Than MCL
LR-105 DIS	8/1/12	Radium-226	1.14	0.47	0.20	J+	Radium-228	1.81	0.83	1.34	J+	2.95		Less Than MCL
MW-102 DIS	8/7/12	Radium-226	0.86	0.41	0.24		Radium-228	0.68	0.67	1.31	U	0.86	*	Less Than MCL
MW-103 DIS	8/11/12	Radium-226	0.27	0.21	0.21	J	Radium-228	4.32	1.27	1.28		4.59		Less Than MCL
MW-104 DIS	8/9/12	Radium-226	0.46	0.29	0.19	J	Radium-228	0.70	0.80	1.61	UJ+	0.46	*	Less Than MCL

Table 8: Summary of Radium Isotope Results from Additional OU-1 Groundwater Sampling

Sample ID	Sample Date	Analyte	Result	CSU	MDA	FINAL Q	Analyte	Result	CSU	MDA	FINAL Q	Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
MW-1204 DIS	8/2/12	Radium-226	2.79	0.88	0.27	J	Radium-228	1.84	0.87	1.43		4.63		Less Than MCL
PZ-100-KS DIS	8/16/12	Radium-226	0.21	0.21	0.25	U	Radium-228	-0.04	1.27	2.73	UJ	Non-Detect		Less Than MCL
PZ-100-SD DIS	7/31/12	Radium-226	2.69	0.87	0.28		Radium-228	0.37	0.67	1.37	U	2.69	*	Less Than MCL
PZ-100-SS DIS	7/31/12	Radium-226	3.95	1.15	0.27		Radium-228	1.12	0.72	1.33	U	3.95	*	Less Than MCL
PZ-101-SS DIS	8/7/12	Radium-226	28.87	6.55	0.24		Radium-228	3.13	1.10	1.47	J	32.01		Exceeds MCL
PZ-102R-SS DIS	8/13/12	Radium-226	3.62	1.08	0.25		Radium-228	1.69	0.88	1.52	J	5.32		Exceeds MCL
PZ-102-SS DIS	8/13/12	Radium-226	3.63	1.06	0.20	J	Radium-228	2.12	0.89	1.38		5.75		Exceeds MCL
PZ-103-SS DIS	8/7/12	Radium-226	3.09	1.00	0.24		Radium-228	1.96	0.83	1.26	J	5.05		Exceeds MCL
PZ-104-KS DIS	8/13/12	Radium-226	0.28	0.23	0.24	J	Radium-228	0.35	1.12	2.36	UJ	0.28	*	Less Than MCL
PZ-104-SD DIS	8/1/12	Radium-226	9.74	2.73	0.46	J	Radium-228	4.68	1.59	2.02	J	14.42		Exceeds MCL
PZ-104-SS DIS	8/1/12	Radium-226	1.60	0.58	0.21	J	Radium-228	0.92	0.62	1.15	UJ	1.60	*	Less Than MCL
PZ-105-SS DIS	8/1/12	Radium-226	1.92	0.65	0.28	J+	Radium-228	1.14	0.61	1.06	J+	3.06		Less Than MCL
PZ-106-KS DIS	8/14/12	Radium-226	0.27	0.22	0.24	J	Radium-228	0.46	0.81	1.66	U	0.27	*	Less Than MCL
PZ-106-SD DIS	7/31/12	Radium-226	1.28	0.52	0.23		Radium-228	1.08	0.71	1.30	U	1.28	*	Less Than MCL
PZ-106-SS-DIS	7/31/12	Radium-226	2.90	0.91	0.28		Radium-228	0.90	0.76	1.47	U	2.90	*	Less Than MCL
PZ-107-SS DIS	8/4/12	Radium-226	5.02	1.39	0.22	J	Radium-228	2.28	0.88	1.27		7.30		Exceeds MCL
PZ-109-SS DIS	8/2/12	Radium-226	2.35	0.80	0.35	J	Radium-228	2.06	0.90	1.43		4.41		Less Than MCL
PZ-110-SS DIS	8/2/12	Radium-226	5.01	1.36	0.19	J	Radium-228	2.11	0.90	1.39		7.13		Exceeds MCL
PZ-111-KS DIS	8/13/12	Radium-226	0.32	0.25	0.22	J	Radium-228	0.09	0.76	1.61	UJ	0.32	*	Less Than MCL
PZ-111-SD DIS	8/1/12	Radium-226	1.26	0.47	0.15	J+	Radium-228	1.37	0.86	1.57	UJ+	1.26	*	Less Than MCL
PZ-112-AS DIS	8/8/12	Radium-226	3.08	1.04	0.36		Radium-228	2.19	0.91	1.39		5.27		Exceeds MCL
PZ-113-AS DIS	8/8/12	Radium-226	0.73	0.42	0.39	J	Radium-228	1.24	0.74	1.33	U	0.73	*	Less Than MCL
PZ-113-SS DIS	8/4/12	Radium-226	1.94	0.64	0.15	J	Radium-228	1.93	0.93	1.54		3.87		Less Than MCL
PZ-113-AD DIS	8/3/12	Radium-226	4.51	1.40	0.31	J	Radium-228	7.70	1.98	1.26		12.20		Exceeds MCL
PZ-113-AD DIS (DUP)	8/3/12	Radium-226	1.21	0.56	0.24	J	Radium-228	1.29	0.86	1.60	UJ	1.21	*	Less Than MCL
PZ-114-AS DIS	7/31/12	Radium-226	0.72	0.36	0.19		Radium-228	1.59	0.84	1.45	J	2.30		Less Than MCL
PZ-115-SS DIS	7/31/12	Radium-226	6.49	1.71	0.33		Radium-228	0.92	0.67	1.26	U	6.49	*	Exceeds MCL
PZ-116-SS DIS	8/3/12	Radium-226	0.19	0.24	0.39	UJ	Radium-228	-0.14	0.68	1.47	U	Non-Detect		Less Than MCL
PZ-200-SS DIS	8/2/12	Radium-226	3.12	0.97	0.28	J	Radium-228	3.03	1.07	1.44		6.15		Exceeds MCL
PZ-200-SS DIS (DUP)	8/2/12	Radium-226	4.50	1.28	0.17	J	Radium-228	1.20	0.91	1.73	UJ	4.50	*	Less Than MCL

Table 8: Summary of Radium Isotope Results from Additional OU-1 Groundwater Sampling

Sample ID	Sample Date	Analyte	Result	CSU	MDA	FINAL Q	Analyte	Result	CSU	MDA	FINAL Q	Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
PZ-201A-SS DIS	8/1/12	Radium-226	0.45	0.27	0.23	J+	Radium-228	0.80	0.67	1.29	UJ+	0.45	*	Less Than MCL
PZ-201A-SS DIS (DUP)	8/1/12	Radium-226	0.15	0.15	0.18	UJ+	Radium-228	1.57	0.84	1.45	J+	1.57	*	Less Than MCL
PZ-202-SS DIS	8/2/12	Radium-226	0.67	0.37	0.28	J	Radium-228	2.02	0.91	1.46		2.69		Less Than MCL
PZ-203-SS DIS	8/1/12	Radium-226	1.08	0.45	0.23	J+	Radium-228	0.95	0.67	1.24	UJ+	1.08	*	Less Than MCL
PZ-204A-SS DIS	8/2/12	Radium-226	0.72	0.37	0.24	J	Radium-228	1.48	0.84	1.48	J	2.20		Less Than MCL
PZ-204-SS DIS	8/3/12	Radium-226	1.41	0.62	0.35		Radium-228	1.02	0.82	1.58	UJ	1.41	*	Less Than MCL
PZ-205-AS DIS	8/3/12	Radium-226	1.33	0.57	0.24	J	Radium-228	0.88	0.76	1.47	U	1.33	*	Less Than MCL
PZ-205-SS DIS	8/3/12	Radium-226	1.54	0.59	0.22	J	Radium-228	1.46	0.82	1.45	J	3.00		Less Than MCL
PZ-206-SS DIS	8/7/12	Radium-226	0.91	0.40	0.20		Radium-228	1.56	0.76	1.26	J	2.47		Less Than MCL
PZ-207-AS DIS	8/8/12	Radium-226	0.73	0.38	0.26	J	Radium-228	0.97	0.71	1.33	U	0.73	*	Less Than MCL
PZ-208-SS DIS	8/2/12	Radium-226	0.52	0.27	0.14	J+	Radium-228	1.90	0.88	1.41	J+	2.42		Less Than MCL
PZ-302-AI DIS	8/9/12	Radium-226	0.47	0.29	0.25	J	Radium-228	1.42	0.70	1.17	J+	1.90		Less Than MCL
PZ-303-AS DIS	8/10/12	Radium-226	0.36	0.23	0.20	J	Radium-228	2.44	1.26	2.15	J+	2.80		Less Than MCL
PZ-304-AI DIS	8/10/12	Radium-226	1.93	0.76	0.35	J	Radium-228	2.76	1.01	1.44		4.69		Less Than MCL
PZ-304-AS DIS	8/10/12	Radium-226	1.61	0.68	0.32		Radium-228	2.46	0.95	1.36	J	4.07		Less Than MCL
PZ-305-AI DIS	8/8/12	Radium-226	0.70	0.43	0.42	J	Radium-228	0.27	0.72	1.50	UJ	0.70	*	Less Than MCL

Notes:
All values are in units of picoCuries per liter (pCi/l)
DIS = dissolved sample (field filtered sample); TOT = total sample (unfiltered sample)
DUP = Duplicate samples; Field duplicates were collected from the following locations: DUP 01 = PZ-201A-SS, DUP 02 = PZ-200-SS, DUP 03 = PZ-113-Ad, DUP-04 = D-6, DUP-05 = D-3, DUP 06 = D-13, DUP 07 = LR-104, and DUP 08 = I-9.
CU = Counting Uncertainty; CSU = Combined Standard Uncertainty (2-sigma); MDA = Minimum Detectable Activity
Data Validation Qualifiers (Final Q) include: U = Non-detect at the reported value,
UJ = Non-Detect at the estimated reported value, UJ+ = Non-Detect at the estimated reported value which may be biased high,
J = estimated result; J+ = estimated result which may be biased high
Combined Radium-226 plus Radium-228 = the sum of the Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *.
Non-Detect = neither Radium-226 nor Radium-228 were detected in the sample
MCL = Maximum Contaminant Level for drinking water systems of 5 pCi/l for total Radium-226 plus Radium-228

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Table 9: Summary of Average, Median and Maximum Radium Results

Alluvial Monitoring Wells

	Radium-226		Radium-228		Combined Radium 226 + 228	
	Total	Dissolved	Total	Dissolved	Total	Dissolved
No. of Detects	45	42	34	29	45	42
No. Non-Detects	1	3	12	16	1	3
Total No. of Samples	46	45	46	45	46	45
Detection Frequency	98%	93%	74%	64%	98%	93%
Mean	1.74	1.35	3.57	3.46	4.44	3.73
Median	1.29	0.97	3.36	3.45	4.28	3.10
Maximum Value	6.84	4.51	7.71	7.70	13.79	12.20

Bedrock Monitoring Wells

	Radium-226		Radium-228		Combined Radium 226 + 228	
	Total	Dissolved	Total	Dissolved	Total	Dissolved
No. of Detects	32	31	16	18	32	32
No. Non-Detects	2	3	18	16	2	2
Total No. of Samples	34	34	34	34	34	34
Detection Frequency	94%	91%	47%	53%	94%	94%
Mean	2.93	3.35	2.19	2.11	4.02	4.44
Median	2.16	1.94	2.08	1.94	2.97	2.95
Maximum Value	12.52	28.87	3.68	4.68	16.19	32.01

Table 10: Comparison of Radium-226 Results from Duplicate Samples

Sample ID	Total or Dissolved	Sample Date	Analyte	Result	CU	CSU	MDA	Units	FINAL Q	Ra-226 = Detect?	Relative Percent Difference (%)
PZ-201A-SS TOT	Total	8/1/12	Radium-226	0.31	0.21	0.22	0.20	pCi/l	J+	Detect	6.0
DUP 01 TOT	Total	8/1/12	Radium-226	0.29	0.15	0.17	0.09	pCi/l	J+	Detect	
PZ-200-SS TOT	Total	8/2/12	Radium-226	4.94	0.96	1.42	0.37	pCi/l	J	Detect	5.1
DUP 02 TOT	Total	8/2/12	Radium-226	4.69	0.87	1.32	0.23	pCi/l	J	Detect	
PZ-113-AD TOT	Total	8/3/12	Radium-226	3.41	0.94	1.19	0.44	pCi/l	J	Detect	106.2
DUP 03 TOT	Total	8/3/12	Radium-226	1.05	0.46	0.51	0.30	pCi/l	J	Detect	
D-6 TOT	Total	8/7/12	Radium-226	3.39	0.77	1.05	0.23	pCi/l		Detect	4.0
DUP 04 TOT	Total	8/7/12	Radium-226	3.26	0.77	1.03	0.26	pCi/l		Detect	
D-3 TOT	Total	8/8/12	Radium-226	4.17	0.94	1.29	0.35	pCi/l		Detect	49.4
DUP 05 TOT	Total	8/8/12	Radium-226	2.52	0.70	0.88	0.30	pCi/l	J	Detect	
D-13 TOT	Total	8/10/12	Radium-226	1.41	0.46	0.54	0.23	pCi/l		Detect	76.8
DUP 06 TOT	Total	8/10/12	Radium-226	0.63	0.32	0.34	0.30	pCi/l	J	Detect	
LR-104 TOT	Total	8/13/12	Radium-226	0.53	0.32	0.34	0.36	pCi/l	J	Detect	2.7
DUP 07 TOT	Total	8/13/12	Radium-226	0.52	0.31	0.33	0.31	pCi/l	J	Detect	
I-9 TOT	Total	8/14/12	Radium-226	2.35	0.63	0.80	0.19	pCi/l		Detect	5.7
DUP 08 TOT	Total	8/14/12	Radium-226	2.22	0.59	0.75	0.18	pCi/l		Detect	
PZ-201A-SS DIS	Dissolved	8/1/12	Radium-226	0.45	0.26	0.27	0.23	pCi/l	J+	Detect	Non-Detect
DUP 01 DIS	Dissolved	8/1/12	Radium-226	0.15	0.14	0.15	0.18	pCi/l	UJ+	Non-Detect	
PZ-200-SS DIS	Dissolved	8/2/12	Radium-226	3.12	0.71	0.97	0.28	pCi/l	J	Detect	36.2
DUP 02 DIS	Dissolved	8/2/12	Radium-226	4.50	0.85	1.28	0.17	pCi/l	J	Detect	
PZ-113-AD DIS	Dissolved	8/3/12	Radium-226	4.51	1.02	1.40	0.31	pCi/l	J	Detect	115.3
DUP 03 DIS	Dissolved	8/3/12	Radium-226	1.21	0.49	0.56	0.24	pCi/l	J	Detect	
D-6 DIS	Dissolved	8/7/12	Radium-226	2.54	0.64	0.83	0.24	pCi/l		Detect	19.6
DUP 04 DIS	Dissolved	8/7/12	Radium-226	3.09	0.74	0.99	0.30	pCi/l	J	Detect	
D-3 DIS	Dissolved	8/8/12	Radium-226	2.55	0.74	0.91	0.31	pCi/l		Detect	18.0
DUP 05 DIS	Dissolved	8/8/12	Radium-226	3.06	0.84	1.06	0.39	pCi/l		Detect	
D-13 DIS	Dissolved	8/10/12	Radium-226	1.21	0.42	0.49	0.17	pCi/l		Detect	25.7
DUP 06 DIS	Dissolved	8/10/12	Radium-226	0.93	0.36	0.41	0.22	pCi/l	J	Detect	
LR-104 DIS	Dissolved	8/13/12	Radium-226	0.48	0.31	0.33	0.33	pCi/l	J	Detect	38.5
DUP 07 DIS	Dissolved	8/13/12	Radium-226	0.71	0.34	0.37	0.25	pCi/l	J	Detect	
I-9 DIS	Dissolved	8/14/12	Radium-226	2.14	0.61	0.76	0.20	pCi/l		Detect	10.8
DUP 08 DIS	Dissolved	8/14/12	Radium-226	2.38	0.62	0.80	0.18	pCi/l		Detect	

Table 10: Comparison of Radium-226 Results from Duplicate Samples

Notes:
DUP = Duplicate samples; Field duplicates were collected from the following locations: DUP 01 = PZ-201A-SS, DUP 02 = PZ-200-SS, DUP 03 = PZ-113-AD, DUP-04 = D-6, DUP-05 = D-3, DUP 06 = D-13, DUP 07 = LR-104, and DUP 08 = I-9.
CU = Counting Uncertainty; CSU = Combined Standard Uncertainty (2-sigma); MDA = Minimum Detectable Activity
Data Validation Qualifiers (Final Q) include:

- J = estimated result
- J+ = estimated result which may be biased high
- UJ+ = Non-Detect at the estimated reported value which may be biased high

Table 11: Comparison of Radium-228 Results from Duplicate Samples

Sample ID	Total or Dissolved	Sample Date	Analyte	Result	CU	CSU	MDA	Units	FINAL Q	Ra228 = Detect?	Relative Percent Difference (%)
PZ-201A-SS TOT	Total	8/1/12	Radium-228	0.87	0.64	0.67	1.27	pCi/l	UJ+	Non-Detect	Non-Detect
DUP 01 TOT	Total	8/1/12	Radium-228	1.40	0.70	0.77	1.33	pCi/l	J+	Detect	
PZ-200-SS TOT	Total	8/2/12	Radium-228	2.80	0.79	1.01	1.37	pCi/l		Detect	35.5
DUP 02 TOT	Total	8/2/12	Radium-228	1.95	0.79	0.90	1.46	pCi/l		Detect	
PZ-113-AD TOT	Total	8/3/12	Radium-228	7.71	1.07	2.05	1.62	pCi/l	J	Detect	Non-Detect
DUP 03 TOT	Total	8/3/12	Radium-228	1.01	0.64	0.68	1.26	pCi/l	U	Non-Detect	
D-6 TOT	Total	8/7/12	Radium-228	4.76	0.86	1.38	1.31	pCi/l	J	Detect	38.0
DUP 04 TOT	Total	8/7/12	Radium-228	3.24	0.83	1.11	1.46	pCi/l		Detect	
D-3 TOT	Total	8/8/12	Radium-228	6.05	0.93	1.66	1.42	pCi/l		Detect	37.7
DUP 05 TOT	Total	8/8/12	Radium-228	4.13	0.77	1.21	1.27	pCi/l		Detect	
D-13 TOT	Total	8/10/12	Radium-228	4.49	0.89	1.35	1.45	pCi/l	J+	Detect	75.0
DUP 06 TOT	Total	8/10/12	Radium-228	2.04	0.82	0.94	1.52	pCi/l	J	Detect	
LR-104 TOT	Total	8/13/12	Radium-228	2.14	0.88	1.00	1.65	pCi/l		Detect	Non-Detect
DUP 07 TOT	Total	8/13/12	Radium-228	1.16	0.73	0.77	1.41	pCi/l	U	Non-Detect	
I-9 TOT	Total	8/14/12	Radium-228	4.48	0.89	1.35	1.40	pCi/l		Detect	16.1
DUP 08 TOT	Total	8/14/12	Radium-228	3.81	1.04	1.36	1.84	pCi/l		Detect	
PZ-201A-SS DIS	Dissolved	8/1/12	Radium-228	0.80	0.65	0.67	1.29	pCi/l	UJ+	Non-Detect	Non-Detect
DUP 01 DIS	Dissolved	8/1/12	Radium-228	1.57	0.76	0.84	1.45	pCi/l	J+	Detect	
PZ-200-SS DIS	Dissolved	8/2/12	Radium-228	3.03	0.83	1.07	1.44	pCi/l		Detect	Non-Detect
DUP 02 DIS	Dissolved	8/2/12	Radium-228	1.20	0.87	0.91	1.73	pCi/l	UJ	Non-Detect	
PZ-113-AD DIS	Dissolved	8/3/12	Radium-228	7.70	0.93	1.98	1.26	pCi/l		Detect	Non-Detect
DUP 03 DIS	Dissolved	8/3/12	Radium-228	1.29	0.81	0.86	1.60	pCi/l	UJ	Non-Detect	
D-6 DIS	Dissolved	8/7/12	Radium-228	3.71	0.79	1.15	1.29	pCi/l	J	Detect	2.8
DUP 04 DIS	Dissolved	8/7/12	Radium-228	3.81	0.71	1.12	1.09	pCi/l		Detect	
D-3 DIS	Dissolved	8/8/12	Radium-228	5.06	0.96	1.50	1.54	pCi/l	J	Detect	28.1
DUP 05 DIS	Dissolved	8/8/12	Radium-228	6.72	0.84	1.74	1.15	pCi/l	J	Detect	
D-13 DIS	Dissolved	8/10/12	Radium-228	2.19	0.75	0.90	1.36	pCi/l	J+	Detect	83.6
DUP 06 DIS	Dissolved	8/10/12	Radium-228	5.34	0.81	1.46	1.21	pCi/l		Detect	
LR-104 DIS	Dissolved	8/13/12	Radium-228	1.62	0.78	0.86	1.49	pCi/l	J	Detect	Non-Detect
DUP 07 DIS	Dissolved	8/13/12	Radium-228	1.21	0.78	0.82	1.52	pCi/l	UJ	Non-Detect	
I-9 DIS	Dissolved	8/14/12	Radium-228	4.21	1.02	1.40	1.75	pCi/l	J	Detect	18.5
DUP 08 DIS	Dissolved	8/14/12	Radium-228	5.06	1.10	1.59	1.82	pCi/l	J	Detect	

Table 11: Comparison of Radium-228 Results from Duplicate Samples

Notes:
DUP = Duplicate samples; Field duplicates were collected from the following locations: DUP 01 = PZ-201A-SS, DUP 02 = PZ-200-SS, DUP 03 = PZ-113-AD, DUP-04 = D-6, DUP-05 = D-3, DUP 06 = D-13, DUP 07 = LR-104, and DUP 08 = I-9.
CU = Counting Uncertainty; CSU = Combined Standard Uncertainty (2-sigma); MDA = Minimum Detectable Activity
Data Validation Qualifiers (Final Q) include:
J = estimated result
J+ = estimated result which may be biased high
U = non-detect at the reported value
UJ = non-detect at the estimated reported value
UJ+ = non-Detect at the estimated reported value which may be biased high

Table 12: Comparison of Radium Results from OU-1 and MDNR Split Samples

Sample Location	Sample Fraction	OU-1 Results: Lab Result	Counting Uncertainty	Combined Sample Uncertainty	MDA	Final Result	Qualifier	MDNR Results: Result	Error	MDA	Qualifier	Relative Percent Difference
Radium-226												
I-9	Total	2.35	0.63	0.80	0.19	2.35		2.32	0.59	0.20		1.1%
	Dissolved	2.14	0.61	0.76	0.20	2.14		3.08	0.88	0.38		36.2%
Dup-08 (I-9)	Total	2.22	0.59	0.75	0.18	2.22						
	Dissolved	2.38	0.62	0.80	0.18	2.38						
D-93	Total	1.22	0.46	0.53	0.23	1.22		2.52	0.68	0.21		69.3%
	Dissolved	1.79	0.55	0.66	0.25	1.79		1.50	0.52	0.24		17.8%
S-5	Total	0.67	0.59	0.61	0.63	0.67	J	0.81	0.53	0.44	J	18.6%
	Dissolved	1.29	0.81	0.85	0.90	1.29	J	2.25	1.22	0.96		53.9%
I-4	Total	2.83	0.78	0.98	0.39	2.83		2.33	0.60	0.22		19.3%
	Dissolved	1.94	0.60	0.72	0.27	1.94		3.15	0.77	0.30		47.4%
PZ-106-KS	Total	0.23	0.23	0.24	0.33	0.33	U	0.43	0.24	0.21	J	Non-Detect
Lab Dup	Total	0.42	0.29	0.31	0.29	0.42	J	0.47	0.27	0.25	J	11.2%
	Dissolved	0.27	0.22	0.22	0.24	0.27	J	0.43	0.25	0.20	J	45.0%
Radium-228												
I-9	Total	4.48	0.89	1.35	1.40	4.48		3.96	0.86	1.46		12.4%
	Dissolved	4.21	1.02	1.40	1.75	4.21	J	4.59	0.96	1.62		8.7%
Dup-08 (I-9)	Total	3.81	1.04	1.36	1.84	3.81						
	Dissolved	5.06	1.10	1.59	1.82	5.06	J					
D-93	Total	1.81	0.88	0.97	1.68	1.81	J	2.77	0.83	1.49		42.0%
	Dissolved	3.45	1.09	1.34	2.00	3.45		3.56	0.80	1.34		3.2%
S-5	Total	2.25	1.29	1.39	2.51	2.51	UJ	5.96	1.36	2.22		Non-Detect
	Dissolved	2.03	1.17	1.25	2.26	2.26	UJ	2.98	1.37	2.59	J	Non-Detect
I-4	Total	3.68	1.19	1.45	2.15	3.68	J	4.48	0.88	1.46		19.6%
	Dissolved	4.23	1.02	1.40	1.73	4.23		3.11	0.89	1.60		30.4%
PZ-106-KS	Total	1.46	0.93	0.99	1.83	1.83	UJ	1.61	0.60	1.09	J	Non-Detect
Lab Dup	Total	0.027	1.08	1.08	2.30	2.30	U	1.23	0.59	1.12	J	Non-Detect
	Dissolved	0.46	0.80	0.81	1.66	1.66	U	2.96	0.86	1.56		Non-Detect

Table 12: Comparison of Radium Results from OU-1 and MDNR Split Samples

Notes:
All values are in units of picoCuries per liter (pCi/l)
DUP = Duplicate sample; The field duplicate DUP 08 = I-9.
MDA = Minimum Detectable Activity
Data Validation Qualifiers (Final Q) include:
U = Non-detect at the reported value
J = Estimated result
UJ = Non-Detect at the estimated reported value

Table 13: Summary of 2012 Radium-226 Results to Prior RI/FS Results

	Nov 1995				Feb 1996				May 1996				Feb - Mar 1997				May - June 1997				Mar 2004				May 2004				2012			
Sample ID	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q
S-5 TOT	31.5		31.5	U	0.6				0.23																				0.67	0.61	0.63	J
S-8 TOT	57.8		57.8	U	0.91				0.37																				0.65	0.35	0.26	J
S-10 TOT	38.8		38.8	U	0.37		0.37	U	0.34																				0.14	0.18	0.29	U
S-61 TOT	30.6		30.6	U	0.71				0.29																				0.55	0.30	0.26	J
S-82 TOT	25.1		25.1	U	1.09				1.39								1.06	0.17	0.11										3.11	1.03	0.34	
S-82 TOT (DUP)																	0.76	0.14	0.14													
S-84 TOT	30.3		30.3	U	0.64				0.34																				1.29	0.52	0.25	
S-84 TOT (DUP)	33.5		33.5	U																												
I-4 TOT	25.4		25.4	U	2.41				1.5								1.04	0.14	0.058										2.83	0.98	0.39	
I-4 TOT (DUP)	29.6		29.6	U																												
I-9 TOT	25.1		25.1	U	1.08				0.64																				2.35	0.80	0.19	
I-9 TOT (DUP)																													2.22	0.75	0.18	
I-11 TOT	34.9		34.9	U	0.85				0.59																				1.31	0.52	0.22	
I-62 TOT	14.2		14.2	U	0.37				0.35																				0.83	0.38	0.20	J
I-65 TOT	24.6		24.6	U	0.79				0.15		0.15	U																	0.88	0.41	0.25	
I-66 TOT	28.2		28.2	U	0.57				0.18		0.18	U																	0.26	0.22	0.24	J
I-66 TOT (DUP)					0.48																											
I-67 TOT	28.5		28.5	U	0.54				0.22																				0.60	0.36	0.29	J
I-68 TOT	27.7		27.7	U	0.72				0.66																				2.12	0.72	0.22	
I-68 TOT (DUP)									0.6																							
I-73 TOT																													0.95	0.42	0.15	
D-3 TOT	28.1		28.1	U	2.7				1.19								1.50	0.19	0.089										4.17	1.29	0.35	
D-3 TOT (DUP)									1.21																				2.52	0.88	0.30	J
D-6 TOT	28.2		28.2	U	1.78				1.88								2.05	0.23	0.053										3.39	1.05	0.23	
D-6 TOT (DUP)																													3.26	1.03	0.26	
D-12 TOT	16.1		16.1	U	0.5				0.73								0.54	0.09	0.077										0.80	0.39	0.25	
D-13 TOT	30.2		30.2	U	1.33				0.86																				1.41	0.54	0.23	
D-13 TOT (DUP)																													0.63	0.34	0.30	J
D-14 TOT	69.8				1.5																								2.18	0.75	0.33	J
D-81 TOT																													0.63	0.33	0.21	
D-83 TOT	25.8		25.8	U	1.25				0.81																				2.80	0.93	0.25	J
D-85 TOT	25.9		25.9	U	0.58				0.16																				6.84	1.92	0.31	J
D-85 TOT (DUP)	27		27	U																												
D-87 TOT																													1.70	0.60	0.24	J+
D-93 TOT	26.5		26.5	U	1.43				2.09								1.34	0.16	0.083										1.22	0.53	0.23	
D-93 TOT (DUP)					1.21																											
LR-100 TOT													2.63	1.12	1.31														0.54	0.34	0.35	J
LR-103 TOT													4.81	1.27	0.932														1.44	0.62	0.32	
LR-104 TOT													3.08	1.08	0.972														0.53	0.34	0.36	J
LR-104 TOT (DUP)													1.8	0.79	0.833														0.52	0.33	0.31	J
LR-105 TOT													3.67	1.24	1.2														0.91	0.44	0.29	J+
MW-102 TOT																													0.53	0.29	0.15	J
MW-103 TOT													0.899		0.899	U	1.17	0.46	0.419										5.44	1.57	0.37	J
MW-103 TOT													0.25	0.34																		
MW-103 TOT (DUP)													0.15		0.15	U	0.515		0.515	U												
MW-104 TOT																													1.59	0.65	0.29	J

Table 13: Summary of 2012 Radium-226 Results to Prior RI/FS Results

	Nov 1995				Feb 1996				May 1996				Feb - Mar 1997				May - June 1997				Mar 2004				May 2004				2012			
Sample ID	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q
MW-1204 TOT													3.56	0.95	0.7		2.36	1	1.21										4.24	1.24	0.21	J
MW-1204 TOT (DUP)																	0.938		0.938	U												
PZ-100-KS TOT																													0.55	0.31	0.22	J
PZ-100-SD TOT													2.5	0.92	1.05		2.98	0.9	0.807										2.74	0.88	0.31	
PZ-100-SS TOT													3.85	0.98	0.837		1.82	0.72	0.891										2.95	0.89	0.21	J
PZ-101-SS TOT																													12.52	2.99	0.24	J
PZ-102R-SS TOT													2.12	1.04	1.3		2.06	0.59	0.426										2.65	0.82	0.15	J
PZ-102-SS TOT																													5.96	1.76	0.38	J
PZ-103-SS TOT																													4.72	1.39	0.22	
PZ-104-KS TOT																													0.17	0.18	0.20	U
PZ-104-SD TOT													3.26	0.87	0.678		1.03	0.67	0.985										4.50	1.26	0.18	
PZ-104-SS TOT													4.62	1.06	0.816		1.53	0.67	0.857										1.62	0.57	0.14	
PZ-105-SS TOT																													1.84	0.62	0.18	J+
PZ-106-KS TOT																													0.23	0.24	0.33	U
PZ-106-SD TOT													4.39	1.16	1.1		1.33	0.56	0.571										1.06	0.44	0.18	
PZ-106-SS TOT													6.33	1.26	0.864		2.8	0.79	0.67										3.93	1.13	0.18	
PZ-107-SS TOT					0.066		0.066	U																					6.33	1.73	0.33	
PZ-109-SS TOT																													2.58	0.83	0.22	J
PZ-110-SS TOT													4.92	1.05	0.642		3.59	0.8	0.672										4.38	1.18	0.21	J
PZ-111-KS TOT																													0.63	0.34	0.21	J
PZ-111-SD TOT													1.57	0.68	0.804		1.31	0.58	0.677										1.34	0.52	0.21	J+
PZ-112-AS TOT																													2.76	1.01	0.40	J
PZ-113-AS TOT													3.56	1.14	0.972		0.794	0.43	0.52										0.64	0.36	0.27	
PZ-113-SS TOT													5.8	1.33	0.87		0.895	0.42	0.485										1.91	0.67	0.21	
PZ-113-AD TOT													2.44	1.11	1.36		2.31	0.8	0.673										3.41	1.19	0.44	J
PZ-113-AD TOT (DUP)													3.58	0.98	0.73														1.05	0.51	0.30	J
PZ-114-AS TOT	27.2		27.2	U	0.68				0.17																				0.41	0.25	0.22	J
PZ-115-SS TOT																													6.20	1.63	0.21	
PZ-116-SS TOT																													0.54	0.32	0.23	J
PZ-200-SS TOT																													4.94	1.42	0.37	J
PZ-200-SS TOT (DUP)																													4.69	1.32	0.23	J
PZ-201A-SS TOT													2.69	0.87	0.87		2.71	0.83	0.843										0.31	0.22	0.20	J+
PZ-201A-SS TOT (DUP)																													0.29	0.17	0.09	J+
PZ-202-SS TOT																													1.97	0.70	0.24	J
PZ-203-SS TOT																													0.95	0.40	0.25	J+
PZ-204A-SS TOT													1.92	0.73	0.802		2.61	0.67	0.561										2.34	0.78	0.21	J
PZ-204-SS TOT																													1.10	0.54	0.40	
PZ-205-AS TOT																													1.20	0.51	0.28	
PZ-205-SS TOT																													1.73	0.64	0.24	J
PZ-206-SS TOT													2.02	0.86	0.98		1.61	0.66	0.766										1.44	0.52	0.22	
PZ-207-AS TOT																													0.66	0.36	0.24	J
PZ-208-SS TOT													2.25	0.78	0.775		1.61	0.56	0.469										0.83	0.37	0.18	J+
PZ-302-AI TOT																													1.08	0.48	0.25	
PZ-303-AS TOT													1.03	0.14			2.13		2.13	U									0.63	0.35	0.25	J
PZ-303-AS TOT (DUP)													2.48	0.75	0.703																	
PZ-304-AI TOT													1.58	0.73	0.878		0.7		0.7	U									1.52	0.69	0.51	

Table 13: Summary of 2012 Radium-226 Results to Prior RI/FS Results

	Nov 1995				Feb 1996				May 1996				Feb - Mar 1997				May - June 1997				Mar 2004				May 2004				2012			
Sample ID	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q
PZ-304-AI-TOT (DUP)													1.89	0.73	0.762		1.56	0.65	0.559													
PZ-304-AS TOT													2.2	0.74	0.688		0.642	0.42	0.561										2.19	0.84	0.35	
PZ-305-AI TOT																													2.18	0.79	0.27	
S-5 DIS	32.5		32.5	U	41.7		41.7	U	0.13		0.13	U									0.37		0.37	U	0.25		0.25	U	1.29	0.85	0.90	J
S-8 DIS	35.7		35.7	U	32.2		32.2	U	0.21																				0.56	0.32	0.25	J
S-10 DIS					29.2		29.2	U	0.32												0.22		0.22	U	0.23	0.1	0.19		0.06	0.13	0.25	U
S-10 DIS (DUP)																									0.45	0.25	0.31					
S-61 DIS	25.7		25.7	U	28		28	U	0.29												0.25	0.16	0.22		0.24		0.24	U	0.35	0.23	0.20	J
S-82 DIS	12.8		12.8	U	39.2		39.2	U	0.88								1.07	0.14	0.062		0.58	0.20	0.19		0.50	0.2	0.16		1.32	0.57	0.31	
S-84 DIS	28.8		28.8	U	28.7		28.7	U	0.34												0.52		0.52	U	0.63	0.24	0.25		0.51	0.32	0.24	J
S-84 DIS (DUP)	23.2		23.2	U																												
I-4 DIS	41.4		41.4	U	37.8		37.8	U	0.87								0.81	0.11	0.058		0.19		0.19	U	1.26	0.29	0.19		1.94	0.72	0.27	
I-4 DIS (DUP)	28.3		28.3	U																												
I-9 DIS	12.7		12.7	U	31.1		31.1	U	0.54												1.60	0.31	0.14		0.94	0.3	0.27		2.14	0.76	0.20	
I-9 DIS (DUP)																													2.38	0.80	0.18	
I-11 DIS	25.5		25.5	U	28.5		28.5	U	0.5												0.59	0.20	0.20		0.85	0.3	0.31		1.01	0.45	0.22	
I-62 DIS	17.1		17.1	U	26.6		26.6	U	0.14		0.14	U																	0.32	0.22	0.20	J
I-65 DIS	23.3		23.3	U	41.5		41.5	U	0.44		0.44	U																	0.22	0.20	0.25	U
I-66 DIS	31.3		31.3	U	33.6		33.6	U	0.34		0.34	U																	0.12	0.17	0.28	UJ
I-66 DIS (DUP)					35.5		35.5	U																								
I-67 DIS	23.9		23.9	U	42		42	U	0.52																				0.55	0.33	0.27	J
I-68 DIS	28.6		28.6	U	36.5		36.5	U	0.44												0.38	0.19	0.22		0.46	0.2	0.20		0.52	0.30	0.23	J
I-68 DIS (DUP)									0.47																							
I-73 DIS																													0.71	0.39	0.27	J
D-3 DIS	39.8		39.8	U	27.2		27.2	U	0.78								0.75	0.11	0.083		2.47	0.44	0.22		2.54	0.5	0.25		2.55	0.91	0.31	
D-3 DIS (DUP)									1.17																				3.06	1.06	0.39	
D-6 DIS	28.6		28.6	U	36.7		36.7	U	1.66								1.80	0.21	0.093		2.61	0.49	0.26		2.56	0.5	0.27		2.54	0.83	0.24	
D-6 DIS (DUP)																					2.08	0.40	0.18						3.09	0.99	0.30	J
D-12 DIS	15.4		15.4	U	44.7		44.7	U	0.36								0.49	0.12	0.14		0.57	0.19	0.18		0.65	0.2	0.21		0.68	0.36	0.22	
D-12 DIS (DUP)																	0.26	0.09	0.11													
D-13 DIS	23.9		23.9	U	24.6		24.6	U	0.58												1.0	0.29	0.24		1.26	0.3	0.14		1.21	0.49	0.17	
D-13 DIS (DUP)																													0.93	0.41	0.22	J
D-14 DIS	31.3		31.3	U	96.7																											
D-81 DIS																													0.62	0.33	0.19	J
D-83 DIS	14		14	U	30.5		30.5	U	0.82																				3.23	1.00	0.27	
D-85 DIS	31.4		31.4	U	54.4		54.4	U	0.54												0.50	0.26	0.30		0.52	0.2	0.23		1.65	0.65	0.28	
D-85 DIS (DUP)	33.9		33.9	U																												
D-87 DIS																													1.42	0.56	0.20	J+
D-93 DIS	28.6		28.6	U	29.6		29.6	U	0.95								1.18	0.15	0.065		1.30	0.28	0.18		1.02	0.3	0.20		1.79	0.66	0.25	
D-93 DIS (DUP)					46		46	U																	0.95	0.3	0.21					
LR-100 DIS																													0.83	0.40	0.28	
LR-103 DIS																													1.10	0.51	0.24	
LR-104 DIS																													0.48	0.33	0.33	J
LR-104 DIS (DUP)																													0.71	0.37	0.25	J
LR-105 DIS													1.58	0.23															1.14	0.47	0.20	J+

Table 13: Summary of 2012 Radium-226 Results to Prior RI/FS Results

	Nov 1995				Feb 1996				May 1996				Feb - Mar 1997				May - June 1997				Mar 2004				May 2004				2012			
Sample ID	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q
MW-102 DIS																					0.25		0.25	U	0.20		0.20	U	0.86	0.41	0.24	
MW-103 DIS													1.77	0.77	0.92		0.502	0.33	0.415										0.27	0.21	0.21	J
MW-103 DIS (DUP)													0.14		0.14	U	0.947	0.44	0.496													
MW-104 DIS																													0.46	0.29	0.19	J
MW-1204 DIS													3.03	1.03	1.1		2.19	0.68	0.56										2.79	0.88	0.27	J
MW-1204 DIS (DUP)																	2.38	0.73	0.687													
PZ-100-KS DIS																													0.21	0.21	0.25	U
PZ-100-SD DIS													2.18	0.9	1.08		1.39	0.6	0.721										2.69	0.87	0.28	
PZ-100-SS DIS													1.9	0.84	1.03		2.4	0.68	0.553										3.95	1.15	0.27	
PZ-101-SS DIS																													28.87	6.55	0.24	
PZ-102R-SS DIS													2.03	1.02	1.25		1.05	0.44	0.42										3.62	1.08	0.25	
PZ-102-SS DIS																													3.63	1.06	0.20	J
PZ-103-SS DIS																													3.09	1.00	0.24	
PZ-104-KS DIS																													0.28	0.23	0.24	J
PZ-104-SD DIS													2.39	0.91	0.971		1.27	0.58	0.682										9.74	2.73	0.46	J
PZ-104-SS DIS													2.55	0.84	0.861		1.15	0.58	0.722										1.60	0.58	0.21	J
PZ-105-SS DIS																													1.92	0.65	0.28	J+
PZ-106-KS DIS																													0.27	0.22	0.24	J
PZ-106-SD DIS													1.84	0.85	1.07		0.706		0.706	U									1.28	0.52	0.23	
PZ-106-SS-DIS													2.62	0.9	0.944		2.53	0.73	0.613										2.90	0.91	0.28	
PZ-107-SS DIS					0.069	0.03	0.043																						5.02	1.39	0.22	J
PZ-109-SS DIS																													2.35	0.80	0.35	J
PZ-110-SS DIS													4.9	1.25	1.17		3.43	0.76	0.516										5.01	1.36	0.19	J
PZ-111-KS DIS																													0.32	0.25	0.22	J
PZ-111-SD DIS													2.07	0.83	0.959		1.34	0.61	0.745										1.26	0.47	0.15	J+
PZ-112-AS DIS																													3.08	1.04	0.36	
PZ-113-AS DIS													1.09	0.73	1.05		0.773	0.4	0.483										0.73	0.42	0.39	J
PZ-113-SS DIS													2.24	0.91	1.09		0.68		0.68	U									1.94	0.64	0.15	J
PZ-113-AD DIS													2.5	0.98	1.16		1.39	0.6	0.732										4.51	1.40	0.31	J
PZ-113-AD DIS (DUP)													2.92	1.06	1.18														1.21	0.56	0.24	J
PZ-114-AS DIS	24.6		24.6		35.8		35.8	U	0.51																				0.72	0.36	0.19	
PZ-115-SS DIS																													6.49	1.71	0.33	
PZ-116-SS DIS																													0.19	0.24	0.39	UJ
PZ-200-SS DIS																													3.12	0.97	0.28	J
PZ-200-SS DIS (DUP)																													4.50	1.28	0.17	J
PZ-201A-SS DIS													0.907		0.907	U	0.893	0.46	0.536										0.45	0.27	0.23	J+
PZ-201A-SS DIS (DUP)																													0.15	0.15	0.18	UJ+
PZ-202-SS DIS																													0.67	0.37	0.28	J
PZ-203-SS DIS																													1.08	0.45	0.23	J+
PZ-204A-SS DIS													1.11	0.65	0.88		0.43		0.43	U									0.72	0.37	0.24	J
PZ-204-SS DIS																													1.41	0.62	0.35	
PZ-205-AS DIS																													1.33	0.57	0.24	J
PZ-205-SS DIS																													1.54	0.59	0.22	J
PZ-206-SS DIS													1.9	0.9	1.12		1.19	0.57	0.669										0.91	0.40	0.20	
PZ-207-AS DIS																													0.73	0.38	0.26	J
PZ-208-SS DIS													1.48	0.72	0.905		1.15	0.45	0.412										0.52	0.27	0.14	J+

Table 13: Summary of 2012 Radium-226 Results to Prior RI/FS Results

	Nov 1995				Feb 1996				May 1996				Feb - Mar 1997				May - June 1997				Mar 2004				May 2004				2012			
Sample ID	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q	Result	CSU	MDA	Q
PZ-302-AI DIS																													0.47	0.29	0.25	J
PZ-303-AS DIS													1.31	0.69	0.91		1.15	0.48	0.502										0.36	0.23	0.20	J
PZ-304-AI DIS													1.31	0.83	1.15		0.87	0.48	0.613										1.93	0.76	0.35	J
PZ-304-AI DIS (DUP)													1.91	0.79	0.917		1.38	0.55	0.566													
PZ-304-AS DIS													2.34	0.87	0.926		0.896	0.62	0.888										1.61	0.68	0.32	
PZ-305-AI DIS																													0.70	0.43	0.42	J

Notes:

All values are in units of picoCuries per liter (pCi/l)

For the results prior to 2012, only the results for wells sampled in 2012 are reported.

DIS = dissolved sample (field filtered sample); TOT = total sample (unfiltered sample)

DUP = Duplicate samples; Field duplicates were collected from the following locations: DUP 01 = PZ-201A-SS, DUP 02 = PZ-200-SS, DUP 03 = PZ-113-Ad, DUP-04 = D-6, DUP-05 = D-3, DUP 06 = D-13, DUP 07 = LR-104, and DUP 08 = I-9.

CSU = Combined Standard Uncertainty (2-sigma); MDA = Minimum Detectable Activity

Data Validation Qualifiers (Final Q) include: U = Non-detect at the reported value, UJ = Non-Detect at the estimated reported value, UJ+ = Non-Detect at the estimated reported value which may be biased high, J = estimated result; J+ = estimated result which may be biased high

Table 14: Summary of Detected Trace Metal Results

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
S-5	8/14/2012	Dissolved	1000 U	50 U	50 U	420	50 U	250 U	11000	50 U	110	0.2 U	200 U	250 U	100 U
S-5	8/14/2012	Total	1000 U	50 U	14 J	420	16 J	250 U	13000	18 J	130	0.2 U	93 J	250 U	100
S-8	8/9/2012	Dissolved	1000 U	50 U	15 U	260	50 U	250 U	920	50 U	880	0.2 U	200 U	250 U	100 U
S-8	8/9/2012	Total	1000 U	24 U	15 U	300	50 U	250 U	3000	50 U	1000	0.2 UJ-	200 U	250 U	35 U
S-10	8/8/2012	Dissolved	590 J	50 U	36 U	100 J	50 U	250 U	61000	50 U	2800	0.2 UJ-	200 U	250 U	100 U
S-10	8/8/2012	Total	790 J+	10 U	36	110	10 U	50 U	65000	1.8 J	3100	0.2 UJ-	18 J	11 J	20 U
S-61	8/7/2012	Dissolved	1000 U	50 U	50 U	190 J	50 U	250 U	500 U	9.0 J	580	0.20 U	200 U	250 U	100 U
S-61	8/7/2012	Total	1300	10 U	10 U	250	10 U	6.6 J	6400	27	720	0.20 U	21 J	6.6 J	33 J+
S-82	8/10/2012	Dissolved	1000 U	50 U	200	900	50 U	250 U	32000	50 U	1800	0.2 U	200 U	250 U	28 U
S-82	8/10/2012	Total	3200	50 U	230	1300	50 U	250 U	45000	51	2000	0.2 UJ-	200 U	250 U	150 J+
S-84	8/6/2012	Dissolved	1000 U	50 U	110	840	50 U	28 J	48000	50 U	1900	0.2 UJ-	200 U	250 U	100 U
S-84	8/6/2012	Total	11000 J+	10 U	120	1100	16	69	69000	25	2300	0.086 U	93	32 J	150
I-4	8/14/2012	Dissolved	1000 U	50 U	50 U	1200	50 U	250 U	31000	8.0 J	880	0.2 U	200 U	250 U	100 U
I-4	8/14/2012	Total	1000 U	50 U	50 U	1400	50 U	250 U	41000	50 U	980	0.2 U	200 U	250 U	100 U
I-9	8/14/2012	Dissolved	1000 U	50 U	50 U	1100	50 U	250 U	18000	50 U	360	0.2 U	200 U	250 U	100 U
I-9	8/14/2012	Total	1000 U	50 U	50 U	1100	50 U	250 U	20000	9.5 J	390	0.2 U	200 U	250 U	100 U
I-9 DUP	8/14/2012	Dissolved	1000 U	50 U	50 U	1100	50 U	250 U	19000	50 U	370	0.2 U	200 U	250 U	100 U
I-9 DUP	8/14/2012	Total	1000 U	50 U	50 U	1200	50 U	250 U	21000	50 U	410	0.2 U	200 U	250 U	100 U
I-11	8/8/2012	Dissolved	1000 U	50 U	15 U	760	50 U	250 U	22000	50 U	1200	0.2 UJ-	200 U	250 U	100 U
I-11	8/8/2012	Total	200 U	10 U	15	860	10 U	50 U	25000	10 U	1300	0.2 UJ-	13 J	6.8 J	6.1 U
I-62	8/9/2012	Dissolved	1000 U	50 U	50 U	270	50 U	250 U	3800	50 U	400	0.2 U	200 U	250 U	100 U
I-62	8/9/2012	Total	2500	50 U	30 U	380	50 U	250 U	13000	12 J	620	0.2 UJ-	200 U	250 U	81 U
I-65	8/6/2012	Dissolved	1000 U	50 U	50 U	200 J	50 U	250 U	500 U	50 U	83	0.2 UJ-	200 U	250 U	100 U
I-65	8/6/2012	Total	1300 J+	10 U	10 U	250	10 U	7.9 J	2100	4.9 J	640	0.069 U	20 J	6.0 J	19 J+
I-66	8/10/2012	Dissolved	1000 U	50 U	50 U	100 J	50 U	250 U	1900	50 U	3200	0.2 U	200 U	250 U	100 U
I-66	8/10/2012	Total	1000 U	50 U	50 U	120 J	50 U	250 U	4000	9.5 J	3600	0.2 UJ-	200 U	250 U	100 U
I-67	8/10/2012	Dissolved	1000 U	50 U	50 U	210 J	50 U	250 U	5900	50 U	1100	0.2 U	200 U	250 U	100 U
I-67	8/10/2012	Total	1000 U	50 U	50 U	230 J	50 U	250 U	7300	50 U	1200	0.2 UJ-	200 U	250 U	100 U
I-68	8/6/2012	Dissolved	1000 U	50 U	11 U	540	50 U	250 U	400 J	50 U	1400	0.2 UJ-	200 U	250 U	100 U
I-68	8/6/2012	Total	35000 J+	5.4 J	11	730	64	26 J	31000	100	1600	0.38	91	75	420
I-73	8/4/2012	Dissolved	200 U	10 U	45	680	10 U	7.6 J	32000	4.7 J	1100	0.080 U	49	50 U	570
I-73	8/4/2012	Total	12000	10 U	58	820	18	11 J	61000	110	1500	0.20 U	73	24 J	6300
D-3	8/8/2012	Dissolved	1000 U	50 U	13 U	1800	50 U	250 U	27000	50 U	410	0.2 UJ-	200 U	250 U	100 U

Table 14: Summary of Detected Trace Metal Results

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
D-3	8/8/2012	Total	200 U	10 U	10 U	2100	10 U	4.9 J	31000	1.7 J	470	0.2 UJ-	18 J	50 U	5.5 U
D-3 DUP	8/8/2012	Dissolved	1000 U	50 U	50 U	2000	50 U	250 U	31000	50 U	460	0.2 UJ-	200 U	250 U	100 U
D-3 DUP	8/8/2012	Total	200 U	4.5 J	10 U	2100	10 U	4.6 J	31000	10 U	470	0.2 UJ-	17 J	5.1 J	5.8 U
D-6	8/7/2012	Dissolved	1000 U	50 U	50 U	950	50 U	250 U	14000	50 U	420	0.20 U	200 U	250 U	100 U
D-6	8/7/2012	Total	200 U	10 U	10 U	1100	10 U	50 U	15000	3.0 J	490	0.20 U	40 U	4.4 J	20 J+
D-6 DUP	8/7/2012	Dissolved	1000 U	50 U	50 U	1100	50 U	250 U	16000	50 U	500	0.20 U	200 U	22 J	100 U
D-6 DUP	8/7/2012	Total	200 U	10 U	10 U	1100	10 U	50 U	15000	2.3 J	480	0.20 U	40 U	50 U	11 U
D-12	8/8/2012	Dissolved	1000 U	50 U	50 U	470	50 U	250 U	11000	11 J	1100	0.2 UJ-	200 U	250 U	100 U
D-12	8/8/2012	Total	230 J+	10 U	10 U	490	10 U	50 U	15000	2.3 J	1100	0.2 UJ-	40 U	50 U	10 U
D-13	8/10/2012	Dissolved	1000 U	50 U	50 U	530	50 U	250 U	11000	50 U	310	0.2 U	200 U	250 U	100 U
D-13	8/10/2012	Total	550 J	50 U	50 U	550	50 U	250 U	16000	50 U	340	0.2 UJ-	200 U	250 U	100 U
D-13 DUP	8/10/2012	Dissolved	1000 U	50 U	50 U	510	50 U	250 U	11000	50 U	310	0.2 U	200 U	250 U	100 U
D-13 DUP	8/10/2012	Total	940 J	50 U	50 U	600	50 U	250 U	21000	50 U	390	0.2 UJ-	200 U	250 U	26 U
D-81	8/9/2012	Dissolved	1000 U	50 U	50 U	390	50 U	250 U	18000	50 U	1100	0.2 U	200 U	250 U	100 U
D-81	8/9/2012	Total	1000 U	50 U	10 U	400	50 U	250 U	18000	9.0 J	1100	0.2 UJ-	200 U	250 U	65 U
D-83	8/9/2012	Dissolved	1000 U	50 U	50 U	1100	50 U	250 U	11000	50 U	260	0.2 U	200 U	250 U	100 U
D-83	8/9/2012	Total	1000 U	50 U	50 U	960	50 U	250 U	9400	50 U	240	0.2 UJ-	200 U	250 U	27 J
D-85	8/6/2012	Dissolved	1000 U	50 U	32 U	1800	50 U	250 U	50000	50 U	950	0.2 UJ-	200 U	250 U	100 U
D-85	8/6/2012	Total	51000 J+	10 U	82	6100	100	88	340000	170	9200	0.22 U	230	130	720
D-87	8/1/2012	Dissolved	200 U	10 U	10 U	1200	10 U	50 U	30000	10 U	530	0.20 UJ-	18 J	50 U	6.9 U
D-87	8/1/2012	Total	140 J	4.6 J	10 U	1100	10 U	50 U	29000	4.7 J	520	0.20 UJ-	40 U	4.3 J	20 U
D-93	8/14/2012	Dissolved	1000 U	50 U	50 U	1400	50 U	250 U	32000	50 U	900	0.2 U	200 U	250 U	100 U
D-93	8/14/2012	Total	730 J	50 U	50 U	1400	50 U	250 U	39000	12 J	900	0.2 U	200 U	250 U	100 U
LR-100	8/13/2012	Dissolved	1000 U	50 U	50 U	450	50 U	250 U	21000	50 U	190	0.2 U	200 U	250 U	100 U
LR-100	8/13/2012	Total	1800	50 U	50 U	440	50 U	250 U	23000	95	220	0.13 J	200 U	250 U	260
LR-103	8/13/2012	Dissolved	1000 U	50 U	64	960	50 U	250 U	37000	50 U	1000	0.2 U	200 U	250 U	100 U
LR-103	8/13/2012	Total	1900	50 U	78	1000	50 U	250 U	39000	50 U	1100	0.2 U	200 U	250 U	42 J
LR-104	8/13/2012	Dissolved	1000 U	50 U	50 U	450	50 U	250 U	17000	8.0 J	1200	0.2 U	200 U	250 U	34 U
LR-104	8/13/2012	Total	1000 U	50 U	50 U	450	50 U	250 U	17000	7.5 J	1200	0.2 U	200 U	250 U	28 J
LR-104 DUP	8/13/2012	Dissolved	1000 U	50 U	50 U	430	50 U	250 U	16000	7.5 J	1200	0.2 U	200 U	250 U	100 U
LR-104 DUP	8/13/2012	Total	1000 U	50 U	50 U	430	50 U	250 U	16000	50 U	1200	0.2 U	200 U	250 U	100 U
LR-105	8/1/2012	Dissolved	200 U	10 U	4.9 J	750	4.3 J	9.6 J	15000	1.5 J	52	0.20 UJ-	100	50 U	8.1 U
LR-105	8/1/2012	Total	610	4.5 J	4.8 J	720	10	8.7 J	15000	15	70	0.065 J-	92	4.1 U	59

Table 14: Summary of Detected Trace Metal Results

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
MW-102	8/7/2012	Dissolved	1000 U	50 U	21 U	390	50 U	250 U	5700	50 U	1600	0.20 U	200 U	250 U	100 U
MW-102	8/7/2012	Total	450	10 U	10	490	10 U	4.7 J	10000	6.4 J	2000	0.20 U	18 J	5.3 J	23 J+
MW-103	8/11/2012	Dissolved	1000 U	50 U	50 U	230 J	50 U	250 U	500 U	50 U	730	0.2 U	200 U	250 U	100 U
MW-103	8/11/2012	Total	80000	50 U	30 J	1100	100	52 J	98000	130	2700	0.26 J-	160 J	200 J	630
MW-104	8/9/2012	Dissolved	1000 U	50 U	68 J+	550	50 U	250 U	50000	50 U	4400	0.2 U	200 U	250 U	100 U
MW-104	8/9/2012	Total	15000	50 U	75 J+	850	20 J	250 U	63000	39 J	4500	0.2 UJ-	200 U	39 J	180 J+
MW-1204	8/2/2012	Dissolved	200 U	10 U	10 U	290	10 U	50 U	5100	10 U	100	0.061 J	40 U	50 U	9.8 U
MW-1204	8/2/2012	Total	170 J+	10 U	10 U	290	10 U	50 U	5700 J	2.7 J	120 J+	0.20 U	40 U	50 U	34 J+
PZ-100-KS	8/16/2012	Dissolved	1000 U	50 U	50 U	250 U	50 U	250 U	500 U	50 U	18 J	0.2 U	200 U	250 U	44 J
PZ-100-KS	8/16/2012	Total	1000 U	50 U	50 U	250 U	50 U	250 U	200 J	50 U	21 J	0.2 U	200 U	32 U	37 J
PZ-100-SD	7/31/2012	Dissolved	200 U	10 U	2.4 U	310	10 U	50 U	1400	2.4 J	73	0.20 U	40 U	50 U	11 J
PZ-100-SD	7/31/2012	Total	200 U	10 U	2.9 U	320	10 U	50 U	1500	2.4 J	74	0.20 U	40 U	50 U	7.6 U
PZ-100-SS	7/31/2012	Dissolved	200 U	10 U	10 U	65	10 U	50 U	100 U	10 U	15 U	0.083 J	18 J	50 U	18 J
PZ-100-SS	7/31/2012	Total	87 J	4.2 J	10 U	69	10 U	50 U	54 U	2.5 J	4.7 J	0.20 U	17 J	50 U	13 U
PZ-101-SS	8/7/2012	Dissolved	1000 U	50 U	20 U	370	50 U	250 U	890	50 U	62 J	0.20 U	200 U	250 U	100 U
PZ-101-SS	8/7/2012	Total	200 U	10 U	6.5 J	500	10 U	50 U	1500	2.2 J	81	0.20 U	18 J	4.1 J	26 J+
PZ-102R-SS	8/13/2012	Dissolved	1000 U	50 U	50 U	86 J	50 U	250 U	1100	50 U	35 J	0.2 U	200 U	250 U	28 U
PZ-102R-SS	8/13/2012	Total	1000 U	50 U	50 U	88 J	50 U	250 U	2100	10 J	37 J	0.2 U	200 U	250 U	48 J
PZ-102-SS	8/13/2012	Dissolved	1000 U	50 U	50 U	500	50 U	250 U	2900	8.5 J	290	0.2 U	200 U	250 U	27 U
PZ-102-SS	8/13/2012	Total	2200	50 U	50 U	570	50 U	250 U	8700	8.5 J	360	0.2 U	200 U	250 U	45 J
PZ-103-SS	8/7/2012	Dissolved	1000 U	50 U	50 U	660	50 U	250 U	18000	50 U	120	0.20 U	200 U	250 U	100 U
PZ-103-SS	8/7/2012	Total	17000	6.4 J	25	1100	37	12 J	42000	22	250	0.16 J	55	52	290
PZ-104-KS	8/15/2012	Dissolved	1000 U	50 U	50 U	57 J	50 U	250 U	560	50 U	75 U	0.2 U	200 U	250 U	63 J
PZ-104-KS	8/15/2012	Total	530 J	50 U	50 U	58 J	50 U	250 U	1100	50 U	21 J	0.2 U	200 U	25 U	28 J
PZ-104-SD	8/1/2012	Dissolved	200 U	5.0 J	12 J+	1200	17	8.4 J	28000	1.7 J	190	0.20 UJ-	52	16 J	18 U
PZ-104-SD	8/1/2012	Total	200 U	4.8 J	7.2 J	520	5.1 J	50 U	13000	2.8 J	140	0.20 UJ-	18 J	7.8 J	15 J
PZ-104-SS	8/1/2012	Dissolved	200 U	10 U	10 U	100	10 U	50 U	2400	10 U	65	0.20 UJ-	40 U	50 U	14 U
PZ-104-SS	8/1/2012	Total	200 U	4.7 J	2.5 J	98	10 U	50 U	2300	2.1 J	61	0.20 UJ-	40 U	50 U	11 J
PZ-105-SS	8/1/2012	Dissolved	200 U	4.3 J	10 U	170	10 U	50 U	140	10 U	6.1 U	0.20 UJ-	40 U	50 U	26 J+
PZ-105-SS	8/1/2012	Total	200 U	10 U	10 U	170	10 U	50 U	540	2.9 J	14 J	0.20 UJ-	40 U	50 U	22
PZ-106-KS	8/14/2012	Dissolved	1000 U	50 U	50 U	45 J	50 U	250 U	330 J	50 U	75 U	0.2 U	200 U	250 U	100 U
PZ-106-KS	8/14/2012	Total	1000 U	50 U	50 U	46 J	50 U	250 U	590	50 U	75 U	0.2 U	200 U	250 U	37 J
PZ-106-SD	7/31/2012	Dissolved	200 U	4.2 J	10 U	93	10 U	50 U	620	1.9 J	69	0.20 U	40 U	50 U	8.7 J

Table 14: Summary of Detected Trace Metal Results

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
PZ-106-SD	7/31/2012	Total	2700	10 U	3.4 U	130	5.7 J	50 U	4300	6.1 J	160	0.20 U	40 U	6.6 U	24
PZ-106-SS	7/31/2012	Dissolved	200 U	10 U	10 U	140	10 U	50 U	510	2.1 J	14 U	0.20 U	40 U	50 U	11 J
PZ-106-SS	7/31/2012	Total	200 U	5.4 J	10 U	140	10 U	50 U	460	1.6 J	33	0.20 U	40 U	50 U	20 U
PZ-107-SS	8/3/2012	Dissolved	200 U	10 U	3.6 U	590	10 U	50 U	2400	4.1 J	120	0.067 U	40	4.2 J	11 J
PZ-107-SS	8/3/2012	Total	200 U	10 U	4.9 U	620	10 U	50 U	5900	1.6 J	100	0.077 U	44	50 U	10 U
PZ-109-SS	8/2/2012	Dissolved	200 U	10 U	10 U	63	10 U	50 U	100 U	10 U	15 U	0.075 J	40 U	50 U	24 J+
PZ-109-SS	8/2/2012	Total	200 U	10 U	10 U	58	10 U	50 U	43 J	10 U	15 U	0.099 J	40 U	50 U	21 J+
PZ-110-SS	8/2/2012	Dissolved	200 U	10 U	10 U	330	10 U	50 U	6500	3.3 J	210	0.074 J	23 J	50 U	12 U
PZ-110-SS	8/2/2012	Total	200 U	4.1 J	10 U	320	10 U	50 U	7100 J	2.6 J	200 J+	0.088 J	19 J	50 U	10 U
PZ-111-KS	8/13/2012	Dissolved	1000 U	50 U	50 U	250 U	50 U	250 U	140 J	50 U	75 U	0.2 U	200 U	250 U	100 U
PZ-111-KS	8/13/2012	Total	1000 U	50 U	50 U	250 U	50 U	250 U	200 J	50 U	75 U	0.2 U	200 U	250 U	100 U
PZ-111-SD	8/1/2012	Dissolved	200 U	5.5 J	10 U	120	10 U	50 U	100 U	10 U	15 U	0.20 UJ-	40 U	50 U	13 U
PZ-111-SD	8/1/2012	Total	200 U	10 U	10 U	110	10 U	50 U	230	10 U	15 U	0.20 UJ-	40 U	50 U	8.6 J
PZ-112-AS	8/8/2012	Dissolved	1000 U	50 U	170	1800	50 U	250 U	37000	50 U	220	0.2 UJ-	200 U	250 U	100 U
PZ-112-AS	8/8/2012	Total	300 J+	10 U	190	2200	3.2 J	50 U	44000	4.4 J	280	0.2 UJ-	16 J	7.5 J	14 J
PZ-113-AD	8/3/2012	Dissolved	200 U	10 U	10 U	2000 J	10 U	5.1 J	30000	3.4 J	570	0.076 U	16 J	50 U	7.2 J
PZ-113-AD	8/3/2012	Total	200 U	10 U	10 U	2000 J	10 U	4.7 J	31000	1.9 J	630	0.093 U	17 J	50 U	5.6 U
PZ-113-AD DUP	8/3/2012	Dissolved	200 U	6.0 J	13 J+	1300 J	10 U	50 U	30000	4.6 J	560	0.061 U	17 J	50 U	8.4 J
PZ-113-AD DUP	8/3/2012	Total	970	4.0 J	18	1300 J	10 U	50 U	33000	2.7 J	610	0.078 U	24 J	4.7 J	17 U
PZ-113-AS	8/8/2012	Dissolved	1000 U	50 U	50 U	740	50 U	250 U	6700	50 U	6400	0.2 UJ-	200 U	250 U	33 U
PZ-113-AS	8/8/2012	Total	200 U	4.9 J	12	740	10 U	11 J	7500	2.3 J	6400	0.2 UJ-	29 J	50 U	9.9 U
PZ-113-SS	8/4/2012	Dissolved	200 U	10 U	10 U	170	10 U	50 U	92	2.5 J	32	0.081 U	40 U	50 U	13 J
PZ-113-SS	8/4/2012	Total	5300	10 U	4.8 U	200	13	50 U	4500	2.7 J	83	0.074 U	14 J	12 J	41 J+
PZ-114-AS	7/31/2012	Dissolved	200 U	10 U	220	710	10 U	7.3 J	80000	3.2 J	4100	0.20 U	40 U	6.2 J	7.1 J
PZ-114-AS	7/31/2012	Total	200 U	5.4 J	220	720	10 U	5.8 J	81000	3.2 J	4200	0.20 U	40 U	7.0 J	20 U
PZ-115-SS	7/31/2012	Dissolved	200 U	10 U	2.9 U	200	10 U	5.6 J	1500	3.6 J	45	0.20 U	24 J	50 U	12 J
PZ-115-SS	7/31/2012	Total	200 U	5.8 J	3.4 U	210	10 U	4.0 J	1900	2.9 J	55	0.20 U	24 J	50 U	5.7 U
PZ-116-SS	8/3/2012	Dissolved	200 U	10 U	10 U	59	10 U	50 U	100 U	3.3 J	15 U	0.066 U	40 U	4.1 J	28
PZ-116-SS	8/3/2012	Total	200 U	10 U	10 U	63	10 U	50 U	69 J	10 U	16	0.20 U	40 U	4.4 J	31 J+
PZ-200-SS	8/2/2012	Dissolved	200 U	10 U	10 U	740	10 U	50 U	7800	2.3 J	3200	0.077 J	40 U	5.1 J	8.3 U
PZ-200-SS	8/2/2012	Total	1400 J+	10 U	12 J+	660	5.4 U	50 U	17000 J	5.8 J	2900 J+	0.16 J	40 U	11 J	48 J+
PZ-200-SS DUP	8/2/2012	Dissolved	200 U	10 U	10 U	690	10 U	50 U	7400	1.8 J	2600	0.20 U	40 U	50 U	8.6 U
PZ-200-SS DUP	8/2/2012	Total	490 J+	5.2 J	3.5 U	630	10 U	50 U	9200 J	4.8 J	2600 J+	0.10 J	40 U	5.4 J	20 J+

Table 14: Summary of Detected Trace Metal Results

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
PZ-201A-SS	8/1/2012	Dissolved	200 U	6.0 J	10 U	120	10 U	50 U	220	1.7 J	38	0.20 UJ-	40 U	50 U	59 J+
PZ-201A-SS	8/1/2012	Total	200 U	10 U	10 U	120	10 U	50 U	190	3.6 J	41	0.20 UJ-	40 U	50 U	34
PZ-201A-SS DUP	8/1/2012	Dissolved	200 U	10 U	10 U	120	10 U	50 U	170	1.6 J	38	0.20 UJ-	40 U	50 U	57 J+
PZ-201A-SS DUP	8/1/2012	Total	200 U	5.0 J	10 U	120	10 U	50 U	180	3.4 J	42	0.20 UJ-	40 U	50 U	20
PZ-202-SS	8/2/2012	Dissolved	200 U	10 U	10 U	410	10 U	50 U	1700	2.4 J	590	0.20 U	40 U	50 U	11 U
PZ-202-SS	8/2/2012	Total	21000 J+	11	17	660	51	23 J	21000 J	46	1200 J+	0.18 J	110	52	1600
PZ-203-SS	8/1/2012	Dissolved	200 U	10 U	10 U	90	10 U	50 U	130	10 U	20 J+	0.20 UJ-	40 U	50 U	12 U
PZ-203-SS	8/1/2012	Total	440	10 U	10 U	89	10 U	50 U	320	2.0 J	21	0.20 UJ-	40 U	50 U	10 J
PZ-204A-SS	8/2/2012	Dissolved	200 U	10 U	15 J+	140	10 U	50 U	2500	1.5 J	1000	0.063 J	40 U	50 U	9.4 U
PZ-204A-SS	8/2/2012	Total	160 J+	10 U	21	340	10 U	50 U	5500 J	3.5 J	1000 J+	0.089 J	40 U	5.9 J	33 J+
PZ-204-SS	8/3/2012	Dissolved	200 U	10 U	10 U	180	10 U	50 U	550	3.1 J	90	0.20 U	40 U	4.8 J	8.1 J
PZ-204-SS	8/3/2012	Total	370	10 U	10 U	200	10 U	50 U	2000	1.7 J	100	0.11 U	40 U	6.4 J	20
PZ-205-AS	8/3/2012	Dissolved	200 U	4.2 J	14 J+	1300	10 U	50 U	30000	5.4 J	580	0.081 U	17 J	50 U	20 U
PZ-205-AS	8/3/2012	Total	940	4.3 J	20	1400	10 U	50 U	34000	3.8 J	630	0.096 U	23 J	5.4 J	16 U
PZ-205-SS	8/3/2012	Dissolved	200 U	10 U	10 U	130	10 U	50 U	77 U	1.6 J	15 U	0.20 U	40 U	50 U	15 J
PZ-205-SS	8/3/2012	Total	80 J	10 U	10 U	140	10 U	50 U	120	10 U	15 U	0.066 U	40 U	50 U	15 U
PZ-206-SS	8/7/2012	Dissolved	1000 U	50 U	50 U	76 J	50 U	250 U	200 J	50 U	51 J	0.20 U	200 U	250 U	34 J
PZ-206-SS	8/7/2012	Total	2900	10 U	10 U	110	6.7 J	4.8 J	5700	5.9 J	110	0.20 U	15 J	11 J	46
PZ-207-AS	8/8/2012	Dissolved	1000 U	50 U	12 U	660	50 U	250 U	19000	50 U	66 J	0.2 UJ-	200	250 U	100 U
PZ-207-AS	8/8/2012	Total	110 J+	10 U	5.4 J	700	3.4 J	5.9 J	22000	4.9 J	71	0.16 UJ-	40	4.7 J	63
PZ-208-SS	8/2/2012	Dissolved	200 U	10 U	10 U	160	10 U	50 U	65 J	1.9 J	28	0.20 U	40 U	50 U	13 U
PZ-208-SS	8/2/2012	Total	3000 J+	10 U	10 U	180	10 U	50 U	4200 J	6.5 J	40 J+	0.20 U	40 U	8.0 J	39 J+
PZ-302-AI	8/9/2012	Dissolved	1000 U	50 U	50 U	310	50 U	250 U	1700	50 U	210	0.2 U	200 U	250 U	100 U
PZ-302-AI	8/9/2012	Total	1500	50 U	13 U	310	50 U	20 J	4900	50 U	210	0.2 UJ-	200 U	250 U	54 U
PZ-303-AS	8/10/2012	Dissolved	1000 U	50 U	90	650	50 U	250 U	66000	8.0 J	1700	0.2 U	200 U	250 U	100 U
PZ-303-AS	8/10/2012	Total	400 J	50 U	88	770	50 U	250 U	78000	9.5 J	1800	0.2 UJ-	200 U	250 U	100 U
PZ-304-AI	8/10/2012	Dissolved	1000 U	50 U	15 U	1600	50 U	250 U	17000	50 U	1300	0.2 U	200 U	250 U	100 U
PZ-304-AI	8/10/2012	Total	1000 U	50 U	50 U	1700	50 U	250 U	22000	13 J	1500	0.2 UJ-	200 U	250 U	100 U
PZ-304-AS	8/10/2012	Dissolved	1000 U	50 U	230	1500	50 U	250 U	24000	50 U	92	0.2 U	200 U	250 U	100 U
PZ-304-AS	8/10/2012	Total	490 J	50 U	210	1600	50 U	250 U	26000	50 U	94	0.2 UJ-	69 J	250 U	100 U
PZ-305-AI	8/8/2012	Dissolved	1000 U	50 U	36 U	610	50 U	250 U	38000	50 U	4000	0.2 UJ-	200 U	250 U	100 U
PZ-305-AI	8/8/2012	Total	980 J+	10 U	26	670	10 U	50 U	44000	3.8 J	4100	0.2 UJ-	40 U	8.5 J	22 U

Table 14: Summary of Detected Trace Metal Results

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc

Notes:
All values are in units of micrograms per liter (ug/l)
DUP = Duplicate samples; Field duplicates were collected from the following locations: DUP 01 = PZ-201A-SS, DUP 02 = PZ-200-SS, DUP 03 = PZ-113-Ad, DUP-04 = D-6, DUP-05 = D-3, DUP 06 = D-13, DUP 07 = LR-104, and DUP 08 = I-9.
Data Validation Qualifiers (Final Q) include:
U = non-detect at the reported value
J = estimated result
J+ = estimated result which may be biased high
J- = estimated result which may be biased low
UJ = non-detect at the estimated reported value
UJ- = non-detect at the estimated reported value which may be biased low

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Table 15: Summary of Most Frequently Detected Volatile Organic Compounds

Sample ID	Sample Date	1,2-Dichlorobenzene	1,4-Dichlorobenzene	Benzene	Chlorobenzene	cis-1,2-Dichloroethene	Methyl tert-butyl ether
S-5	8/14/2012	1.3 J	10	3.8 J	1.3 J	5 U	0.86 J
S-8	8/9/2012	5 U	5 U	5 U	5 U	5 U	5 U
S-10	8/8/2012	0.29 J	0.76 J	3.2 J	5.5	1.9 J	0.66 J
S-61	8/7/2012	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	1.0 J-	5.0 UJ
S82	8/10/2012	5 U	5 U	0.31 J	5 U	2.7 J	5 U
S-84	8/6/2012	5 U	5 U	1.6 J	9.9	0.66 J	5 U
D-3	8/8/2012	5 U	5 U	0.50 J	2.4 J	5 U	0.50 J
D-3 DUP	8/8/2012	5 U	5 U	0.53 J	5.1	5 U	0.51 J
D-6	8/7/2012	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	0.42 J-	8.7 J-
D-6 DUP	8/7/2012	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	0.50 J-	8.9 J-
D-12	8/8/2012	5 U	5 U	5 U	1.2 J	0.44 J	0.52 J
D-13	8/10/2012	5 U	5 U	5 U	5 U	5 U	13
D-13 DUP	8/10/2012	5 U	5 U	5 U	5 U	5 U	15
D-81	8/9/2012	5 U	5 U	5 U	5 U	2.6 J	5 U
D-83	8/9/2012	5 U	5 U	5 U	5 U	5 U	5 U
D-85	8/6/2012	5 UJ	5 UJ	0.35 J	60 J	0.18 J	5 UJ
D-87	8/1/2012	5.0 U	5.0 U	0.57 J	5.0 U	0.70 J	5.0 U
D-93	8/14/2012	5 U	5 U	5 U	5 U	5 U	5 U
LR-104 DUP	8/13/2012	5 U	5 U	5 U	5 U	0.56 J	5 U
I-4	8/14/2012	0.69 J	2.5 J	1.7 J	8.7	5 U	0.78 J
I-9	8/14/2012	5 U	5 U	0.68 J	5 U	5.4	5 U
I-9 DUP	8/14/2012	5 U	5 U	0.63 J	5 U	5.4	5 U
I-11	8/8/2012	5 U	5 U	5 U	19	1.9 J	0.55 J
I-62	8/9/2012	5 U	5 U	5 U	5 U	5 U	5 U
I-65	8/6/2012	5 U	5 U	5 U	5 U	5 U	5 U
I-66	8/10/2012	5 U	5 U	5 U	5 U	5 U	5 U
I-67	8/10/2012	5 U	5 U	5 U	5 U	5 U	5 U
I-68	8/6/2012	5 U	5 U	5 U	5 U	5 U	5 U
I-73	8/4/2012	5.0 U	5.0 U	2.7 J	0.71 J	16	5.0 U
LR-100	8/13/2012	0.54 J	6.9	6.7	87	5 U	5 U
LR-103	8/13/2012	5 U	5 U	5 U	5 U	0.39 J	5 U
LR-104	8/13/2012	5 U	5 U	5 U	5 U	0.52 J	5 U
LR-105	8/1/2012	0.77 J	26	8.1	180	5.0 U	0.62 J

Table 15: Summary of Most Frequently Detected Volatile Organic Compounds

Sample ID	Sample Date	1,2-Dichlorobenzene	1,4-Dichlorobenzene	Benzene	Chlorobenzene	cis-1,2-Dichloroethene	Methyl tert-butyl ether
MW-102	8/7/2012	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
MW-103	8/11/2012	5 U	5 U	5 U	5 U	5 U	5 U
MW-104	8/9/2012	5 U	5 U	0.27 J	5 U	0.27 J	5 U
MW-1204	8/2/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	0.97 J
P-303-AS	8/10/2012	2.7 J	0.85 J	48	5 U	1.2 J	0.65 J
PZ-100-KS	8/16/2012	5 U	5 U	5 U	5 U	5 U	5 U
PZ-100-SD	7/31/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-100-SS	7/31/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-101-SS	8/7/2012	5.0 UJ	0.69 J-	1.6 J-	4.9 J-	5.0 UJ	0.52 J-
PZ-102R-SS	8/13/2012	5 U	5 U	5 U	0.44 J	5 U	5 U
PZ-102-SS	8/13/2012	5 U	5 U	5 U	5 U	5 U	5 U
PZ-103-SS	8/7/2012	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
PZ-104-KS	8/15/2012	5 U	5 U	5 U	5 U	5 U	5 U
PZ-104-SD	8/1/2012	5.0 U	1.6 J	120	5.0 U	5.0 U	1.5 J
PZ-104-SS	8/1/2012	5.0 U	4.0 J	470	5.0 U	5.0 U	2.2 J
PZ-105-SS	8/1/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-106-KS	8/14/2012	5 U	5 U	5 U	5 U	5 U	5 U
PZ-106-SD	7/31/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-106-SS	7/31/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-107-SS	8/3/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	0.59 J
PZ-109-SS	8/2/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-110-SS	8/2/2012	5.0 U	5.0 U	5.0 U	5.0 U	2.6 J	5.0 U
PZ-111-KS	8/13/2012	5 U	5 U	5 U	5 U	5 U	5 U
PZ-111-SD	8/1/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-112-AS	8/8/2012	19	17	58	2800	5 U	0.56 J
PZ-113-AD	8/3/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	0.48 J
PZ-113-AD DUP	8/3/2012	5.0 U	5.0 U	6.0	6.6	5.0 U	5.0 U
PZ-113-AS	8/8/2012	5 U	5 U	0.33 J	5 U	5 U	1.5 J
PZ-113-SS	8/4/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-114-AS	7/31/2012	0.32 J	3.1 J	3.5 J	25	0.52 J	5.0 U
PZ-115-SS	7/31/2012	5.0 U	5.0 U	5.0 U	0.74 J	5.0 U	5.0 U
PZ-116-SS	8/3/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-200-SS	8/2/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

Table 15: Summary of Most Frequently Detected Volatile Organic Compounds

Sample ID	Sample Date	1,2-Dichlorobenzene	1,4-Dichlorobenzene	Benzene	Chlorobenzene	cis-1,2-Dichloroethene	Methyl tert-butyl ether
PZ-200-SS DUP	8/2/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-201A-SS	8/1/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-201A-SS DUP	8/1/2012	0.51 J	0.44 J	5.0 U	1.1 J	5.0 U	5.0 U
PZ-202-SS	8/2/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-203-SS	8/1/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-204A-SS	8/2/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-204-SS	8/3/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-205-AS	8/3/2012	5.0 U	5.0 U	5.6	6.9	0.22 J	5.0 U
PZ-205-SS	8/3/2012	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
PZ-206-SS	8/7/2012	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	0.23 J-	5.0 UJ
PZ-207-AS	8/8/2012	0.49 J	3.0 J	1.6 J	13	5 U	1.0 J
PZ-208-SS	8/2/2012	5.0 U	5.0 U	5.0 U	5.0 U	0.53 J	5.0 U
PZ-302-AI	8/9/2012	5 U	5 U	5 U	5 U	0.38 J	5 U
PZ-304-AI	8/10/2012	5 U	5 U	3.9 J	27	2.0 J	5 U
PZ-304-AS	8/10/2012	5 U	5 U	8.2	44	5 U	5 U
PZ-305-AI	8/8/2012	5 U	5 U	1.4 J	4.6 J	5 U	5 U

Notes:

All values are in units of micrograms per liter (ug/l)

DUP = Duplicate samples; Field duplicates were collected from the following locations: DUP 01 = PZ-201A-SS, DUP 02 = PZ-200-SS, DUP 03 = PZ-113-Ad, DUP-04 = D-6, DUP-05 = D-3, DUP 06 = D-13, DUP 07 = LR-104, and DUP 08 = I-9.

Data Validation Qualifiers (Final Q) include:

U = non-detect at the reported value

J = estimated result

J- = estimated result which may be biased low

UJ = non-detect at the estimated reported value

Table 16: Summary of Detected Semivolatile Organic Compounds

Sample ID	Sample Date	Analyte	Result	Final Q
MW-103	8/11/2012	1,2,4-Trichlorobenzene	4.7	J
MW-103	8/11/2012	1,2-Dichlorobenzene	1.8	J
MW-103	8/11/2012	1,3-Dichlorobenzene	1.7	J
PZ-104-SD	8/1/2012	1,4-Dichlorobenzene	1.0	J
PZ-112-AS	8/8/2012	1,4-Dichlorobenzene	11	
PZ-114-AS	7/31/2012	1,4-Dichlorobenzene	2.0	J
PZ-207-AS	8/8/2012	1,4-Dichlorobenzene	2.4	J
S-5	8/14/2012	1,4-Dichlorobenzene	5.2	J
I-4	8/14/2012	1,4-Dichlorobenzene	1.3	J
LR-105	8/1/2012	1,4-Dichlorobenzene	19	
PZ-104-SS	8/1/2012	1,4-Dichlorobenzene	2.1	J
PZ-304-AI	8/10/2012	1,4-Dichlorobenzene	1.6	J
PZ-304-AS	8/10/2012	1,4-Dichlorobenzene	7.4	J
LR-100	8/13/2012	1,4-Dichlorobenzene	4.4	J
MW-103	8/11/2012	2,4-Dimethylphenol	120	
PZ-104-SD	8/1/2012	2,4-Dimethylphenol	1.1	J
LR-105	8/1/2012	2,4-Dimethylphenol	65	
PZ-112-AS	8/8/2012	2-Chlorophenol	9.8	
LR-105	8/1/2012	2-Methylnaphthalene	1.0	J
MW-103	8/11/2012	2-Methylnaphthalene	47	
LR-100	8/13/2012	2-Methylnaphthalene	2.4	J
MW-103	8/11/2012	2-Methylphenol	3.4	J
PZ-104-SD	8/1/2012	3 & 4 Methylphenol	54	
I-68	8/6/2012	Benzo[b]fluoranthene	1.3	J
PZ-104-SS	8/1/2012	Bis(2-ethylhexyl) phthalate	1.4	J
S-5	8/14/2012	Bis(2-ethylhexyl) phthalate	7.1	J
PZ-207-AS	8/8/2012	Bis(2-ethylhexyl) phthalate	28	
D-87	8/1/2012	Bis(2-ethylhexyl) phthalate	1.1	J
PZ-104-SD	8/1/2012	Bis(2-ethylhexyl) phthalate	1.2	J
MW-103	8/11/2012	Bis(2-ethylhexyl) phthalate	9.3	J
LR-105	8/1/2012	Bis(2-ethylhexyl) phthalate	12	
PZ-100-SS	7/31/2012	Bis(2-ethylhexyl) phthalate	0.96	J
LR-100	8/13/2012	Bis(2-ethylhexyl) phthalate	120	
LR-105	8/1/2012	Butyl benzyl phthalate	1.4	J
PZ-101-SS	8/7/2012	Dimethyl phthalate	1.5	J-
PZ-113-AS	8/8/2012	Dimethyl phthalate	1.8	J
D-12	8/8/2012	Dimethyl phthalate	1.8	J
PZ-103-SS	8/7/2012	Dimethyl phthalate	4.3	J-
MW-103	8/11/2012	Di-n-butyl phthalate	7.2	J
LR-100	8/13/2012	Di-n-octyl phthalate	5.3	J
I-68	8/6/2012	Fluoranthene	1.3	J
I-68	8/6/2012	Indeno[1,2,3-cd]pyrene	3.6	J
LR-105	8/1/2012	Naphthalene	11	
S-5	8/14/2012	Naphthalene	6.6	J

Table 16: Summary of Detected Semivolatile Organic Compounds

Sample ID	Sample Date	Analyte	Result	Final Q
MW-103	8/11/2012	Naphthalene	56	
LR-100	8/13/2012	Naphthalene	1.3	J
PZ-112-AS	8/8/2012	Naphthalene	220	
LR-100	8/13/2012	N-Nitrosodiphenylamine	2.5	J
PZ-207-AS	8/8/2012	N-Nitrosodiphenylamine	1.9	J
LR-105	8/1/2012	N-Nitrosodiphenylamine	1.1	J
MW-103	8/11/2012	Phenanthrene	1.8	J
LR-100	8/13/2012	Phenanthrene	1.4	J
LR-105	8/1/2012	Phenol	2.4	J
P-303-AS	8/10/2012	Phenol	3.1	J
LR-100	8/13/2012	Phenol	2.0	J
PZ-102-SS	8/13/2012	Phenol	2.9	J
PZ-304-AS	8/10/2012	Phenol	2.7	J
I-68	8/6/2012	Pyrene	1.1	J

Notes:
All values are in units of micrograms per liter (ug/l)
Data Validation Qualifiers (Final Q) include:
J = estimated result
J- = estimated result which may be biased low

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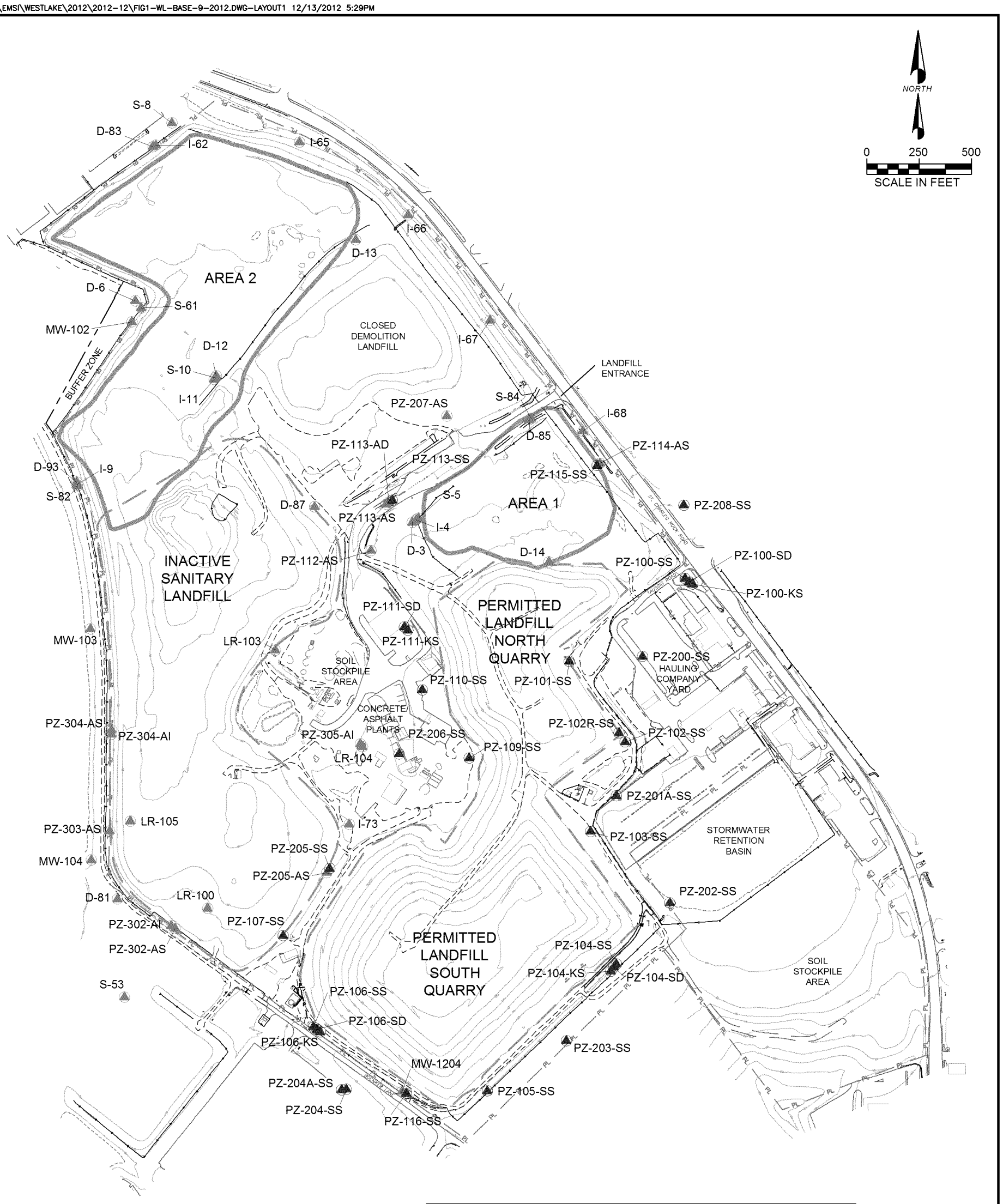
Figures



Generalized Stratagraphic Column					
System	Series	Group	Formation	Thickness (ft)	Dominant Lithology
Quaternary	Holocene		Alluvium	0-150	Sand, gravel, silt, and clay.
	Pleistocene		Loess Glacial Till	1-110 0-55	Silt. Pebbly clay and silt.
Pennsylvanian	Missourian	Pleasanton	Undifferentiated	0-75	Shales, siltstones, "dirty" sandstones, coal beds and thin limestone beds.
	Desmoinesian	Marmaton	Undifferentiated	0-90	
		Cherokee	Undifferentiated	0-200	
	Atokan		Cheltenham Formation	unknown	
Mississippian	Meremacian		Ste. Genevieve Formation	0-160	Argillaceous to arenaceous limestone.
			St. Louis Limestone	0-180	
			Salem Formation	0-180	
			Warsaw Formation	0-110	Shales in upper portion, limestone in lower portions.
	Osagean		Burlington-Keokuk Formation	0-240	Cherty limestone.
			Fern Glen Formation	0-105	Red limestone and shale.

LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Existing 10' Contours
- Building or Structure
- Property Line
- Fence
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Figure 1

Base Map

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2012\2012-12\FIG2-WL-G712.DWG-WO-TOPO 12/13/2012 5:34PM

LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

440	Groundwater Elevation Contour (FAMSL) - Alluvium
440	Groundwater Elevation Contour (FAMSL) - St. Louis Fm
(458.64)	Alluvium Groundwater Elevation (FAMSL)
(458.64)	Bedrock Groundwater Elevation (FAMSL)
*	Groundwater Elevation not used for contouring
→	Groundwater Flow Direction - Alluvium
→	Groundwater Flow Direction - St. Louis
(FAMSL)	Feet above mean sea level

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Figure 2
Alluvial Groundwater Table and
St. Louis FM. Potentiometric Elevation Map
July 30, 2012
West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

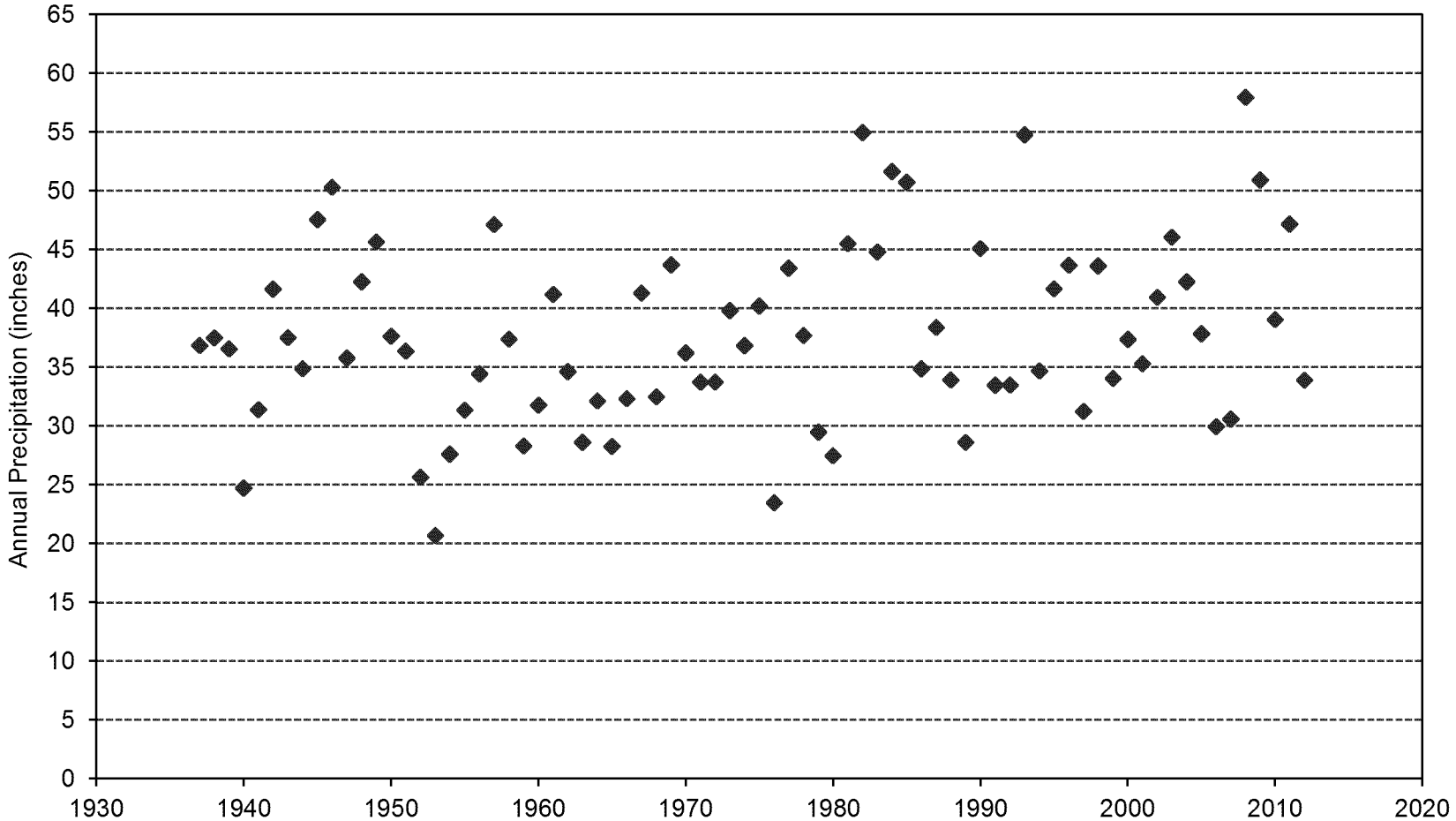


Figure 3

Annual Precipitation
1937 - 2012
St Louis Lambert Field

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

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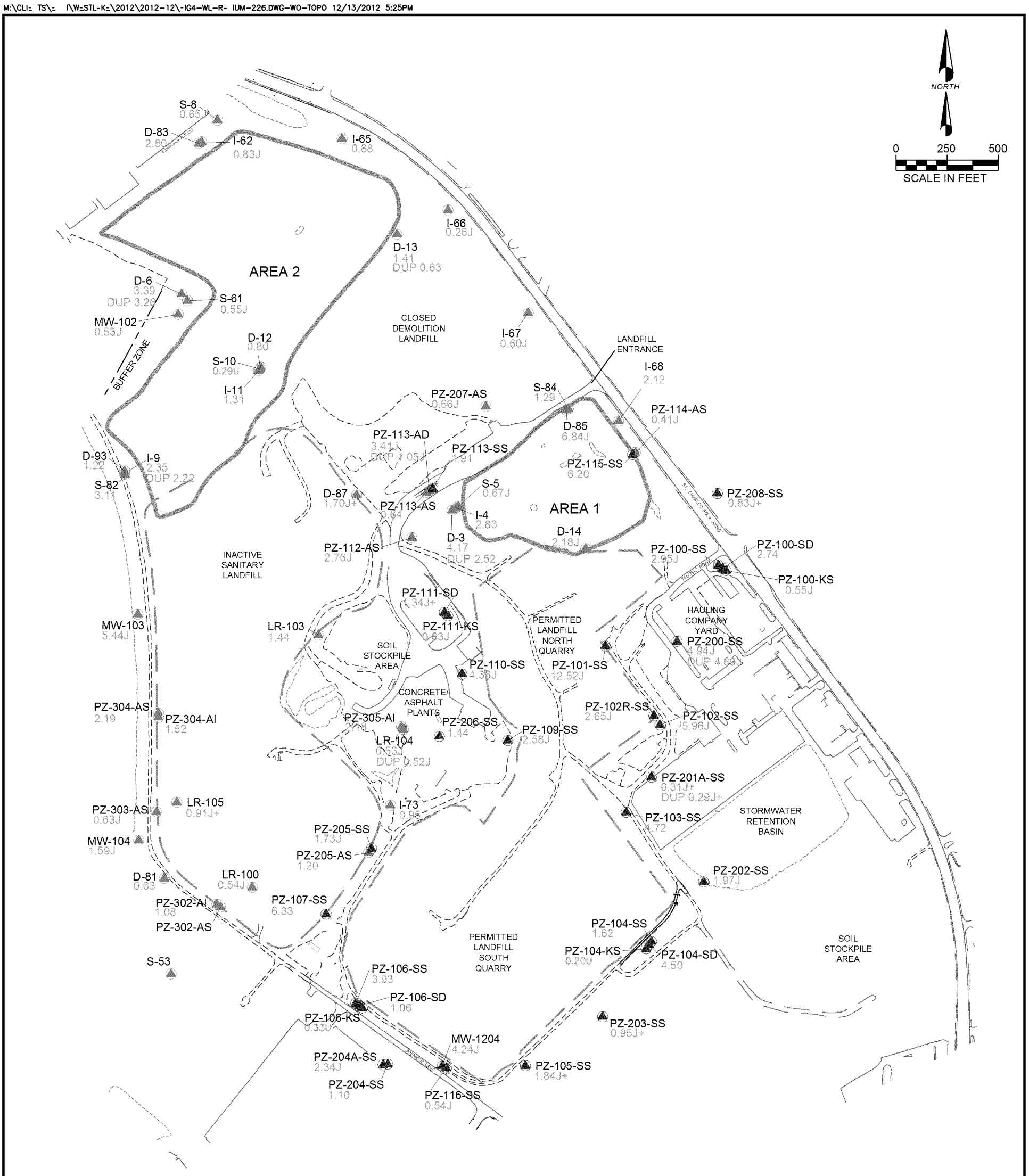

LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Paved Road
- Unpaved Road

RADIUM EXPLANATION

.092 Radium-226 (pCi/L)

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
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SS: St. Louis Formation Well
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KS: Keokuk Formation Well

NOTES:

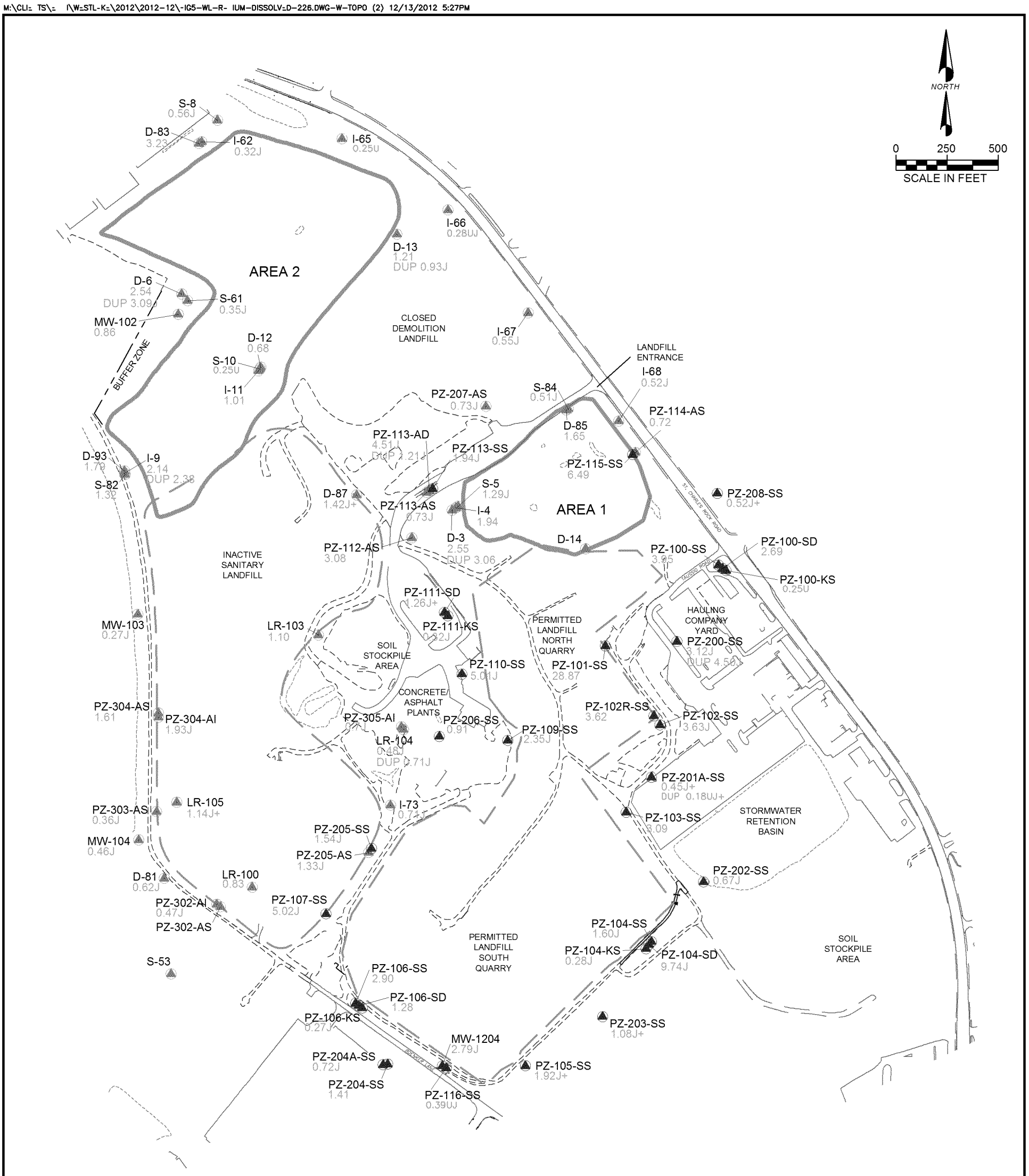
1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Figure 4

Total Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
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NOTES:

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2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

.092 Dissolved Radium-226 (pCi/L)

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

Figure 5

Dissolved Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

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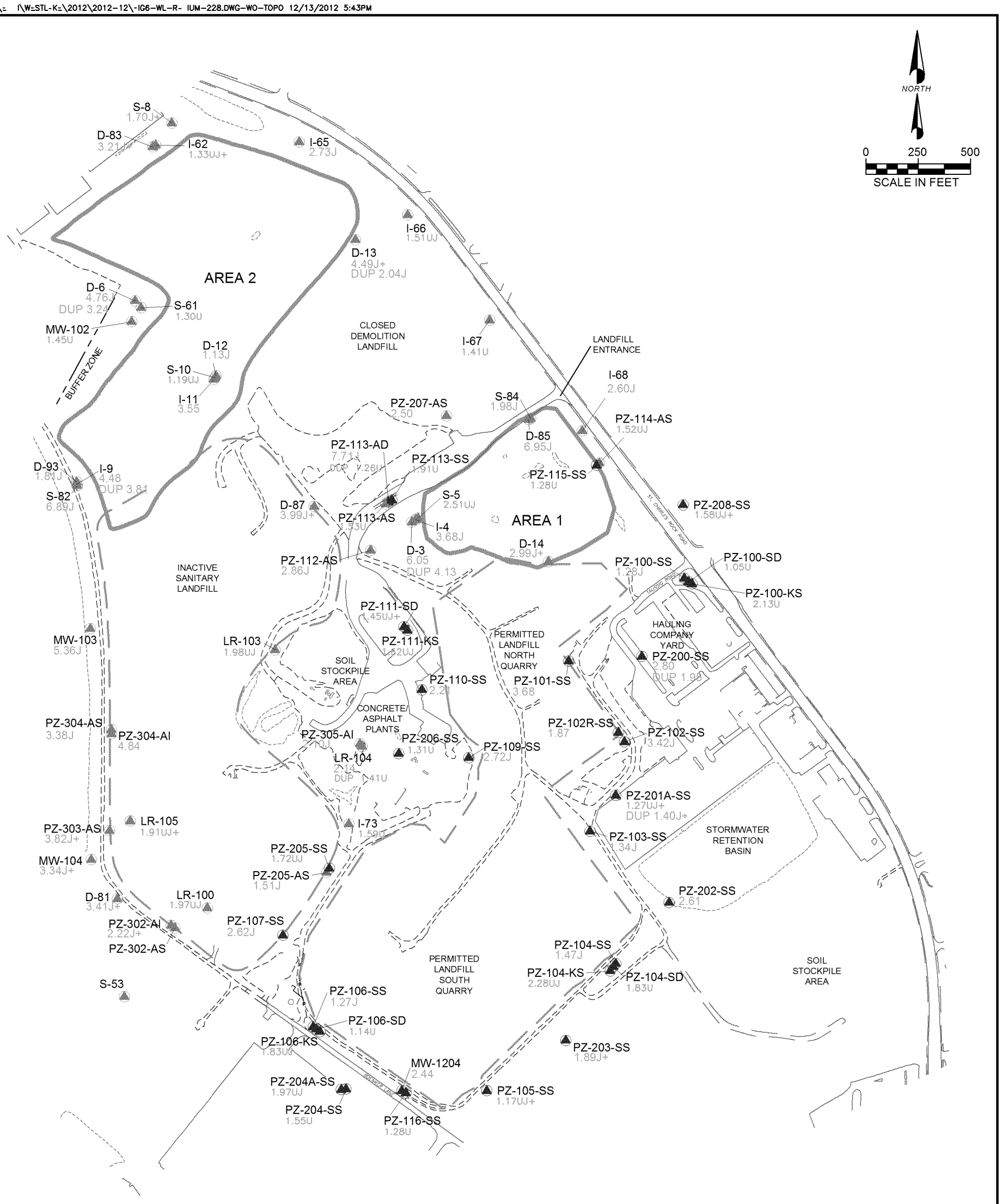

LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

1.10 Radium-228 (pCi/L)

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

Figure 6

Total Radium-228 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

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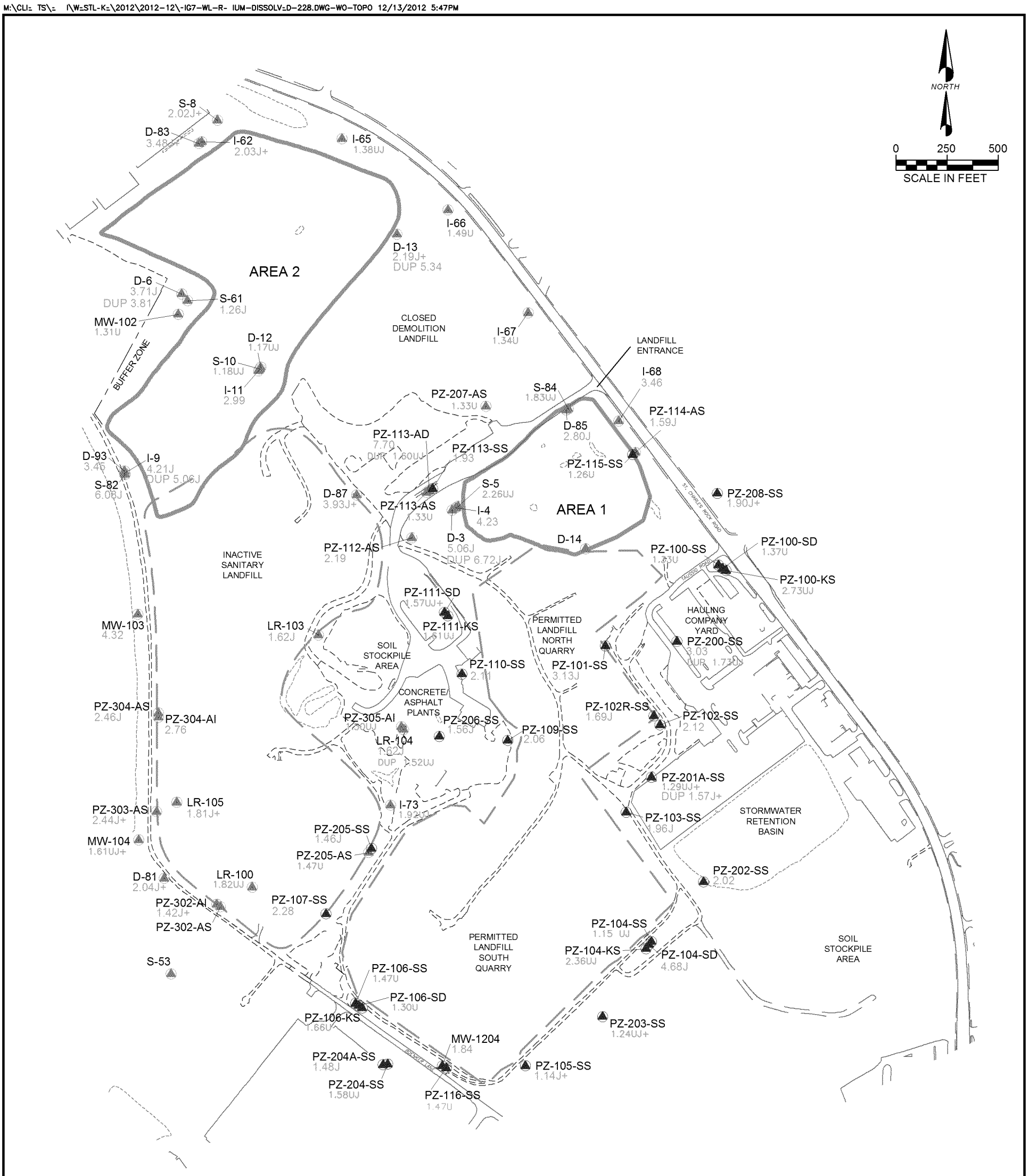

LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Paved Road
- Unpaved Road

RADIUM EXPLANATION

.092 Dissolved Radium-228 (pCi/L)

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
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NOTES:

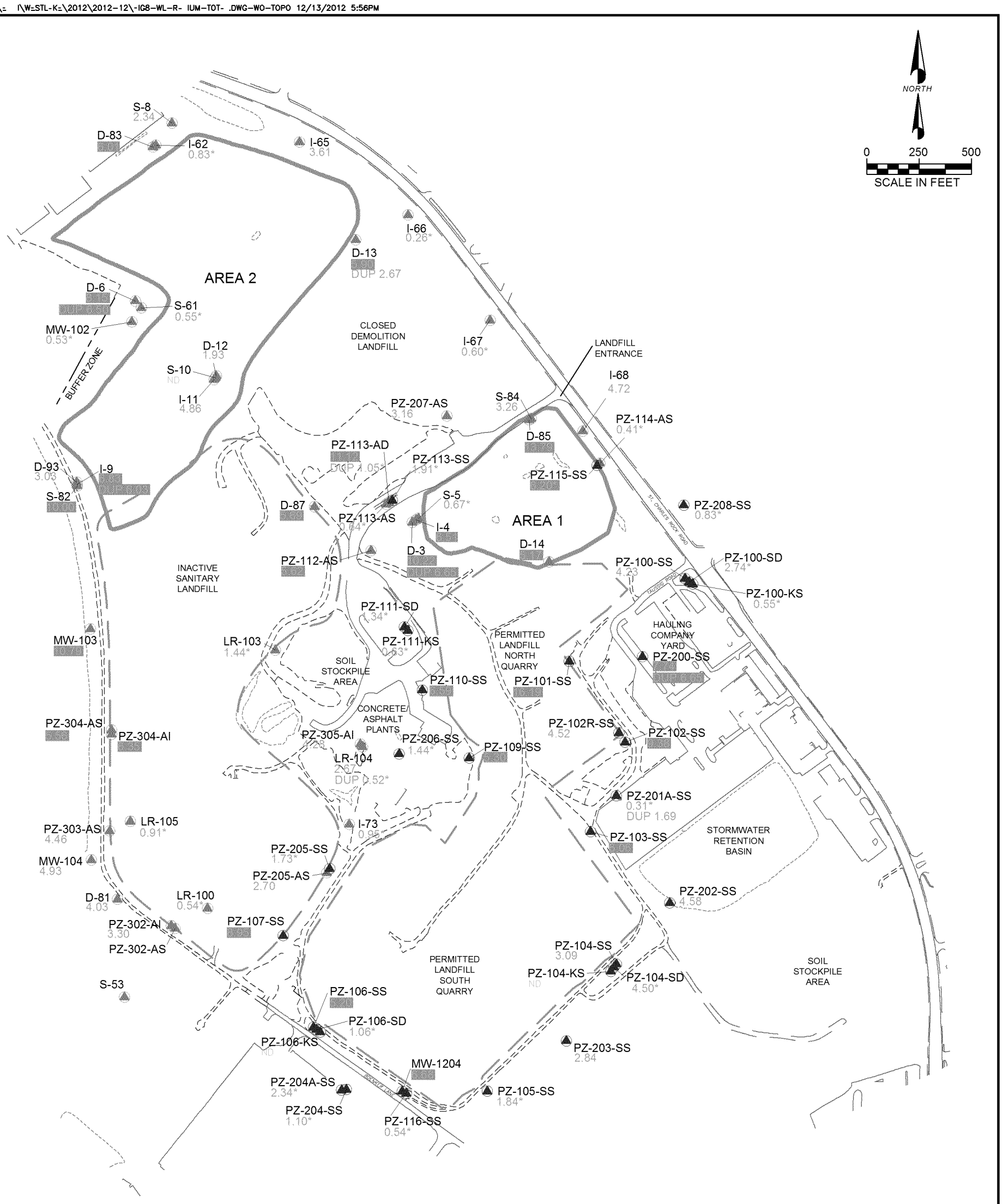
1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Figure 7

Dissolved Radium-228 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

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NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

1.72 Total Radium result that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228

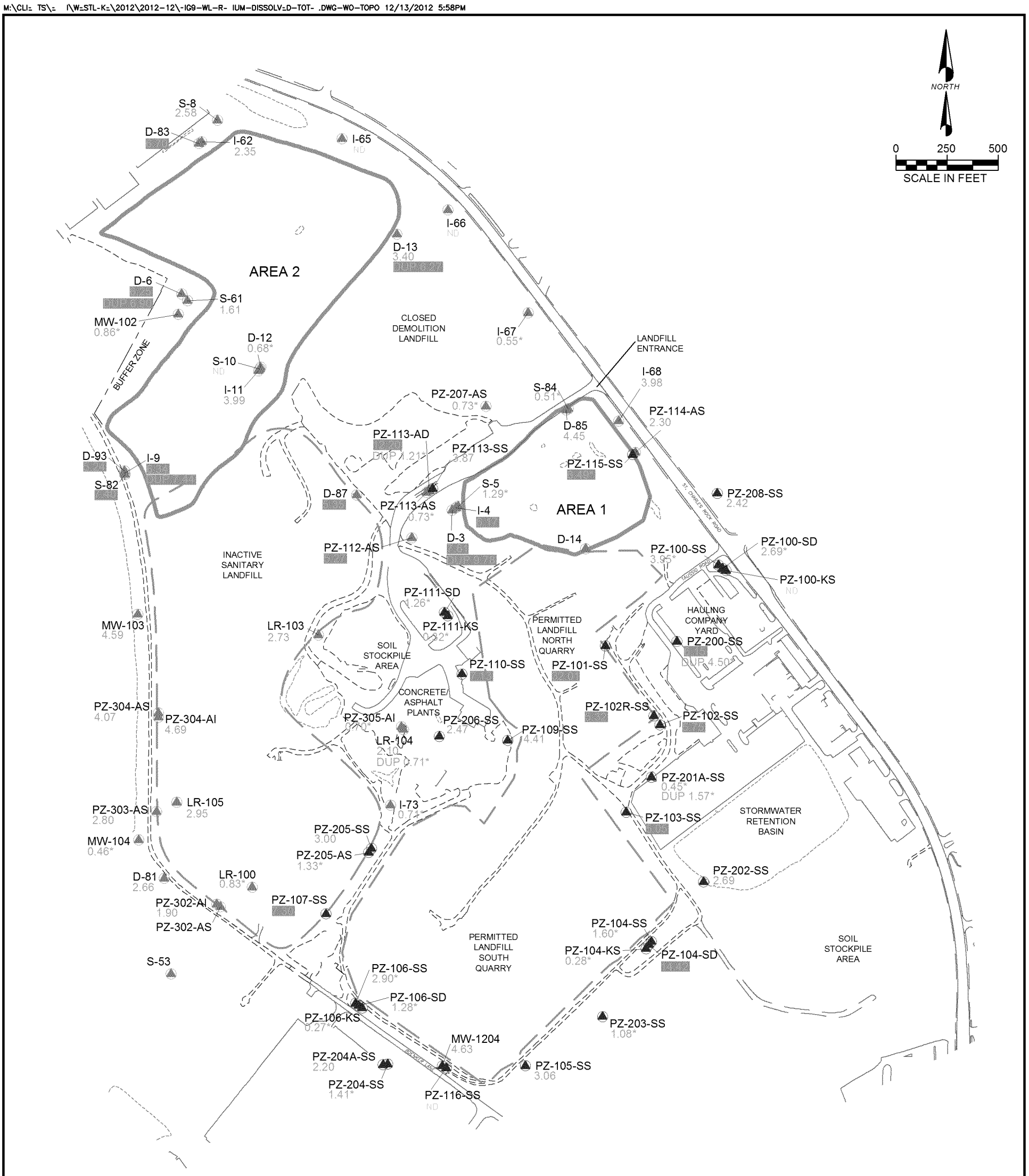
4.50* Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *

Total Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228

ND Both Radium-226 and Radium-228 were non-detect

Figure 8
Combined
Total Radium-226 + Total Radium-228
in Groundwater
West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Paved Road
- Unpaved Road

RADIUM EXPLANATION

.092	Total Dissolved Radium that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
1.08*	Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *
	Total Dissolved Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
ND	Both Radium-226 and Radium-228 were non-detect

WELL FORMATION DESIGNATIONS

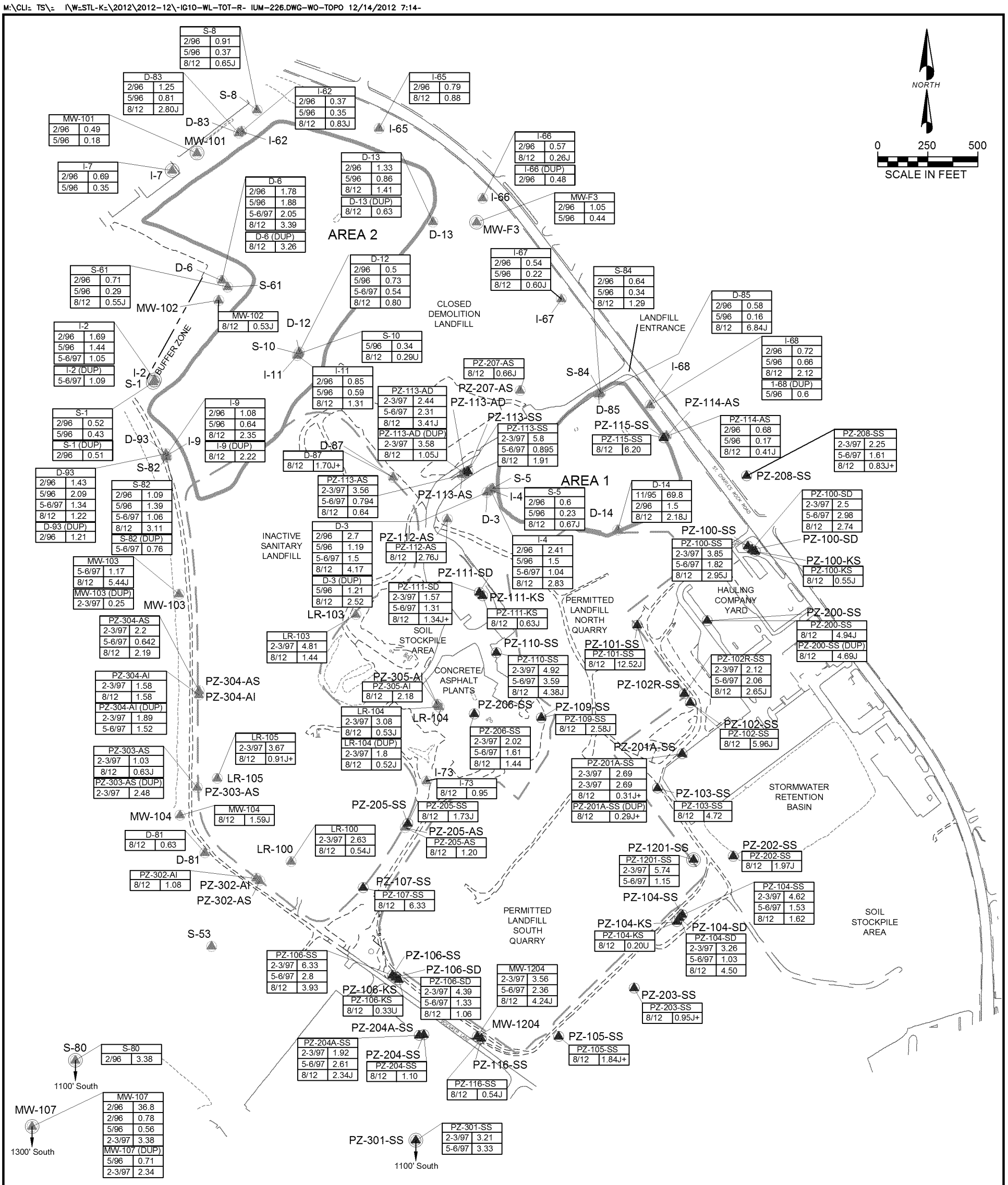
LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Figure 9
Combined
Dissolved Radium-226 + Dissolved Radium-228
in Groundwater
West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- RI/FS Groundwater Well That No Longer Exists
- Operable Unit-1 Area as Defined By ROD
- Paved Road
- Unpaved Road

Well Number — MW-1204
Date Sampled — 2-3/97 — 3.56 — Total Radium-226 Concentration in (pCi/L)

RADIUM EXPLANATION

EMSI has concluded that D-14 results are not vaild due to extreme variations between filtered and unfiltered results and extreme variations among sampling events.

OU-1 Wells Sampled 11/95, 2/96, 5/96, 5/97, 3/04, and 5/04
OU-2 Wells Sampled 2-3/97 and 5-6/97

Data from either OU-1 RI (EMSI, 2000), OU-2 RI (Herst & Associates, 2000), or 2004 Data for OU-1 FS Effort.

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

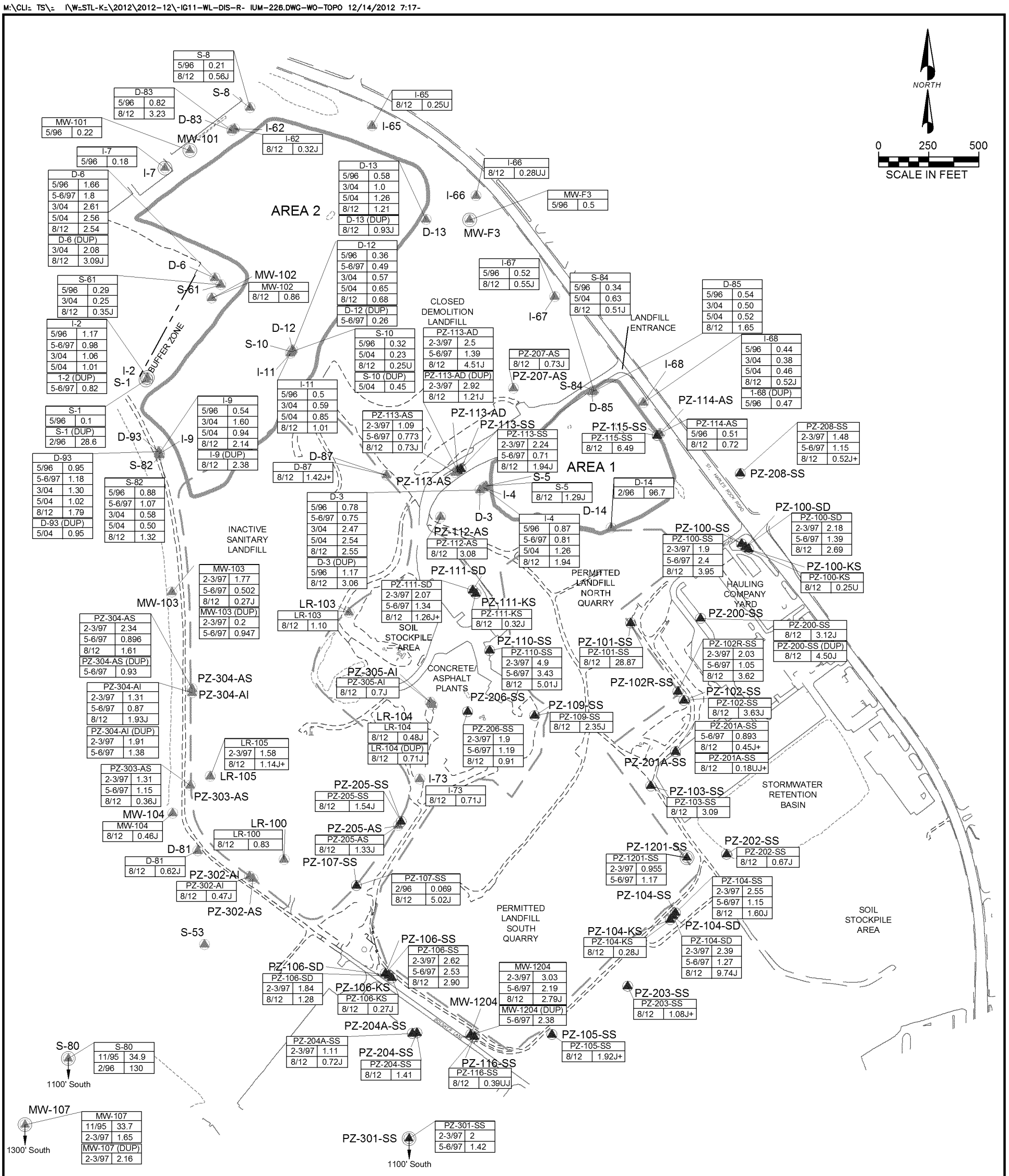
Figure 10

2012 and RI/FS Results for Total Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLI= TS\= I\W=STL-K=\2012\2012-12\-IG11-WL-DIS-R- IUM-226.DWG-WO-TOPO 12/14/2012 7:17-



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- RI/FS Groundwater Well That No Longer Exists
- Operable Unit-1 Area as Defined By ROD
- Paved Road
- Unpaved Road

Well Number — MW-1204

Date Sampled — 2-3/97 — 3.03 — Dissolved Radium-226 Concentration in (pCi/L)

RADIUM EXPLANATION

EMSI has concluded that D-14 results are not vaild due to extreme variations between filtered and unfiltered results and extreme variations among sampling events.

OU-1 Wells Sampled 11/95, 2/96, 5/96, 5/97, 3/04, and 5/04
OU-2 Wells Sampled 2-3/97 and 5-6/97

Data from either OU-1 RI (EMSI, 2000), OU-2 RI (Herst & Associates, 2000), or 2004 Data for OU-1 FS Effort.

Data Validation Qualifiers:

U = Non-detect at the reported value
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UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
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SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Figure 11

2012 and RI/FS Results for Dissolved Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

Appendices

(on compact disk)