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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0021

FINAL

SCOPING SURVEY REPORT FOR BUILDING 233 DRAIN LINES AND WALL VENTS

October 31, 2008

DCN: ECSD-2201-0021-0009

BUILDING 233
NAVAL STATION TREASURE ISLAND
TREASURE ISLAND, CALIFORNIA

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TREASURE ISLAND, CALIFORNIA

DCN: ECSD-2201-0021-0009

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TABLE OF CONTENTS

PAGE

ABBREVIATIONS AND ACRONYMS v

EXECUTIVE SUMMARY ES-1

1.0 SITE DESCRIPTION AND BACKGROUND 1-1
- 1.1 SITE LOCATION AND DESCRIPTION 1-1
- 1.2 PRIOR HISTORICAL USE 1-1
- 1.3 RADIONUCLIDES OF CONCERN AND RADIATION CHARACTERISTICS 1-2
- 1.4 REPORT ORGANIZATION 1-2

2.0 INVESTIGATION LEVELS 2-1
- 2.1 INVESTIGATION LEVELS 2-1
- 2.2 INVESTIGATION LEVELS FOR ALPHA AND BETA RADIATION SURVEYS MEASUREMENTS 2-1
- 2.3 INVESTIGATION LEVELS FOR ALPHA AND BETA RADIATION SWIPES MEASUREMENTS 2-1
- 2.4 INVESTIGATION LEVELS FOR GAMMA RADIATION SURVEYS 2-1
- 2.5 INVESTIGATION LEVELS FOR SEDIMENT SAMPLES 2-2

3.0 SURVEY DESIGN 3-1
- 3.1 MOBILIZATION 3-1
- 3.2 DRAINAGE PIPING SURVEYS 3-1
- 3.3 SEDIMENT SAMPLES 3-1
- 3.4 SWIPES AND GAMMA STATIC MEASUREMENTS 3-2
- 3.5 PARKING LOT 3-2

4.0 SURVEY INSTRUMENTATION 4-1
- 4.1 INSTRUMENT SELECTION 4-1
- 4.2 INSTRUMENT CALIBRATION AND QUALITY ASSURANCE PROCEDURES 4-1
- 4.3 INSTRUMENT OPERATIONAL CHECKS 4-1
- 4.4 INSTRUMENTS FOR STATIC MEASUREMENT OF ALPHA AND BETA RADIATION ACTIVITY 4-2
- 4.5 INSTRUMENTS FOR STATIC AND SCAN SURVEYS FOR GAMMA RADIATION ACTIVITY 4-2
- 4.6 INSTRUMENT FOR SWIPE SAMPLES 4-2

5.0 EFFICIENCY AND DETECTION SENSITIVITY – STATIC MINIMUM DETECTABLE CONCENTRATION AND MINIMUM DETECTABLE COUNT RATE 5-1
- 5.1 INSTRUMENT AND SURFACE EFFICIENCY 5-1

TABLE OF CONTENTS
(Continued)

PAGE

5.1.1 Instrument Efficiencies 5-1
5.1.2 Surface Efficiency 5-1
5.2 STATIC MINIMUM DETECTABLE CONCENTRATION 5-1
5.2.1 Calculation of Static Minimum Detectable Concentration for Alpha Surveys (126-cm^2 [19.5-in^2] Probe) 5-2
5.2.2 Calculation of Static Minimum Detectable Concentration for Beta Surveys (126-cm^2 [19.5-in^2] Probe) 5-3
5.2.3 Calculation of Static Minimum Detectable Count for Gamma Surveys 5-3

6.0 SURVEY PROCEDURES AND MEASUREMENT DATA INTERPRETATION 6-1
6.1 REFERENCE (BACKGROUND) MEASUREMENTS 6-1
6.2 DATA INTERPRETATION 6-1
6.2.1 Step One – Define the Problem 6-2
6.2.2 Step Two – Identify the Decision 6-2
6.2.3 Step Three – Identify Inputs to the Decision 6-2
6.2.4 Step Four – Define the Study Boundaries 6-3
6.2.5 Step Five – Develop a Decision Rule 6-3
6.2.6 Step Six – Specify Limits on Decision Error 6-3
6.2.7 Step Seven – Optimize the Design for Obtaining Data 6-3
6.2.8 Analysis 6-3

7.0 ANALYSIS AND RESULTS 7-1
7.1 INVESTIGATION POINTS 7-1
7.2 SEDIMENT SAMPLE RESULTS 7-1
7.3 ADDITIONAL SURVEY DATA 7-1

8.0 CONCLUSION 8-1

9.0 REFERENCES 9-1

TABLE OF CONTENTS
(Continued)

TABLES

Table 1-1	Radionuclide of Concern
Table 3-1	Exterior Asphalt Gamma Measurements
Table 7-1	Interior Alpha/Beta Measurements
Table 7-2	Sediment Sample Results

FIGURES

Figure 1-1	Regional Location Map
Figure 1-2	Site Location Map
Figure 1-3	Building 233 Floor Plan with Scan Locations
Figure 3-1	Building 233 Floor Plan with Sediment Sample Locations

APPENDICES

Appendix A	Survey Instrumentation
Appendix B	Instrument Calibration Documentation
Appendix C	Field Survey Data Sheets
Appendix D	Laboratory Data Quality Control Evaluation
Appendix E	Project Photographs
Appendix F	Response to Comments

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ABBREVIATIONS AND ACRONYMS

α	alpha
β	beta
ε_i	instrument efficiency
ε_s	surface efficiency
γ	gamma
σ	standard deviation
AEC	Atomic Energy Commission
cm	centimeter
cm^2	square centimeter
cpm	count per minute
DCGL	derived concentration guideline level
DoD	Department of Defense
dpm	disintegrations per minute
DQO	data quality objective
EPA	Environmental Protection Agency
ft^2	square feet
FSS	Final Status Survey
in	inch
in^2	square inch
ISO	International Organization for Standardization
km^2	square kilometer
m^2	square meter
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
MeV	megaelectron volt
min	minute
NaI	sodium iodide
NAVSEA	Naval Sea Systems Command
NAVSTA TI	Naval Station Treasure Island
NIST	National Institute of Standards and Technology

ABBREVIATIONS AND ACRONYMS
(Continued)

NRC	Nuclear Regulatory Commission
pCi/gm	picocuries per gram
QC	quality control
^{226}Ra	radium-226
R_B	background count rate
ROC	radionuclide of concern
T_B	background counting time
T_{S+B}	sample counting time
TI	Treasure Island
TtEC	Tetra Tech EC, Inc.
W_A	active area of the detector window
YBI	Yerba Buena Island

EXECUTIVE SUMMARY

This report presents results of the scoping survey of the drain lines at Building 233 performed in September 2007. Building 233 is located at Naval Station Treasure Island (NAVSTA TI) on the eastern portion of Treasure Island (TI). NAVSTA TI is located on two islands in San Francisco Bay (TI and Yerba Buena Island), approximately midway between the City of San Francisco and the City of Oakland. Building 233 is a two-story, raised floor, wood structure built in 1944. Although currently not in use, the building was used as the Radiation Safety School beginning in 1947. The 1,745.65-square-meter (18,790-square-foot) building has classrooms, offices, and laboratories.

A radium spill took place in the first floor laboratory in January 1950. Radium contamination from a capsule containing radium sulfate was spread throughout most of the building before the spill was discovered. Students directly involved in the spill were sent to a second floor classroom for monitoring and to the washroom for decontamination of hands and shoes. The limited amount of liquid generated during this initial decontamination of students was most likely washed down the drain. The building was secured and the Navy Radiological Defense Laboratory (NRDL) was called on-site. The NRDL established a decontamination station across the street from Building 233 where waste generated from decontamination was collected for off-site disposal. Decontamination of the building was accomplished using chemical and dry methods and required removal of floor coverings and portable furniture, and destructive procedures to completely decontaminate wooden and cement floors. Monitoring inside the building revealed high levels of airborne radon and airborne alpha radiation contamination for weeks after the spill. Nine months after the spill, decontamination of the building was completed, and it was released for use again.

Due to the radium spill and the subsequent decontamination of personnel and the building, the potential for residual radioactivity in the drainage system exists. Scoping surveys were conducted as recommended by the TI Historical Radiological Assessment (Naval Sea Systems Command [NAVSEA], 2006) and using guidance from the *Multi-Agency Radiation Survey and Site Investigation Manual* (Department of the Navy [DoD] et al., 2000). Scoping surveys were conducted to identify general levels and extent of contamination.

Measurement locations at Building 233 were those deemed to have the highest potential for residual radioactivity and for providing an indication of the extent of radioactivity remaining in the drainage system. The primary objectives of the scoping survey were to:

- Perform a preliminary contamination assessment
- Identify radionuclide contaminants
- Assess general levels and extent of radionuclide contamination

A total of 45 locations were surveyed and sampled. Most of the locations did not have a sufficient quantity of sediment to permit collection of samples for off-site laboratory analysis. Only six sediment samples were collected. All locations were swipe sampled, and a gamma (γ) radiation measurement was taken, except for a manhole due to access limitations. Of the 45 investigation points, 4 were located in the sewer lines, 1 was located in the nearest downstream manhole, 24 were located in sink drains, 8 were located in floor drains, 1 was located in a shower drain, 2 were located in urinal drain traps, and 5 were located in wall vents. No activity was found above background at any location by the swipe sample or γ radiation measurement. Alpha, beta, and γ static measurements were collected from 44 locations throughout the building. None of the measurements exceeded the investigation levels.

Indications of residual radioactivity were deemed significant if the level exceeded 1.0 picocurie per gram (pCi/g). Of the locations surveyed, only the two sediment samples collected from the common waste drain piping system outside the building indicated the presence of residual radioactivity. Gamma spectroscopy analysis of the sediment samples resulted in an average radium-226 concentration of 1.1 pCi/g. The sediment sample collected from the manhole downstream of the common waste drain piping system did not indicate the presence of residual radioactivity. Therefore, detectable residual radioactivity appears to be limited to the drain lines from where they tie into the common waste drain piping system to the building.

Building 233 is planned for demolition as part of the TI redevelopment. The scoping survey has indicated that at least some of the building piping is radiologically impacted; however, the building is no longer in use and the piping is a closed system and poses no hazard to the public in its current condition. It is recommended that the piping be removed and fully surveyed for release during building demolition. If the survey indicates that the piping can not be free released, then it will be managed as radiologically impacted material. The piping will be disposed of appropriately.

1.0 SITE DESCRIPTION AND BACKGROUND

This section provides information on the site and site location, prior historical site use, the radionuclide of concern (ROC), and report objectives.

1.1 SITE LOCATION AND DESCRIPTION

Naval Station Treasure Island (NAVSTA TI) is located on two islands, Treasure Island (TI) and Yerba Buena Island (YBI), in San Francisco Bay. Both islands are located approximately midway between the City of San Francisco and the City of Oakland (Figure 1-1). TI is a man-made island approximately 32.4 square kilometers (km^2) (403 acres) in size connected by a man-made causeway to the 0.69-km^2 (170-acre) YBI, which is a natural island.

Building 233 is located in the eastern portion of TI in the block bordered by 3rd and 4th Streets. Figure 1-2 shows the location of Building 233 on TI. Building 233 is a two-story, raised floor, wood structure built in 1944. The 1,745.65-square-meter (m^2) (18,790-square-foot [ft^2]) building has classrooms, offices, and laboratories. Figure 1-3 shows the layout of Building 233.

1.2 PRIOR HISTORICAL USE

The first documented use of radioactive materials on NAVSTA TI began in 1947. Building 233 was used for training Naval personnel in the use and maintenance of radiation detection, identification, and computation instruments. There are no known current uses of licensed or unlicensed radioactive materials at NAVSTA TI.

A radium spill took place in the first floor laboratory (Room 121) of Building 233 in January 1950. Radium contamination from a capsule containing radium sulfate was spread throughout most of the building before the spill was discovered. The building was secured, and the scheduled classes were suspended and reassigned. Students directly involved in the spill were sent to a second floor classroom for monitoring and to the washroom for decontamination of hands and shoes. Decontamination of hands and shoes was performed using water, an abrasive detergent, and scrubbers. The liquid generated by the decontamination was most likely washed down the drain. Decontamination of the building required removal of floor coverings and portable furniture, and destructive procedures to completely decontaminate wooden and cement floors. Monitoring inside the building revealed high levels of airborne radon and airborne alpha (α) radiation contamination for weeks after the spill. All but five of the rooms in the building were contaminated. These rooms had been closed at the time of the spill. Nine months after the spill, decontamination of the building was completed, and it was released for use again.

1.3 RADIONUCLIDES OF CONCERN AND RADIATION CHARACTERISTICS

Radium-226 (^{226}Ra) is the primary ROC as proven by gamma (γ) spectroscopy analysis of drain line samples. Table 1-1 lists the primary radiation properties: principal types of radiation and the associated half-life.

1.4 REPORT ORGANIZATION

This report details the procedures and results of the scoping surveys performed in Building 233. Appendices A and B provide survey instrumentation data and instrument calibration documentation. Appendix C presents field measurements. Appendix D presents the off-site gamma spectroscopy laboratory data quality control (QC) evaluation. Appendix E is a photographic library of activities at Building 233.

2.0 INVESTIGATION LEVELS

This section presents the various investigation levels for the survey.

2.1 INVESTIGATION LEVELS

Investigation levels are specific levels of radioactivity used for comparison purposes to indicate when additional investigation may be necessary. Investigation levels also serve as a quality control check. For example, in addition to indicating potential contamination, a measurement that exceeds the investigation level may indicate that the survey unit was improperly classified or may indicate a failing instrument. When determining an investigation level using a statistical-based parameter (e.g., standard deviation), the following may be considered: survey objectives, underlying radionuclide distributions (e.g., normal, lognormal, or nonparametric), data population descriptors (e.g., standard deviation, mean, or median), and prior survey and historical information.

If an investigation level was exceeded, the measurement was confirmed to ensure that the initial measurement actually exceeded the particular investigation level. This involved taking additional measurements to confirm the initial results and, as appropriate, to quantify the area of elevated residual radioactivity.

2.2 INVESTIGATION LEVELS FOR ALPHA AND BETA RADIATION SURVEYS MEASUREMENTS

For α and beta (β) radiation surveys, the investigation levels for total activity were 100 disintegrations per minute (dpm)/100 square centimeters (cm^2) (100 dpm/15.5 square inches [in^2]) and 5,000 dpm/100 cm^2 (5,000 dpm/15.5 in^2), respectively. These investigation levels were established by the Atomic Energy Commission (AEC) in the *Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors* (AEC, 1974) congruent with the specific ROC for Building 233, as shown in Table 1-1.

2.3 INVESTIGATION LEVELS FOR ALPHA AND BETA RADIATION SWIPES MEASUREMENTS

The α and β radiation loose surface investigation levels for swipes is 20 percent of the values for total activity investigation levels listed in Section 2.2 above.

2.4 INVESTIGATION LEVELS FOR GAMMA RADIATION SURVEYS

For γ radiation surveys, the investigation level was established at the reference area mean + 3σ, where σ is the standard deviation of the γ radiation readings in the reference area. It should be noted that there are currently no established release criteria for building interior surfaces based on γ radiation readings alone. γ radiation surveys of building interior surfaces were performed as

an added measure to help detect any anomalies, such as γ-emitting radiation sources that may not emit α or β radiation.

2.5 INVESTIGATION LEVELS FOR SEDIMENT SAMPLES

The investigation level for sediment samples was set at 1 picocurie per gram (pCi/g). This level is consistent with the release criteria agreed upon by stakeholder agencies at other Naval installations in the area. Table 1-1 shows the investigation level for sediment samples.

3.0 SURVEY DESIGN

This section describes the mobilization activities, drainage piping surveys, sediment sampling, swipes, static measurements, and parking lot measurements.

3.1 MOBILIZATION

Mobilization to perform the scoping survey of Building 233 began in mid-September 2007. Measurement locations were selected based on professional experience at those places with the highest potential for residual radioactivity and for providing an indication of the extent of radioactivity remaining in the drainage system. The building was inspected to identify locations where entry to the drainage system was possible. Locations were marked and the piping prepared to permit access. Piping diagrams were used to identify the downstream manhole closest to where the drainage piping from the building connected to the main drainage system.

3.2 DRAINAGE PIPING SURVEYS

Due to the radium spill and subsequent decontamination of personnel and the building, the potential for residual radioactivity in the drainage system existed. The intent of the scoping survey was to open the piping, collect a sample of any sediment in the piping, and collect a swipe and a γ radiation measurement. However, when the piping was opened, most sections did not contain sufficient sediment to collect a sample. Additionally, the piping diameter was too small to allow the radiation detectors to enter the pipe. Therefore, it was decided to cut the piping at traps or to use floor drains for access. Surface α and β measurements were collected at the locations where the piping was opened. Piping was surveyed in the locations shown on Figure 1-3. Once the survey was complete the piping was resealed with polyurethane foam. The foam expands to form a waterproof seal in the piping. For more information on the foam, go to: http://www.dap.com/docs/tech/00077005001.pdf.

3.3 SEDIMENT SAMPLES

A total of 42 pipes were sampled and surveyed. Most of the piping did not have a sufficient quantity of sediment to permit collection for off-site laboratory analysis. Photograph 092407_001 in Appendix E shows a typical pipe opening and the quantity of sediment collected.

A total of five sediment samples were collected from the piping inside Building 233 and one from the closest downstream manhole. Two samples were collected from Room 121 (teaching laboratory) and one from Room 124 (first floor bathroom). Two sediment samples were collected from the piping as it exits the building to connect to the main drainage line. One sediment sample was collected from the closest downstream manhole located at the southern end of the building. All sediment samples were sent to an off-site laboratory for γ spectroscopy analysis. Sediment sample locations are shown on Figure 3-1.

Once the samples and surveys were completed, the pipe openings were sealed with a sealant to prevent foreign material from entering the system.

3.4 SWIPES AND GAMMA STATIC MEASUREMENTS

Swipes and γ radiation static measurements were obtained at each opening in the piping. Swipe samples were taken around the opening and inside the pipe. Gamma radiation static measurements were obtained from the opening or inside the pipe if the pipe was large enough to allow use of the detector. Photographs 092407_002 and 091807_001 in Appendix E show γ radiation static measurements being collected from a floor drain and the manhole, respectively.

3.5 PARKING LOT

While preparing to collect sediment samples and perform the swipe and γ radiation static measurement of the drain piping as it exits the building, elevated levels of γ radiation were measured in the parking lot surrounding the building. After discussion with the Radiological Affairs Support Office, an exploratory scoping survey was designed and implemented to gain an understanding of the extent of the increased measurements. Thirteen separate locations were identified with increased radioactivity (Table 3-1). A copy of the survey form documenting the survey results is contained in Appendix C. Photographs 092807_003 through _005 in Appendix E show the parking lot survey locations.

4.0 SURVEY INSTRUMENTATION

This section details the instrument selection, instrument calibration and quality assurance procedures, instrument operational checks, instruments used to measure the α and β radiation activity, instruments used for static and scan surveys for γ radiation activity, and instruments for swipe samples.

4.1 INSTRUMENT SELECTION

Instruments were selected to be suitable for the physical and environmental conditions at the site. The instruments and measurement methods selected were able to detect the ROC or radiation types of interest, and were, in relation to the survey or analytical technique, capable of measuring levels sufficient to support the data quality objectives (DQOs) included in the Work Plan and in Section 6.0 of this report. Appendix A provides a detailed description of all survey instruments used.

4.2 INSTRUMENT CALIBRATION AND QUALITY ASSURANCE PROCEDURES

Prior to the start of and throughout the project, survey and laboratory instruments were maintained within calibration-based parameters using National Institute of Standards and Technology (NIST) traceable standards. Survey instruments were source-checked daily, prior to and after each surveillance activity. Appendix B provides calibration certificates specific to field instrumentation used for data collection purposes and source certificates for radioactive sources used to perform instrument response checks and analysis.

4.3 INSTRUMENT OPERATIONAL CHECKS

Radiation detection instrumentation used in the scoping survey were maintained and calibrated to operate within manufacturer specifications so that the required sensitivity and precision were maintained. Specific calibration and maintenance was conducted by personnel familiar with the equipment or by the manufacturer's technical representatives. No field maintenance or re-calibration was required during the length of the project.

Procedures were developed for all field instrumentation to verify that the instruments were operating properly (including physical, battery, and response checks) and that the data were valid (reference). Instrument calibrations were performed by Duratek using NIST traceable radiation sources. These procedures included functional operational checks, routine maintenance, calibration procedures, and operational instructions.

All of the instruments were within the ±20 percent criterion established when setting up their baseline information. This was performed daily during field activities as part of the daily check. Had the instrument not met the criteria, it would have been removed from service and returned to the manufacturer for maintenance.

4.4 INSTRUMENTS FOR STATIC MEASUREMENT OF ALPHA AND BETA RADIATION ACTIVITY

Surveys for α and β particulate radiation were performed using a Ludlum Model 2360 data logger equipped with a Ludlum Model 43-68, 126-cm^2 (19.5-in^2) gas-flow proportional detector. This instrument measures α and β radiation levels and can record data in scaler (time-integrated count) or rate-meter (instantaneous count rate) mode. The data logger, operated in the scaler mode, recorded static measurements for α and β particulate radiation by positioning the detector assembly approximately 0.635 centimeter (cm) (0.25 inch [in]) from the designated surveillance surface and completing a stationary 2-minute count cycle.

4.5 INSTRUMENTS FOR STATIC AND SCAN SURVEYS FOR GAMMA RADIATION ACTIVITY

Scan and static surveys for γ radiation were performed using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 0.79-cm by 0.79-cm (2-in by 2-in) sodium iodide (NaI) scintillation detector. Static γ radiation measurements were obtained by positioning the detector assembly approximately 10 cm (4 in) above the surface and completing a stationary 60-second survey.

4.6 INSTRUMENT FOR SWIPE SAMPLES

Standard swipe samples were collected for the analysis of removable contaminants. Swipe samples, also referred to as smears, were obtained at discrete predetermined survey locations in corresponding survey units. All samples were processed using a Ludlum Model 2929 scaler with a Model 44-10 scintillation probe. The procedures for collecting swipe samples are discussed in the Final Radiological Work Plan Buildings 343 and 344 and Building 233 Drain Lines (Work Plan) (Tetra Tech EC, Inc. [TtEC], 2007).

5.0 EFFICIENCY AND DETECTION SENSITIVITY – STATIC MINIMUM DETECTABLE CONCENTRATION AND MINIMUM DETECTABLE COUNT RATE

This section describes the instrument and surface efficiencies, and the static minimum detectable concentration (MDC) for α and β radiation.

5.1 INSTRUMENT AND SURFACE EFFICIENCY

This section describes how the instrument and surface efficiencies were calculated.

5.1.1 Instrument Efficiencies

The instrument efficiencies (ϵ_i) were calculated for each instrument per the procedures outlined in Section 7.2.1 of the Work Plan (TtEC, 2007).

5.1.2 Surface Efficiency

Because surface efficiencies (ε_s) were not experimentally determined, guidance from the International Organization for Standardization (ISO, 1988) and the Nuclear Regulatory Commission (NRC, 1997) provided conservative recommendations for surface efficiencies. The ISO standard recommends use of a surface efficiency of 0.5 for maximum β energies exceeding 0.4 megaelectron volt (MeV), and the use of a surface efficiency of 0.25 for β energies between 0.15 and 0.4 MeV and for α energies (ISO, 1988; NRC, 1997). The NRC evaluation document provides surface efficiencies based on studies performed for the NRC. In general, the NRC guidance states that the ISO rule-of-thumb for surface efficiencies is conservative, particularly for β-emitting radionuclides with end-point energies between 0.25 and 0.4 MeV. Therefore, a surface efficiency of 0.25 was used for α and β radiation emitters.

5.2 STATIC MINIMUM DETECTABLE CONCENTRATION

The static MDC is the level of radioactivity practically achievable by the overall measurement process. Equation 5-1 is used to calculate instrument MDC in dpm per 100 cm^2 (15.5 in^2) when the background and sample are counted for the same time intervals.

Equation 5-1

$$MDC = \frac{3 + 4.65 \cdot \sqrt{R_B T_B}}{\varepsilon_s \varepsilon_i \frac{W_A}{100} T_B}$$

Where:

R_B	=	background count rate (count per minute [cpm])
T_B	=	background counting time (min)
ε_i	=	instrument efficiency (count per particle)
ε_s	=	surface efficiency (particles per disintegration)
W_A	=	active area of the detector window (cm^2)

In Equation 4-1, W_A is the size of the "active" area of the detector window. If the area of the detector window (cm^2) does not equal 100 cm^2 (15.5 in^2), it is necessary to convert the detector response to units of dpm per 100 cm^2 (15.5 in^2). If the background and sample are counted for different time intervals, Equation 5-2 is used to calculate the MDC in dpm per 100 cm^2 (15.5 in^2).

Equation 5-2

$$MDC = \frac{3 + 3.29\sqrt{R_B T_{S+B}\left(1 + \frac{T_{S+B}}{T_B}\right)}}{\varepsilon_i \varepsilon_s \frac{W_A}{100cm^2} T_{S+B}}$$

Where:

R_B	=	background count rate (cpm)
T_B	=	background counting time (min)
T_{S+B}	=	sample counting time (min)
ε_i	=	instrument efficiency (count per particle)
ε_s	=	surface efficiency (particles per disintegration)
W_A	=	active area of the detector window (cm^2)

5.2.1 Calculation of Static Minimum Detectable Concentration for Alpha Surveys (126-cm^2 [19.5-in^2] Probe)

The following calculation of the MDC, in dpm/100 cm^2 (15.5 in^2), is for the gas-proportional instrument with a 126-cm^2 (19.5-in^2) probe area that was used for the direct measurement surveys of α radiation in Building 233. For this calculation, the observed average background count rate of 0 cpm was used, and measurement and background counting times were each 2 minutes:

Where:

Instrument Efficiency: 29.5 percent

Surface Efficiency Factor: 25 percent

Background Count Rate: 0 cpm

Sample Count Time: 2 min

Probe Area Size: 126 cm^2

The MDC is calculated using the following equation:

$$MDC = \frac{3 + 4.65\sqrt{0.00 \times 2}}{0.295 \times 0.25 \times \frac{126}{100} \times 2} = 17 dpm/100 cm^2 \alpha$$

5.2.2 Calculation of Static Minimum Detectable Concentration for Beta Surveys (126-cm^2 [19.5-in^2] Probe)

The following calculation of the MDC in dpm/100 cm^2 (dpm/15.5 in^2) is for the gas-proportional instrument with a 126-cm^2 (19.5-in^2) probe area that was used for the direct measurement surveys of β radiation in Building 233. For this calculation, the observed average background count rate of 168 cpm was used, and measurement and background counting times were each 2 minutes:

Where:

Instrument Efficiency: 34.55 percent

Surface Efficiency Factor: 25 percent

Background Count Rate: 168 cpm

Sample Count Time: 2 min

Probe Area Size: 126 cm^2

$$MDC = \frac{3 + 4.65\sqrt{168 \times 2}}{0.3455 \times 0.25 \times \frac{126}{100} \times 2} = 405 dpm/100 cm^2 \beta$$

5.2.3 Calculation of Static Minimum Detectable Count for Gamma Surveys

When using a NaI instrument, the nature of the instrument's response precludes the direct calculation of an MDC. Instead, a minimum detectable count rate (MDCR) is typically calculated. The following calculation of MDCR in cpm γ for the NaI instrument with a 5.08-cm by 5.08-cm

(2-in by 2-in) probe was used for the direct measurement surveys of γ radiation in the drain lines at Building 233. The measurement and background counting times were each 1 minute.

Where:

Background Count Rate = 6,287 cpm

Background Count Time = 1 min

$$MDCR_{\gamma} = \frac{3 + 4.65\sqrt{6287 \times 1}}{1} = 372\ cpm$$

6.0 SURVEY PROCEDURES AND MEASUREMENT DATA INTERPRETATION

This section discusses the types of surveys and their implementation in the field, focusing on the methods for conducting each type of survey. The survey procedures described in this section were performed in accordance with the Work Plan (TtEC, 2007).

6.1 REFERENCE (BACKGROUND) MEASUREMENTS

The background level for the piping in Building 233 was determined by performing ambient measurements for α, β, and γ radiation. An ambient background was used for the piping surveys, as the expected background from non-impacted piping would be equivalent to ambient readings. A single 2-minute background measurement was taken to obtain backgrounds for α and β radiation static measurements. A single 1-minute measurement was taken for γ radiation background. The same survey methodology and instruments used to collect the background data were used to perform the measurements during the surveys. Instrumentation was allowed to stabilize before background readings were taken. The single background measurement was performed since the surveys were scoping in nature and intended to identify elevated areas and not to quantify the activity. Quantification was determined via collection of solid samples. The α and β background counts were 0.79 cpm and 99.23 cpm, respectively. The γ background count was 5,426 cpm.

The background measurements were collected from a location across the parking lot approximately 100 feet from the building.

No background data were collected for sediment samples from the piping, as naturally occurring radioactive material would not be expected.

6.2 DATA INTERPRETATION

The first level check for validating data integrity during collection and reporting was verification of numerical work. After collection of survey data each day, the results were reviewed by the Radiological Control Technician to verify their completeness. The purpose of the first level check was to ascertain that the data presented were free of numerical or transcription errors and that established procedures and methodology were properly followed.

During the collection of associated data, a verification and validation process was incorporated to evaluate whether the data met the objectives of the survey and whether the data were sufficient to determine compliance. Data collected from each survey unit were subjected to a minimum of the following three independent reviews:

1. The collected data were compared to the DQOs documented in the Work Plan (TtEC, 2007) on a daily basis. This is typically an informal look to ensure the MDC is less

than the derived concentration guideline level (DCGL), that the correct number of measurements were taken to ensure the agreed upon confidence level (95 percent) is reached, and that nothing exceeded the DCGL.

2. A supervisor not directly involved in the data collection process independently conducted a technical review of the information on the daily survey reports. This was a QC of the data to ensure all the survey locations were measured and that the instrumentation was in calibration and had been source checked.

3. The off-site sediment data were reviewed by the project chemist to evaluate the implementation of the sampling and analytical procedures detailed in the Sampling and Analysis Plan in Appendix A of the Work Plan (TtEC, 2007).

This process ensured the validity of collected data, the measurement techniques used, the consistency in surveillance data collection, and the quality of off-site data.

DQOs are qualitative and quantitative statements developed to define the purpose of the data collection effort, clarify what the data should represent to satisfy this purpose, and specify the performance requirements for the quality of information to be obtained from the data. These outputs are used to develop a data collection design that meets all performance criteria and other design requirements and constraints. The U.S. Environmental Protection Agency (EPA) has developed a seven-step process to develop DQOs. During this process, it is important to note that the intent of the investigation is to define the extent of contamination or provide for a comprehensive risk assessment. The seven steps are listed in the following subsections with information specific to the Building 233 scoping survey.

6.2.1 Step One – Define the Problem

The problem defined for the surveys of Building 233 was to determine the extent of residual radioactive material in surface building materials due to historical site operations.

6.2.2 Step Two – Identify the Decision

Whether the scoping survey can recommend the building for Final Status Survey (FSS) release or whether remediation is warranted must be decided. Therefore, the decision to be made can be stated as, "Do the results of the survey meet the α radiation release limits of 100 dpm/100 cm^2 (100 dpm/15.5 in^2) for ^{226}Ra?"

6.2.3 Step Three – Identify Inputs to the Decision

Radionuclide surface activities or sediment samples in excess of the release criteria are the necessary inputs to the decision. Thus, γ scan survey; α/β scan surveys; systematic and biased static α, β, and γ static readings; systematic and biased sediment and swipe sampling; and systematic and biased exposure rates were measured and analyzed as inputs to the decision.

6.2.4 Step Four – Define the Study Boundaries

The spatial boundaries for this survey effort were confined to the physical boundaries of entrance to the drain lines, manhole, and vents.

6.2.5 Step Five – Develop a Decision Rule

The decision rule for being able to use the scoping survey results for the FSS is related to whether or not the building meets the release criteria for unrestricted use. The decision rule is based on the results of the Wilcoxon Rank-Sum test used to analyze the data. The rule is stated as follows: "If the null hypothesis is rejected, then the survey unit is approved for unrestricted use."

6.2.6 Step Six – Specify Limits on Decision Error

Acceptable decision errors for this project were established to enable testing of data relative to guidelines. Surveys were performed on the drain lines and wall vents to ensure that all statistical testing criteria would be met. These surveys were designed to limit Type I and Type II errors to 5 percent.

6.2.7 Step Seven – Optimize the Design for Obtaining Data

To the extent practicable, the design for collecting data presented in this report was optimized to achieve the stated DQOs. The scope of work and data collection process were designed to provide near real-time data during implementation of field activities. These data were used to modify and expand the scope of field activities, as needed, to verify that the DQOs were met.

6.2.8 Analysis

The results of the surveys performed at Building 233 were consistent with the DQOs. The implementation of the surveys met the limits established in the DQOs and provided the necessary data for evaluation of the underlying decision. Based on the locations surveyed, only the two sediment samples collected from the common drain line header outside the building indicated the presence of residual radioactivity. Gamma spectroscopy analysis of the sediment samples indicated ^{226}Ra concentrations above 1.0 pCi/g. The sediment sample collected from the manhole downstream of the drain line did not indicate the presence of residual radioactivity. Therefore, detectable residual radioactivity appears to be limited to the drain lines from where they tie into the common header to the building.

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7.0 ANALYSIS AND RESULTS

The section discusses the survey and sampling results for the Building 233 Scoping Survey.

7.1 INVESTIGATION POINTS

A total of 45 locations were surveyed and sampled. Most of the locations did not have a sufficient quantity of sediment to permit collection for off-site laboratory analysis. Only six sediment samples were collected. All locations were swipe sampled, and a γ radiation measurement was taken, except for the manhole due to access limitations. Of the 45 investigation points, 4 were located in the sewer lines, 1 was located in the nearest manhole, 24 were located in sink drains, 8 were located in floor drains, 1 was located in a shower drain, 2 were located in urinal drain traps, and 5 were located in wall vents. Measurement data are presented in Table 7-1. No activity was found above background in any location by the swipe sample or γ radiation measurement.

7.2 SEDIMENT SAMPLE RESULTS

A total of six sediment samples were collected from Rooms 121 and 124, and the manhole and the common waste drain piping system outside of the building. The drain piping was 10.6 centimeters (4–inch)-diameter cast iron piping. These samples were sent to an off-site laboratory for γ spectroscopy analysis. Samples were analyzed after a 5-day hold period to provide a preliminary indication of contamination, and then reanalyzed after a 21-day hold period. While there was no release criteria associated with the scoping survey, indications of residual radioactivity were deemed significant if the level exceeded 1.0 pCi/g. Sediment sample results are provided in Table 7-2.

Sediment samples 021-233-SL-001N and 021-233-SL-002S indicated concentrations of radium at levels above 1.0 pCi/g. Sample 021-233-SL-001N was collected from the common drain line next to the entry door. Results of the γ spectroscopy indicated radium at approximately 2.0 pCi/g. Sample 021-233-SL-002S was collected from a common drain line outside the building at Room 121. Results of the γ spectroscopy indicated radium at approximately 3.0 pCi/g. All remaining sediment samples did not indicate radium in excess of 1.0 pCi/g. Samples collected from the manhole downstream of the drain lines did not indicate the presence of residual radioactivity. Copies of the laboratory reports are contained in Appendix D along with a QC evaluation of the data.

7.3 ADDITIONAL SURVEY DATA

While preparing to collect sediment samples and perform the swipe and γ radiation static measurement of the drain piping as it exits the building, elevated levels of γ radiation were measured in the asphalted parking lot surrounding the building. TtEC performed an exploratory

scoping survey designed to gain an understanding of the extent of the elevated measurements in the vicinity of Building 233. Thirteen separate locations were identified with elevated radioactivity.

8.0 CONCLUSION

A total of 45 locations were surveyed and sampled. Most of the locations did not have a sufficient quantity of sediment to permit collection of samples for off-site laboratory analysis. Only six sediment samples were collected. All locations were swipe sampled, and a γ radiation measurement was taken, except for the manhole due to access limitations. Of the 45 investigation points, 4 were located in the sewer lines, 1 was located in the nearest downstream manhole, 24 were located in sink drains, 8 were located in floor drains, 1 was located in a shower drain, 2 were located in urinal drain traps, and 5 were located in wall vents. No activity was found above background at any location by the swipe sample or γ radiation measurement. At 44 locations throughout the building, α, β, and γ static measurements were collected. None of the measurements exceeded the investigation levels.

Of the locations surveyed, only the two sediment samples collected from the common waste drain piping system outside the building indicated the presence of residual radioactivity. Gamma spectroscopy analysis of the sediment samples indicated ^{226}Ra concentrations above 1.0 pCi/g. The sediment sample collected from the manhole downstream of the drain line did not indicate the presence of residual radioactivity. Therefore, detectable residual radioactivity appears to be limited to the drain lines from where they tie into the common waste drain piping system to the building.

Building 233 is planned for demolition as part of the TI redevelopment. The scoping survey indicated that the common waste drain piping system beneath the building is radiologically impacted. The scoping survey indicated the remaining piping in the building is not radiologically impacted. The building is no longer in use, and the piping is a closed system and poses no hazard to the public in its current condition. It is recommended the portion of the piping which is radiologically impacted be fully surveyed prior to demolition of the building. Once the extent and amount of impacted piping is determined, the decision will be made whether the piping can be free released or will be managed as radiologically impacted material.

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9.0 REFERENCES

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TABLES

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TABLE 1-1

RADIONUCLIDE OF CONCERN

Radioisotope	Primary Radiation Properties		Release Criteria			
	Type	Half-life	Total Surface Activity (dpm/100 cm^2)	Removable Activity (dpm/100 cm^2)	Maximum (dpm/100 cm^2)	Sediment (pCi/g)
Radium (Ra)-226	Alpha Gamma	1,600 y	100	20	300	1

Abbreviations and Acronyms:

cm^2 – square centimeter
dpm – disintegrations per minute
pCi/g – picocuries per gram
y – year

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TABLE 3-1

EXTERIOR ASPHALT GAMMA MEASUREMENTS

Measurement Number	Location	Gamma Measurement (cpm)
1	Pavement on northeast side of building	53,639
2	Pavement on northeast side of building	30,722
3	Pavement on northeast side of building	19,564
4	Pavement on northeast side of building	28,782
5	Pavement on northeast side of building	15,203
6	Pavement on northeast side of building	21,408
7	Pavement on northeast side of building	22,300
8	Pavement on northeast side of building	34,665
9	Pavement on northeast side of building	16,563
10	Pavement on northeast side of building	24,104
11	Pavement on southwest corner of building	66,844
12	Pavement on southwest corner of building	55,102
13	Pavement on southwest corner of building	77,944

Abbreviations and Acronyms:

cpm – count per minute

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TABLE 7-1

INTERIOR ALPHA/BETA MEASUREMENTS

Measurement No.	Location	Alpha Static (dpm/100 cm^2)	Beta Static (dpm/100 cm^2)	Alpha Swipe (dpm/100 cm^2)	Beta Swipe (dpm/100 cm^2)	Gamma (cpm)
1	Rm 204 Sink Drain	0.00	-1359.89	-1.79	-78.47	3,587
2	Rm 205 Sink Drain	10.76	-1369.08	0.20	-76.01	3,862
3	Rm 201 Sink Trap	5.38	-1437.99	-1.79	-71.09	3,926
4	Rm 203 Floor Drain 2 East	0.00	-1336.92	2.19	-31.73	3,947
5	Rm 203 Urinal Drain 4	10.76	-1405.83	-1.79	-39.11	4,155
6	Rm 203 Floor Drain 1 West	10.76	-1419.61	-1.79	-51.41	3,101
7	Rm 203 Floor Drain 3	10.76	-1382.86	-1.79	-56.33	4,166
8	Rm 210 Sink Drain	0.00	-1617.16	-1.79	-71.09	4,087
9	Rm 210 Floor Drain	21.52	-1539.06	0.20	-51.41	2,704
10	Rm 126 Shower Floor Drain	0.00	-1176.12	2.19	-63.71	6,018
11	Rm 126 Urinal Drain	0.00	-1185.31	0.20	-100.62	5,562
12	Rm 126 Sink Drain 4	0.00	-1203.68	-1.79	-130.14	8,457
13	Rm 126 Floor Drain 2 West	5.38	-1235.84	2.19	-100.62	5,497
14	Rm 124 Sink Trap	10.76	-1153.15	0.20	-98.15	5,017
15	Rm 126 Floor Drain 1 East	10.76	-1226.66	-1.79	-120.30	5,908
16	Rm 125 Sink Trap 3 East	0.00	-1249.63	0.20	-61.25	4,805
17	Rm 125 Floor Drain	0.00	-1130.18	-1.79	-46.49	5,216
18	Rm 125 Floor Drain 2 West	16.14	-1350.70	-1.79	-73.55	5,553
19	Rm 121 Sink Drain 4 Southeast	0.00	-1258.82	-1.79	-115.38	5,447

TABLE 7-1

INTERIOR ALPHA/BETA MEASUREMENTS

Measurement No.	Location	Alpha Static (dpm/100 cm^2)	Beta Static (dpm/100 cm^2)	Alpha Swipe (dpm/100 cm^2)	Beta Swipe (dpm/100 cm^2)	Gamma (cpm)
20	Rm 121 Sink Drain Southwest	0.00	-1208.28	2.19	-56.33	5,351
21	Rm 121 Sink Drain 2 Northwest	0.00	-1396.64	0.20	-73.55	5,667
22	Rm 121 Sink Drain 3 Northeast	5.38	-1355.29	-1.79	-83.39	5,920
23	Rm 113 Floor Drain	0.00	-1148.55	-1.79	-103.08	6,121
24	Rm 113 Sink Drain	10.76	-1268.00	0.20	-181.80	5,128
25	Rm 111 Sink Drain	10.76	-1378.26	-1.79	-24.35	5,234
26	Rm 109 Sink Drain	0.00	-1401.24	-1.79	-117.84	5,218
27	Rm 105 Sink Drain 1 West	5.38	-1309.35	-1.79	-46.49	5,929
28	Rm 105 Sink Drain 2 East	0.00	-1313.95	-1.79	-88.31	5,485
29	Rm 102 Sink Drain	0.00	-1235.84	-1.79	-90.77	4,826
30	Rm 104 Sink Drain 1 West	5.38	-1378.26	0.20	-103.08	5,286
31	Rm 104 Sink Drain 2 East	10.76	-1277.19	4.19	17.47	5,351
32	Rm 108 Sink Drain 1 East	10.76	-1304.76	-1.79	-41.57	4,962
33	Rm 108 Sink Drain 2 South	10.76	-1442.58	-1.79	-68.63	5,155
34	Rm 110 Sink Drain	0.00	-1359.89	0.20	-95.69	4,781
35	Rm 114 Sink Drain	5.38	-1350.70	-1.79	-76.01	4,557
36	Sample location SL001	0.00	-1212.87	6.88	-53.87	5,541
37	Sample location SL001	0.00	-1483.93	-1.79	-103.08	5,635

TABLE 7-1

INTERIOR ALPHA/BETA MEASUREMENTS

Measurement No.	Location	Alpha Static (dpm/100 cm^2)	Beta Static (dpm/100 cm^2)	Alpha Swipe (dpm/100 cm^2)	Beta Swipe (dpm/100 cm^2)	Gamma (cpm)
38	Sample location SL002	10.76	-1327.73	2.19	-63.71	6,680
39	Sample location SL002	5.38	-1428.80	-1.79	-29.27	5,332
40	Vent Rm 121SW			0.20	-88.31	
41	Vent Rm 121SE			0.20	-66.17	
42	Vent Rm 105			0.20	-39.11	
43	Vent Rm 104			0.20	-4.67	
44	Vent Rm 108			0.20	-78.47	

Abbreviations and Acronyms:

cm^2 – centimeter squared
cpm – counts per minute
dpm – disintegration per minute
Rm – room

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TABLE 7-2

SEDIMENT SAMPLE RESULTS

Sample Number:			21-001-MH		021-124-ST-001		021-233-SL-002S		021-233-SL-001N		021-121-SL-005		021-121-SL-006	
Sample Date:			9/18/2007		9/24/2007		9/25/2007		9/25/2007		9/26/2007		9/26/2007	
Location:			Manhole		Sink Drain		Sewer Line		Sewer Line		Sewer Line		Sewer Line	
Analyte	Units	Method												
Actinium-228	pCi/g	EPA 901.1	0.305	U	0.884	U	0.523	U	0.211	U	0.682	U	0.799	U
Americium-241	pCi/g	EPA 901.1	0.062	U	0.753	U	0.101	U	0.057	U	0.232	U	0.667	U
Bismuth-212	pCi/g	EPA 901.1	0.828	U	2.40	U	1.48	U	0.548	U	2.23	U	2.51	U
Bismuth-214	pCi/g	EPA 901.1	0.844		0.520		3.15		2.03		0.361	U	0.382	U
Cobalt-60	pCi/g	EPA 901.1	0.056	U	0.457	U	0.121	U	0.054	U	0.166	U	0.197	U
Cesium-137	pCi/g	EPA 901.1	0.120		0.202	U	0.118	U	0.041	U	0.164	U	0.187	U
Europium-152	pCi/g	EPA 901.1	0.483	U	1.43	U	0.931	U	0.313	U	1.05	U	1.39	U
Europium-154	pCi/g	EPA 901.1	0.186	U	0.499	U	0.350	U	0.138	U	0.442	U	0.476	U
Potassium-40	pCi/g	EPA 901.1	7.46		4.82	U	2.75	U	0.845	U	1.84		2.95	
Protactinium-234m	pCi/g	EPA 901.1	9.40	U	28.9	U	20	U	7.16	U	111	U	28.9	U
Lead-210	pCi/g	EPA 901.1	1.84	U	18	U	3.48		1.96		3.39		15.5	U
Lead-212	pCi/g	EPA 901.1	0.392		0.322	U	0.182	U	0.089	U	0.320	U	0.273	U
Lead-214	pCi/g	EPA 901.1	0.863		0.703		3.62		2.38		0.506	U	0.362	U
Radium-226	pCi/g	EPA 901.1	0.820		0.505		3.06		1.97		0.351	U	0.371	U
Thorium-230	pCi/g	EPA 901.1	4.96	U	30.8	U	6.34	U	3.9	U	16.1	U	27.7	U
Thorium-232	pCi/g	EPA 901.1	0.322		1.46	U	0.523	U	0.241		0.682	U	0.799	U
Thorium-234	pCi/g	EPA 901.1	0.035	U	0.117	U	0.041	U	0.024	U	0.236	U	0.114	U
Thallium-208	pCi/g	EPA 901.1	0.089		0.208	U	0.127	U	0.048	U	0.209	U	0.183	U
Uranium-235	pCi/g	EPA 901.1	0.236	U	0.734	U	0.403	U	0.188	U	1.09	U	0.730	U

Abbreviations and Acronyms:

EPA - U.S. Environmental Protection Agency
pCi/g - picocuries per gram
U - not detected

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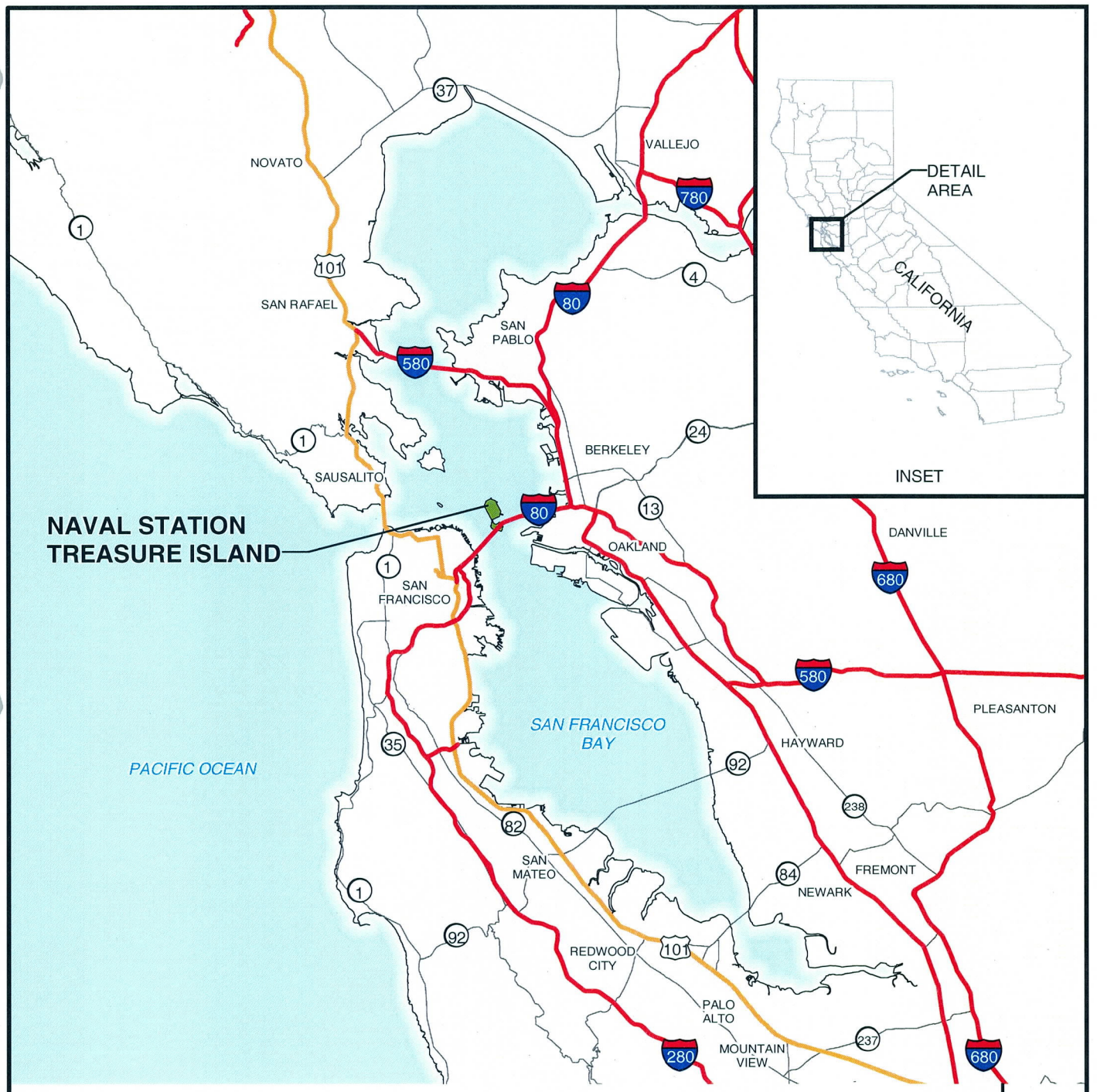
FIGURES



LEGEND

- STATE HIGHWAY
- US HIGHWAY
- INTERSTATE HIGHWAY
- TREASURE ISLAND
- WATER

4 0 4 8 Miles

Scale: 1" = 8 Miles

N

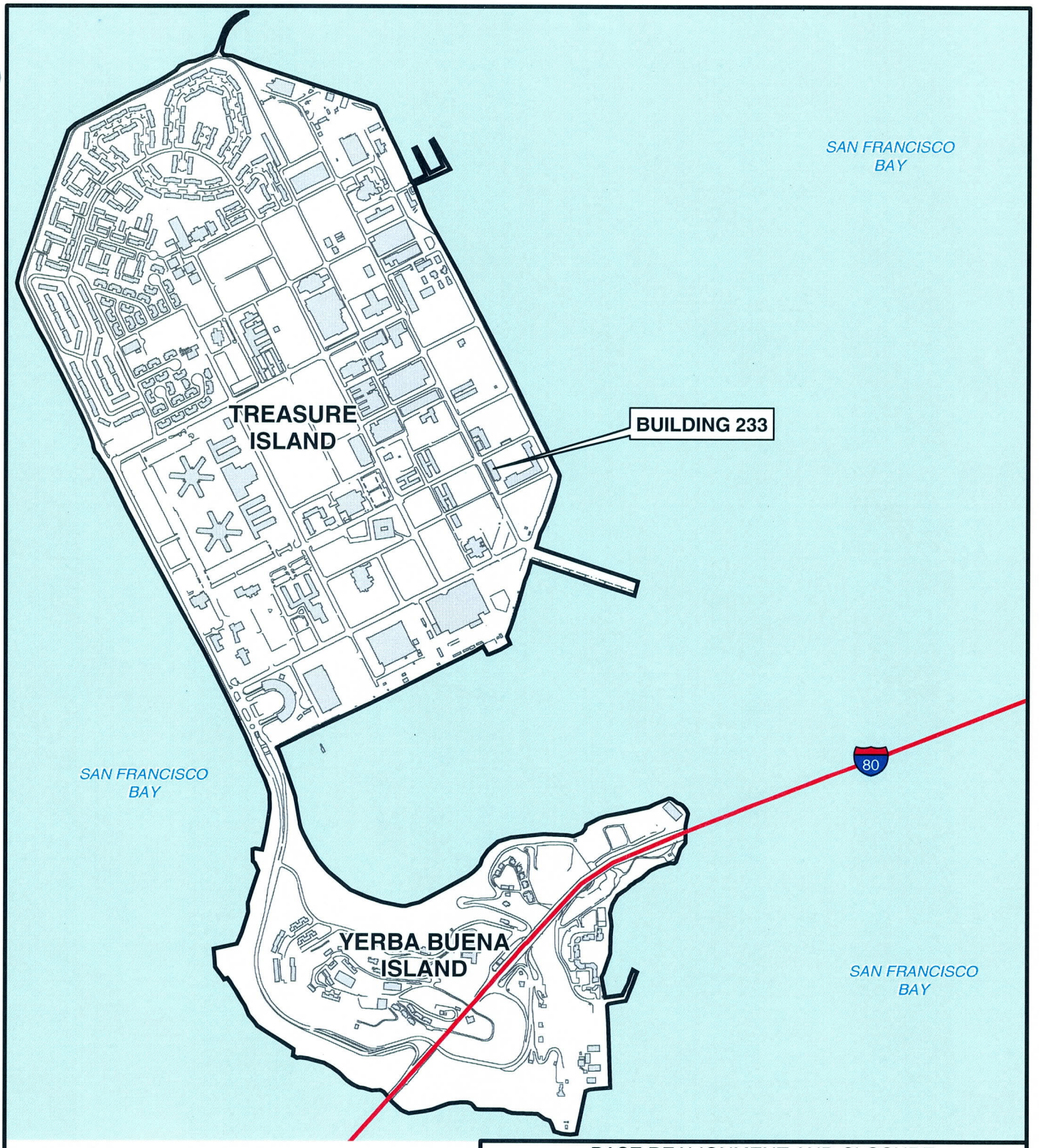
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

SCOPING SURVEY REPORT
FOR BUILDING 233 DRAIN LINES AND WALL VENTS

FIGURE 1-1
REGIONAL LOCATION MAP
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

REVISION: 2
AUTHOR: GFG
DCN: ECSD-2201-0021-0009
FILE NUMBER: 080090R2171.mxd

TETRA TECH EC, INC.



LEGEND

80 INTERSTATE HIGHWAY

NAVAL STATION TREASURE ISLAND BASE BOUNDARY

600 0 600 1,200 Feet

Scale: 1" = 1200'

N

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

SCOPING SURVEY REPORT
FOR BUILDING 233 DRAIN LINES AND WALL VENTS

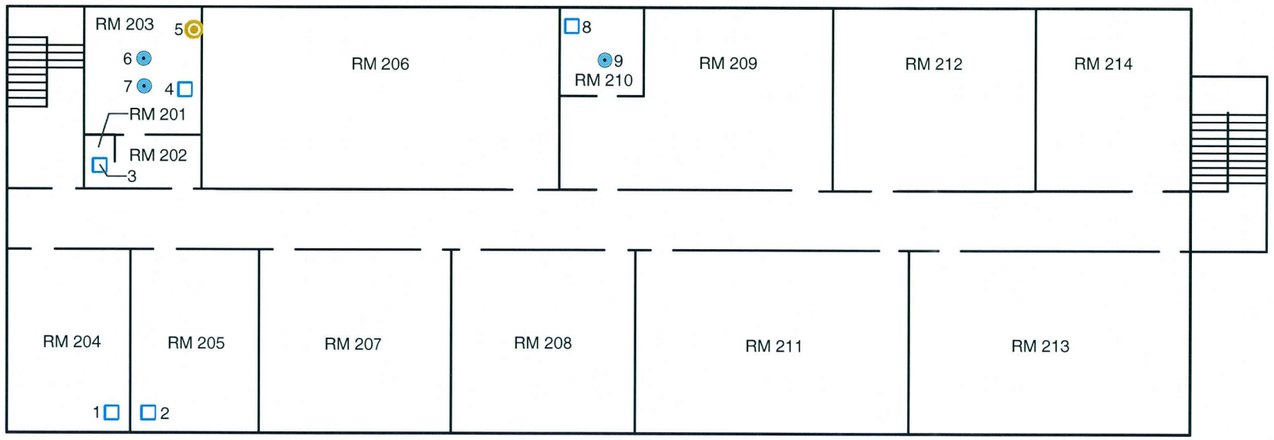
FIGURE 1-2

SITE LOCATION MAP
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

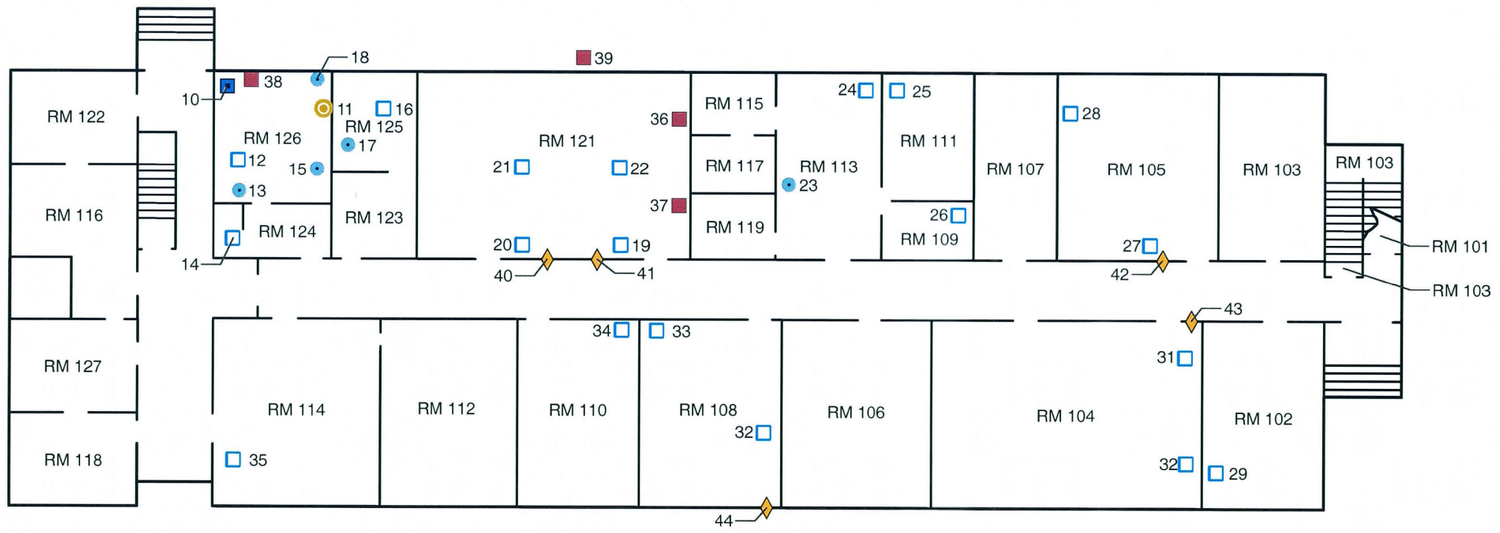
REVISION: 2
AUTHOR: GFG
DCN: ECSD-2201-0021-0009
FILE NUMBER: 080090S2174.mxd

TETRA TECH EC, INC.

SECOND FLOOR



FIRST FLOOR



LEGEND

- FLOOR DRAIN
- SEWER LINE
- SHOWER DRAIN
- SINK DRAIN
- URINAL DRAIN TRAP
- WALL VENT
- 28 LOCATION IDENTIFICATION NUMBER

NOTES:

WIPES WERE TAKEN IN ALL OF THE DRAINS AND PIPES AND 2 MINUTE ALPHA/BETA STATICS WERE PERFORMED.

GAMMA STATICS WERE TAKEN DIRECTLY ON DRAINS AND PIPES.

SMEARS WERE TAKEN ON INSIDE OF PIPES AND DRAINS.

ONLY SMEARS WERE OBTAINED FROM THE VENTS.

RM - ROOM

10 0 10 20 Feet

Scale: 1" = 20'

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

SCOPING SURVEY REPORT
FOR BUILDING 233 DRAIN LINES AND WALL VENTS

FIGURE 1-3

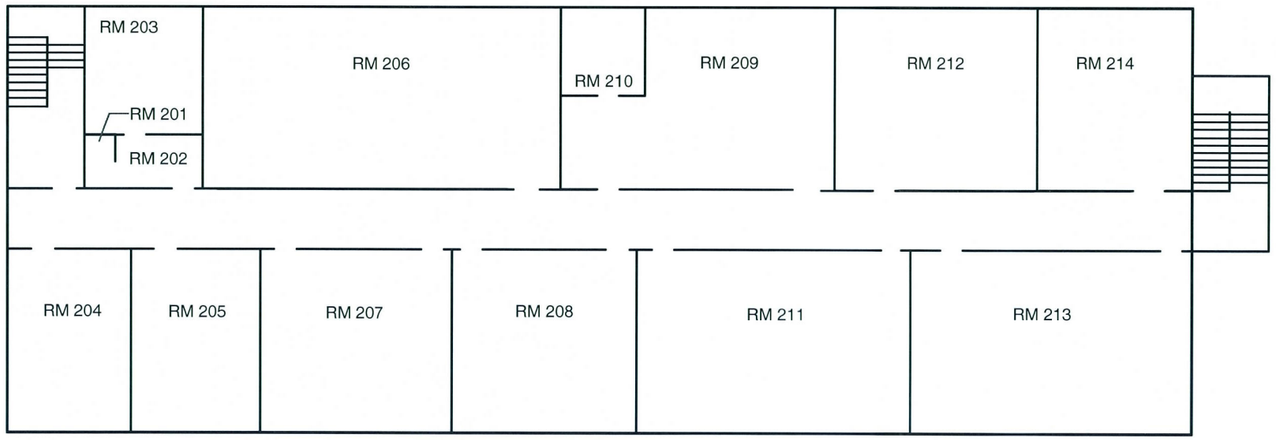
BUILDING 233 FLOOR PLAN WITH SCAN LOCATIONS

NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

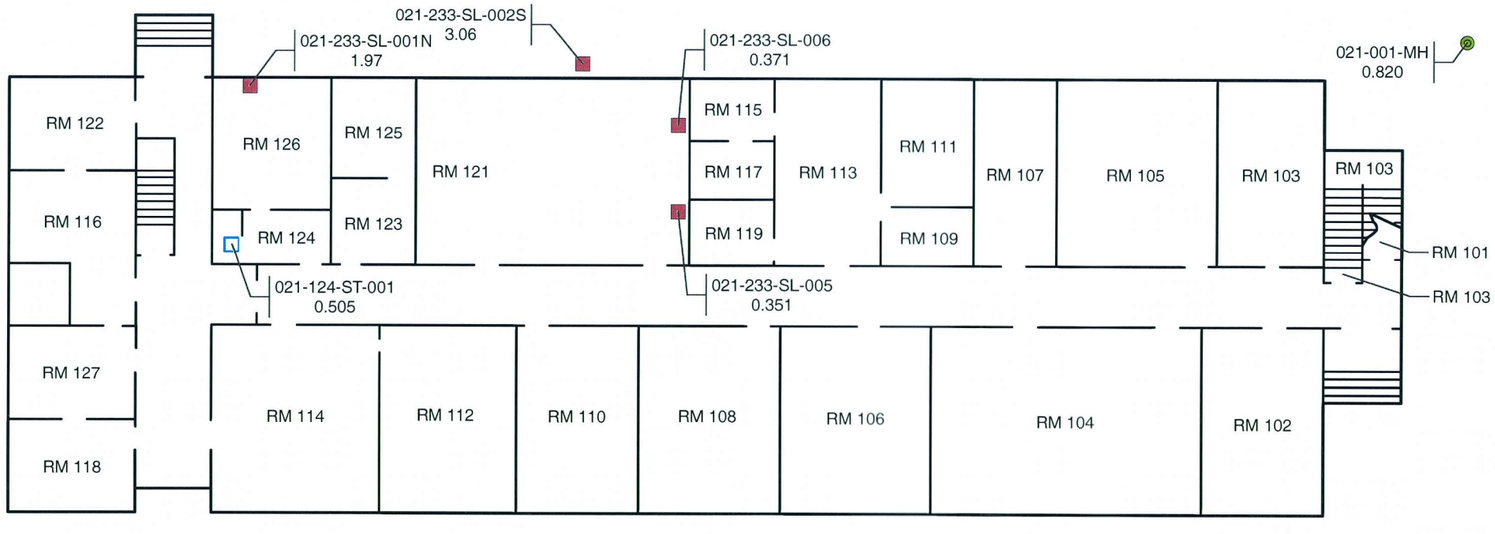
REVISION: 0
AUTHOR: GFG
DCN: ECSD-2201-0021-0009
FILE NUMBER: 080090L2042.mxd

TETRA TECH EC, INC.

SECOND FLOOR



FIRST FLOOR



LEGEND

- MANHOLE
- SEWER LINE
- SINK DRAIN

021-001-MH 0.820 — SAMPLE ID FOR GAMMA SPEC, EPA 901.1M AND GAMMA COUNT (pCi/g)

NOTES:

EPA - ENVIRONMENTAL PROTECTION AGENCY

pCi/g - PICOCURIE PER GRAM

RM - ROOM

10 0 10 20 Feet

Scale: 1" = 20'

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

SCOPING SURVEY REPORT
FOR BUILDING 233 DRAIN LINES AND WALL VENTS

FIGURE 3-1

BUILDING 233 FLOOR PLAN WITH SEDIMENT SAMPLE LOCATIONS

NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

REVISION: 0
AUTHOR: GFG
DCN: ECSD-2201-0021-0009
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TETRA TECH EC, INC.

APPENDIX A

SURVEY INSTRUMENTATION

MODEL 2360 Alpha/Beta Data Logger

- *Data Logger*
- *Simultaneous Alpha/Beta Counting*
- *6 Digit LCD Scaler*
- *Ratemeter with Total Counting Range from 0 - 500,000 cpm*
- *RS-232 Output*
- *Optional Keypad for setup*
- *Bar Code Reader*
- *Alpha Only, Beta Only, or Alpha/Beta Counts*

INDICATED USE: Alpha, beta discrimination, and data logging
COMPATIBLE DETECTORS: Proportional and dual phosphor scintillation detectors
DATA LOGGER: Capable of logging up to 550 individual data points with the following identifiers for each point (*All data is stored in non-volatile memory allowing batteries to be removed without loss of data*)

```
alpha and beta sample counts        sample number

date/time stamp                     scaler count time

10 character location identifier
```

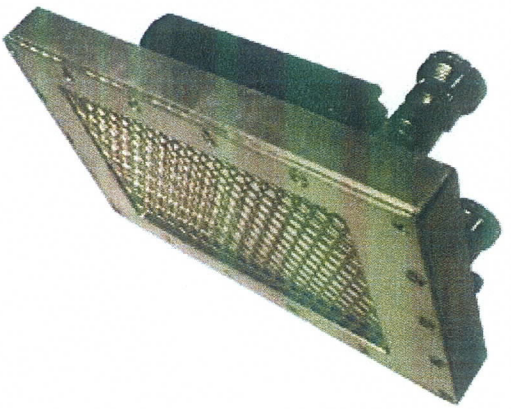
LOGGING PUSHBUTTON: Located in the handle; used to activate scaler and/or log a count
LOGGING FUNCTION CONTROL: Internal selection that enables the pushbutton to log the ratemeter reading, initiate a scaler count, and log the resulting reading, log both the scaler and ratemeter reading, or disables the logging function.
LOCATION CODE: A 10 character alphanumeric identifier. (*Can be set by bar code reader, ASCII terminal, or PC*)
CALIBRATION DUE DATE: An internal date that disables the instrument if the required calibration interval has been missed
HEADER INFORMATION: Six lines of user defined memory at the beginning of the stack for storing user name, survey name, serial numbers, etc. (*Information is dumped with logged data*)
RS-232 PORT: Located on the can, this allows the instrument to be connected to a PC for dumping data, and setup parameters.
CONNECTOR: Series "C" (*others available on request*)
AUDIO: Built in unimorph speaker with volume control (*greater than 60 dB at 2 feet, full volume*)

AUDIO DIVIDE: Selectable dual or individual click-per-event for alpha and beta counts and divisions of 1, 10, 100, or 1000 events-per-click(*beta channel only*)
METER: 2.5"(6.4cm) arc, 1 mA analog type
METER DIAL: 0 - 500 cpm, 0 - 2 kV, BAT OK, OL(overload)
MULTIPLIERS: X1, X10, X100, X1000
LINEARITY: Reading within plus or minus 10% of true value with detector connected
SCALER: 6 digit LCD with 0.25" digits, overflow arrow, and colons to indicate when a count is in process
COUNT TIME: Switch selectable times of 0.1, 0.5, 1, 2, 5, 10, and 60 minutes, or PC to allow for a specific count time to be set from a PC.
SELECTOR SWITCH: Toggle switch to select alpha+beta, alpha only, or beta only
RESET/READ HV: A two position momentary action switch to allow for the meter to be reset or a reading of the HV setting.
HIGH VOLTAGE: Adjustable from 200 - 2000 volts (*Can be read on the meter*)
THRESHOLD: Internal control allows for adjustment from 2 - 15 mV for beta, and 40 - 700 mV for alpha
WINDOW: Internal control allows for adjustment from the beta threshold up to the alpha threshold setting (*Beta only*)
OVERLOAD: Senses detector saturation. Indicated by red lamp on meter and meter deflecting to full scale (*Adjustable depending on detector selected*)
RESPONSE: Will vary according to the number of counts present. Typically 2 - 11 seconds from 10% - 90% of final reading
POWER: 2 each "D" cell batteries (*housed in sealed compartment that is accessible from front of instrument*)
BATTERY LIFE: Greater than 150 hours (*battery condition can be checked on meter*)
CONSTRUCTION: Cast and drawn aluminum with beige polyurethane enamel paint
TEMPERATURE RANGE: -4° F(-20° C) to 122° F(50° C)
May be certified for operation from -40° F(-40° C) to 150° F(65° C)
SIZE: 6.5"(16.5cm)H X 3.5"(8.9cm)W X 8.5"(21.6cm)L
WEIGHT: 3.5 lbs (1.6kg) including batteries

MODEL 43-68 Gas Proportional Detector

PART NUMBER:47-2005

The Model 43-68 is a large area gas proportional detector for use in simultaneous alpha/beta surveys as well as alpha or beta surveys



INDICATED USE: Alpha-beta survey
RECOMMENDED COUNTING GAS: P-10 (*10% methane, 90% argon*)
GAS RECHARGE: Will operate on a static charge for over 15 hours with a 39" cable
WINDOW: Typically 0.8 mg/cm² aluminized mylar (*other thickness available*)
WINDOW AREA:
Active - 126 cm²
Open - 100 cm²
EFFICIENCY (4pi geometry): Typically 20% - Pu-239; 30% - Tc-99; 15% - C-14; less than 1% - gamma
BACKGROUND:
Alpha - Less than 5 cpm (*when operating on the alpha only plateau region*)
Beta - Typically 400 cpm or less (*10 microR/hr field*)
COMPATIBLE INSTRUMENTS: Model 12, 16, 18, 2000, 2200, 2221, 2224, 2225, 2241, 2350-1
OPERATING VOLTAGE:
Alpha - Typically 1000 - 1500 volts
Beta-gamma - Typically 1600 - 1800 volts
COUNTER THRESHOLD SETTING: Typically 2 - 5 mV
GAS CONNECTORS: Double end quick disconnect
CONNECTOR: Series "C" (*others available*)
CONSTRUCTION: Anodized aluminum housing
TEMPERATURE RANGE: -4° F(-20° C) to 122° F(50° C)
May be certified for operation from -40° F(-40° C) to 150° F(65° C)
SIZE: 3.9"(10cm)H X 4.6"(11.7cm)W X 7.8"(19.8cm)L
WEIGHT: 2 lbs (0.9kg)

MODEL 2350-1 Data Logger

- *Data Logger*
- *16 Independent Detector Setups*
- *Microprocessor Based Electronics*
- *RS-232 Output*
- *Optional Keypad for Setup*
- *LCD Display with backlight*
- *Scaler*
- *Ratemeter*
- *Integrated Dose*
- *5 decade Logarithmic Trend Indicator*
- *Bar Code Reader*

INDICATED USE: Field analysis and data logging
COMPATIBLE DETECTORS: G-M, proportional, scintillation
CONNECTOR: Series "C" (*others available on request*)
DISPLAY: 8 line LCD display with 15 characters per line
BACKLIGHT: A two position toggle switch to turn backlight ON or OFF
SCALER: 6 digit display
TIMER: Used in conjunction with scaler. Count time can be set from 1 - 65,535 seconds in 1 second intervals
RATEMETER: Digital ratemeter, corrected for dead time and calibration constant
TREND INDICATOR: 5 decade logarithmic bar graph
LINEARITY: Reading within plus or minus 10% of true value with detector connected
SCALE: Can display in rem/hr, Sv/hr, R/hr, cpm, cps, dpm, dps, rad(r), Gray(G), C/kg, Ci/cm squared, or Bq/cm squared
INTEGRATED DOSE: Counter provided to give total accumulated dose for up to 45 days (*Will display in same units as ratemeter*)
AUDIO: Built in unimorph speaker with volume control (*greater than 60 dB at 2 feet, full volume*)
AUDIO DIVIDE: Operator selected divisions of 1, 10, or 100 events-per-click
ALARM: Separate alarms for digital ratemeter, scaler, and integrated dose can be set at any point (*audible and visual indicators*)
ACK/SCROLL: Push-button to silence audio after alarm has been indicated and/or scroll through the various displays
DATA LOGGER: Capable of logging up to 1000 individual data points with the following identifiers for each point

```
8 Location codes (5 character )      Time of day
```

Month, Day, and Year	Count rate/scaler count/integrated dose
Count time	Detector number
Logging mode	Sample number

DETECTOR PARAMETERS: Capable of storing the following parameters for 16 different detectors

Model number	Serial number
Calibration constant	Dead time correction
High voltage	Threshold
Window	Display range multiplier
Display time base	Display units
Overload current	Ratemeter alarm setting
Scaler alarm setting	Low ratemeter alarm setting
Integrated dose alarm setting	Scaler count time

RS-232 PORT: A full duplex communication port that allows for instrument setup by optional keypad or PC. Also allows for data to be transferred to a PC file.
BAR CODE READER (optional): Allows for setup of instrument by computer generated bar codes
HIGH VOLTAGE: Adjustable from 200 - 2500 volts
THRESHOLD: Adjustable from 100 - 1000
WINDOW: Adjustable from 0 - 1000 above threshold
GAIN: Adjustable from 2 - 350 mV at threshold setting of 100
DEAD TIME: Adjustable to compensate for dead time of detector and electronics
RESPONSE:
Fixed - Adjustable from 1 - 127 seconds in 1 second intervals
Variable - Will vary according to number of counts present.
Typical times FAST: 4 - 25 seconds, SLOW: 4 - 60 seconds from 10% to 90% of final reading
POWER: 4 each "D" cell batteries (*housed in sealed compartment that is accessible from back of instrument*)
BATTERY LIFE: Greater than 75 hours (*low battery condition is automatically indicated*)
CONSTRUCTION: Milled and drawn aluminum with beige polyurethane enamel paint
TEMPERATURE RANGE: 32° F(0° C) to 122° F(50° C) (*LCD limits temperature range*)
SIZE: 6"(15cm)H X 4.3"(11cm)W X 8.8"(22cm)L
WEIGHT: 5 lbs (2.3kg) including batteries

MODEL 44-10 Gamma Scintillator

The Model 44-10 is a 2" X 2" NaI(Tl) Gamma Scintillator that can be used with several different instruments including survey meters, scalers, ratemeters, and alarm ratemeters

CE

INDICATED USE: High energy gamma detection
SCINTILLATOR: 2" (5.1 cm) diameter X 2" (5.1 cm) thick sodium iodide (NaI)Tl scintillator
SENSITIVITY: Typically 900 cpm/microR/hr (*Cs-137*)
ENERGY RESPONSE: Energy dependent
COMPATIBLE INSTRUMENTS: General purpose survey meters, ratemeters, and scalers
TUBE: 2"(5.1cm) diameter magnetically shielded photomultiplier
OPERATING VOLTAGE: Typically 500 - 1200 volts
DYNODE STRING RESISTANCE: 60 megohm
CONNECTOR: Series "C" (*others available*)
CONSTRUCTION: Aluminum housing with beige polyurethane enamel paint
TEMPERATURE RANGE: -4° F(-20° C) to 122° F(50° C)
May be certified to operate from -40° F(-40° C) to 150° F(65° C)
SIZE: 2.6" (6.6 cm) diameter X 11" (27.9 cm)L
WEIGHT: 2.3 lb (1.1kg)

APPENDIX B

INSTRUMENT CALIBRATION DOCUMENTATION

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Duratek

DETECTOR CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		DETECTOR INFORMATION
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum
Address: 628 Gallaher Rd Kingston, TN 37763		Detector Model: 43-94
Contact Name: Tony Riggs		Serial Number: 124115
Customer Purchase Order Number: N/A	Work Order Number: 2007-04641	Evaluation Method: Source

DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION

Source Nuclide: Tc^{99}	Serial Number: 129668	Activity: 66,977 dpm	Certification Date: 06/01/95

Parameter	As Found	As Left	Precision Test	CPM (Source #1)
Count 1	2073	2073	Count 1(90°)	2086
Count 2	2101	2101	Count 2(180°)	2064
Count 3	2065	2065	Count 3(270°)	2043
Average	2079.7	2079.7	Average	2064.3
Background (cpm)	68.2	68.2	Tolerance	All counts within ±10% of Average
Net Counts	2011.5	2011.5	Pass/Fail	PASS
Efficiency	3.0%	3.0%		

Low Sample Activity: Source #: N/A	High Sample Activity: Source #: N/A	Dead Time (DT): $20.0E^{-6}$	Calibration Constant (CC): 1.0

SCALER INFORMATION		DETECTOR INFORMATION			
Model	Serial Number	Due Date	Background (cpm)	Operating Voltage	Threshold
2350-1	120633	8/28/2008	68.2	1700	100 = 4 mV

Detector Setup Report	YES ✓ NO	Barcode Report	YES ✓ NO	Voltage Plateau	YES ✓ NO

COMMENTS

Calibrated with 50Ft. Cable Efficiencies determined with 1.5" Geometry at 100+cc/min gas flow

10 minute background Dead Time set to manufacturer's suggested setting

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector Calibrated By:	Reviewed By:	Date: 8/30/07
Calibration Date: 08/30/2007		Calibration Due: 08/30/2008

Duratek

DETECTOR
CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		DETECTOR INFORMATION
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum
Address: 628 Gallaher Rd Kingston, TN 37763		Detector Model: 43-98
Contact Name: Tony Riggs		Serial Number: 117963
Customer Purchase Order Number: N/A	Work Order Number: 2007-04641	Evaluation Method: Source

DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION

Source Nuclide: Tc^{99}	Serial Number: 129669	Activity: 67,066dpm	Certification Date: 06/01/95

Parameter	As Found	As Left	Precision Test	CPM (Source #1)
Count 1	1,796	1,796	Count 1(90°)	1,703
Count 2	1,768	1,768	Count 2(180°)	1,883
Count 3	1,748	1,748	Count 3(270°)	1,846
Average	1,770.7	1,770.7	Average	1,810.7
Background (cpm)	102.4	102.4	Tolerance	All counts within ±10% of Average
Net Counts	1,668.3	1,668.3	Pass/Fail	PASS
Efficiency	2.4%	2.4%		

Low Sample Activity: Source #: N/A	High Sample Activity: Source #: N/A	Dead Time (DT): $20.0E^{-6}$	Calibration Constant (CC): 1.0

SCALER INFORMATION		DETECTOR INFORMATION			
Model	Serial Number	Due Date	Background (cpm)	Operating Voltage	Threshold
2350-1	120633	8/28/2008	102.4	1800	100 = 4 mV

Detector Setup Report	YES √ NO	Barcode Report	YES √ NO	Voltage Plateau	YES √ NO

COMMENTS

Calibrated with 50Ft. Cable Efficiencies determined with 2" Geometry at 100+cc/min gas flow

10 minute background Dead Time set to manufacturer's suggested setting

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector Calibrated By:	Reviewed By:	Date: 8/30/07
Calibration Date: 8/29/2007		Calibration Due: 8/29/2008

Duratek

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

CALIBRATION CERTIFICATE

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		DETECTOR INFORMATION
Customer Name: EnergySolutions, LLC.		Manufacturer: Ludlum
Contact Name: Tony Riggs		Detector Model: 43-68
Address: 628 Gallaher Rd, Kingston Tn 37763		Serial Number: 091050
Customer Purchase: Order Number: NA	Work Order Number: 2007-04641	Evaluation Method: Source

DETECTOR EVALUATION INFORMATION

Source Nuclide	Serial Number	Activity (dpm)*	Net Response	Efficiency (%)
Th-230	060101	13,260	4071	30.7%
Tc-99	119718	10,080	3252	32.3%

SCALER INFORMATION			DETECTOR INFORMATION		
Model	Serial Number	Due Date	Background	Operating Voltage	Threshold
2360	193680	08/28/08	0	1625V	Alpha (120mV)
2360	193680	08/28/08	167	1625V	Beta (3.5-30mV)

ATTACHMENTS

Voltage Plateau: √YES NO MDA/Cross Talk Evaluation: √YES NO

COMMENTS	LINEARITY TEST	
Calibrated with 5ft cable Linearity test performed with Th-230 #060101. *Efficiencies determine using 2¶ emissions. Calibrated in accordance with original equipment technical manual.	Count 1 (Toe)	3876
	Count 2 (Mid)	4172
	Count 3 (Heel)	3765
	Average	3938
	Pass/Fail	PASS (+/-10% Tolerance)

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector Certified By: Jeff Woodlee	Reviewed By:	Date: 8/30/07
Certification Date: 08/29/07	Certification Due: 08/29/08	

Detector 43-68 #091050 Raw Data (Counts)										
	Background		Th-230		Tc-99		N/A		N/A	
Voltage	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
1500	1	53	2634	1178	1	2730				
1525	2	53	2366	1169	4	3006				
1550	2	61	3014	1248	1	3359				
1575	4	82	3253	1269	5	3722				
1600	1	146	3837	1130	6	3703				
1625	4	170	3972	956	8	3345				
1650	4	213	4220	840	42	2899				
1675	5	190	4371	700	202	2252				
1700										
1725										
1750										
1775										
1800										

		Source Info		
Nuclide	Th-230	Tc-99	N/A	N/A
ID	60101	119708		
Initial DPM	13260 ***	10,080 ***		
Certification Date	10/14/1997	8/8/1996		
Today's Date	8/29/2007	8/29/2007	8/29/2007	8/29/2007
Source Age (Years)	9.87	11.06	107.66	107.66
Half-Life (Years)	7.70E+04	2.13E+05		
Corrected Activity	13259	10080	#DIV/0!	#DIV/0!

Net CPM (Efficiencies determined below only used for selecting operating voltage)													
	MDA/Cross-Talk				Beta Eff.	Alpha Eff.	Th-230		Tc-99		N/A		N/A
Voltage	Beta MDA	Alpha MDA	Beta-Alpha	Alpha-Beta	(%)	(%)	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha
1500	137.7	37.1	0.00%	42.73%	26.56%	19.9%	2633	1125	0	2677	-1	-53	-1
1525	124.9	52.1	0.07%	47.21%	29.30%	17.8%	2364	1116	2	2953	-2	-53	-2
1550	119.3	40.9	-0.03%	39.41%	32.72%	22.7%	3012	1187	-1	3298	-2	-61	-2
1575	124.2	49.0	0.03%	36.53%	36.11%	24.5%	3249	1187	1	3640	-4	-82	-4
1600	167.0	25.4	0.14%	25.65%	35.29%	28.9%	3836	984	5	3557	-1	-146	-1
1625	201.2	40.1	0.13%	19.81%	31.50%	29.9%	3968	786	4	3175	-4	-170	-4
1650	265.0	37.8	1.41%	14.87%	26.65%	31.8%	4216	627	38	2686	-4	-213	-4
1675	326.8	39.8	9.55%	11.68%	20.46%	32.9%	4366	510	197	2062	-5	-190	-5
1700	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0
1725	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0
1750	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0
1775	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0
1800	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0

HV Setting 1625 v *** 2¶ emission rate used to determine efficiency.

Performed By: Jeff Wooldridge Date: 8/29/07

Reveiwed By: Jeff Dickinson Date: 8/30/07

Duratek

CALIBRATION
CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum	
Address:628 Gallaher Road, Kingston, TN 37763		Model: 2360	Serial Number: 193680
Contact Name: Tony Riggs		Probe: N/A	Serial Number: N/A
Customer Purchase Order Number: N/A	Work Order Number: 2006-04641	Calibration Method: Electronic	

INSTRUMENT CALIBRATION INFORMATION

Instrument Range	Calibration Standard Value	Ratemeter Response		Calibration Standard Value CPM	Time Base (minutes)	Tolerances (cpm) ±10%	Scaler Response	
		As Found	As Left				As Found	As Left
X 1	100	100	100	1,000 CPM	.1	90 – 110	100	100
X 1	200	200	200	1,000 CPM	.5	450 – 550	498	498
X 1	400	400	400	1,000 CPM	1	900 - 1,000	998	998
X 10	1,000	1,000	1,000	1,000 CPM	2	1.8K–2.2K	1,995	1,995
X 10	2,000	2,000	2,000	1,000 CPM	5	4.5K-5.5K	4,988	4,988
X 10	4,000	4,000	4,000	1,000 CPM	10	9.9K-11K	9,978	9,978
X 100	10,000	10,000	10,000					
X 100	20,000	20,000	20,000					
X 100	40,000	40,000	40,000					
X 1000	100,000	100,000	100,000					
X 1000	200,000	200,000	200,000					
X 1000	400,000	400,000	400,000					

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: [signature]	Reviewed By: [signature] Date: 8/30/07
Calibration Date: 08/28/07	Calibration Due: 08/28/08

Model: 2360 Serial Number: 193680

M&TE					Environmental Conditions		
Volt Meter	ID#	5965115	Cal Due:	10/30/07	Barometer	ID# 2551	Cal Due: 10/18/07
Pulser	ID#	100272	Cal Due:	09/19/07	Thermometer	ID# 2551	Cal Due: 10/18/07
Humidity	ID#	958670	Cal Due:	05/09/08	Temp: 21.1 °C	Pressure: 742 mmHg	Humidity: 55%

Special Test

Geotropism	Sat (√) Unsat ( )	As Found		As Left	
Audio Check	Sat (√) Unsat ( )	Alpha Sensitivity =	70 mv	Alpha Sensitivity =	120 mv
Mechanical Zero	Sat (√) Unsat ( )	Beta Sensitivity =	3.8 mv	Beta Sensitivity =	3.5 mv
Reset	Sat (√) Unsat ( )	Beta Window =	32 mv	Beta Window =	30 mv
HV Analog Display	Sat (√) Unsat ( )	See 43-68 detector certificate for High Voltage setting			

High Voltage Calibration				Overload Not Set		Overload Not Set	
Voltage	Tolerance	As Found	As Left	H.V. Set With Detector Not Connected			
500	450-550	504	504				
1000	900-1100	988	988				
1500	1350-1650	1,487	1,487				

COMMENTS

Calibrated with 5ft. Cable

Instrument Calibrated By: [signature]	Reviewed By: [signature] Date: 8/30/07
Calibration Date: 08/28/07	Calibration Due: 08/28/08

Duratek

CALIBRATION CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		DETECTOR INFORMATION
Customer Name: EnergySolutions, LLC.		Manufacturer: Ludlum
Contact Name: Tony Riggs		Detector Model: 43-68
Address: 628 Gallaher Rd, Kingston Tn 37763		Serial Number: 095526
Customer Purchase: Order Number: NA	Work Order Number: 2007-04641	Evaluation Method: Source

DETECTOR EVALUATION INFORMATION

Source Nuclide	Serial Number	Activity (dpm)*	Net Response	Efficiency (%)
Th-230	060101	13,260	3973	30.0%
Tc-99	119718	10,080	3621	35.9%

SCALER INFORMATION			DETECTOR INFORMATION		
Model	Serial Number	Due Date	Background	Operating Voltage	Threshold
2360	177117	08/28/08	1	1575V	Alpha (120mV)
2360	177117	08/28/08	121	1575V	Beta (3.5-30mV)

ATTACHMENTS

Voltage Plateau: √YES NO MDA/Cross Talk Evaluation: √YES NO

COMMENTS	LINEARITY TEST	
Calibrated with 5ft cable	Count 1 (Toe)	3583
Linearity test performed with Th-230 #060101.	Count 2 (Mid)	3793
*Efficiencies determine using 2¶ emissions.	Count 3 (Heel)	3675
Calibrated in accordance with original equipment technical manual.	Average	3684
	Pass/Fail	PASS (+/-10% Tolerance)

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector Certified By: Jeff Woolley Reviewed By: Jeff Anderson Date: 8/30/07

Certification Date: 08/29/07 Certification Due: 08/29/08

Detector 43-68 #095526 Raw Data (Counts)										
	Background		Th-230		Tc-99		N/A		N/A	
Voltage	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
1500	0	27	2916	1184	1	2919				
1525	1	54	3203	1227	1	3186				
1550	1	82	3431	1306	3	3590				
1575	2	126	3909	1242	2	3609				
1600	2	159	4141	1109	2	3564				
1625	1	197	4257	948	9	3207				
1650	0	205	4548	800	70	2784				
1675	4	179	4689	709	242	2228				
1700										
1725										
1750										
1775										
1800										

Source Info				
Nuclide	Th-230	Tc-99	N/A	N/A
ID	60101	119708		
Initial DPM	13260 ***	10,080 ***		
Certification Date	10/14/1997	8/8/1996		
Today's Date	8/29/2007	8/29/2007	8/29/2007	8/29/2007
Source Age (Years)	9.87	11.06	107.66	107.66
Half-Life (Years)	7.70E+04	2.13E+05		
Corrected Activity	13259	10080	#DIV/0!	#DIV/0!

Net CPM (Efficiencies determined below only used for selecting operating voltage)													
	MDA/Cross-Talk				Beta Eff.	Alpha Eff.	Th-230		Tc-99		N/A		N/A
Voltage	Beta MDA	Alpha MDA	Beta-Alpha	Alpha-Beta	(%)	(%)	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha
1500	93.7	12.3	0.03%	39.68%	28.69%	22.0%	2916	1157	1	2892	0	-27	0
1525	118.8	30.5	0.00%	36.63%	31.07%	24.1%	3202	1173	0	3132	-1	-54	-1
1550	128.8	28.5	0.06%	35.69%	34.80%	25.9%	3430	1224	2	3508	-1	-82	-1
1575	159.0	31.5	0.00%	28.56%	34.55%	29.5%	3907	1116	0	3483	-2	-126	-2
1600	181.7	29.8	0.00%	22.95%	33.78%	31.2%	4139	950	0	3405	-2	-159	-2
1625	227.8	22.9	0.27%	17.65%	29.86%	32.1%	4256	751	8	3010	-1	-197	-1
1650	271.0	7.9	2.71%	13.08%	25.59%	34.3%	4548	595	70	2579	0	-205	0
1675	319.6	34.0	11.62%	11.31%	20.33%	35.3%	4685	530	238	2049	-4	-179	-4
1700	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0
1725	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0
1750	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0
1775	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0
1800	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0

HV Setting 1575 v *** 2π emission rate used to determine efficiency.

Performed By: _____ Date: 8/29/07

Reveiwed By: _____ Date: 8/30/07

Duratek

CALIBRATION CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum	
Address:628 Gallaher Road, Kingston, TN 37763		Model: 2360	Serial Number: 177117
Contact Name: Tony Riggs		Probe: N/A	Serial Number: N/A
Customer Purchase Order Number: N/A	Work Order Number: 2007-04641	Calibration Method: Electronic	

INSTRUMENT CALIBRATION INFORMATION

Instrument Range	Calibration Standard Value	Ratemeter Response		Calibration Standard Value CPM	Time Base (minutes)	Tolerances (cpm) ± 10%	Scaler Response	
		As Found	As Left				As Found	As Left
X 1	100	100	100	1,000 CPM	.1	90 – 110	100	100
X 1	200	200	200	1,000 CPM	.5	450 – 550	499	499
X 1	400	400	400	1,000 CPM	1	900 -1,000	1,000	1,000
X 10	1,000	1,000	1,000	1,000 CPM	2	1.8K–2.2K	1,996	1,996
X 10	2,000	2,000	2,000	1,000 CPM	5	4.5K-5.5K	4,990	4,990
X 10	4,000	4,000	4,000	1,000 CPM	10	9.9K-11K	9,979	9,979
X 100	10,000	10,000	10,000					
X 100	20,000	20,000	20,000					
X 100	40,000	40,000	40,000					
X 1000	100,000	100,000	100,000					
X 1000	200,000	200,000	200,000					
X 1000	400,000	400,000	400,000					

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: [signature]	Reviewed By: [signature] Date: 8/28/07
Calibration Date: 08/28/07	Calibration Due: 08/28/08

Model: 2360 Serial Number: 177117

M&TE					Environmental Conditions		
Volt Meter	ID#	5965115	Cal Due:	10/30/07	Barometer	ID# 2551	Cal Due: 10/18/07
Pulser	ID#	100272	Cal Due:	09/19/07	Thermometer	ID# 2551	Cal Due: 10/18/07
Humidity	ID#	958670	Cal Due:	05/09/08	Temp: 21.1 °C	Pressure: 742 mmHg	Humidity: 55%

Special Test

Geotropism	Sat (√) Unsat ( )	As Found		As Left	
Audio Check	Sat (√) Unsat ( )	Alpha Sensitivity =	70 mv	Alpha Sensitivity =	120 mv
Mechanical Zero	Sat (√) Unsat ( )	Beta Sensitivity =	2.9 mv	Beta Sensitivity =	3.5 mv
Reset	Sat (√) Unsat ( )	Beta Window =	33 mv	Beta Window =	30 mv
HV Analog Display	Sat (√) Unsat ( )	See detector certificate for High Voltage setting			

High Voltage Calibration				Overload Not Set		Overload Not Set	
Voltage	Tolerance	As Found	As Left	H.V. Set With Detector Not Connected			
500	450-550	483	491				
1000	900-1100	981	1,000				
1500	1350-1650	1,467	1,505				

COMMENTS

Calibrated with 5ft. Cable

Instrument Calibrated By: Jeff Wooldridge	Reviewed By: Jeff Dalcanio Date: 8/28/07
Calibration Date: 08/28/07	Calibration Due: 08/28/08

Duratek

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

CALIBRATION CERTIFICATE

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		DETECTOR INFORMATION
Customer Name: EnergySolutions, LLC.		Manufacturer: Ludlum
Contact Name: Tony Riggs		Model: 2929/43-10-1
Address: 628 Gallaher Rd, Kingston Tn 37763		Serial Number: 182585/186558
Customer Purchase: Order Number: NA	Work Order Number: 2007-04641	Evaluation Method: Source

DETECTOR EVALUATION INFORMATION

Source Nuclide	Serial Number	Activity (dpm)	Net Response	Efficiency (%)
Th-230	060101	13,260	8876.75	66.9%
Tc-99	119718	10,080	5468.05	54.2%

SCALER INFORMATION			DETECTOR INFORMATION		
Model	Serial Number	Due Date	Background	Operating Voltage	Threshold
2929	182585	08/28/08	.25	963V	Alpha (175mV)
2929	182585	08/28/08	53.95	963V	Beta (4-49mV)

ATTACHMENTS

Voltage Plateau: √YES NO MDA/Cross Talk Evaluation: YES √ NO

COMMENTS

Efficiencies determine using 2¶ emissions.

Calibrated in accordance with original equipment technical manual.

This is a supplemental sheet for 2¶ efficiencies to accompany the standard calibration cert.

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector Certified By:	Reviewed By:	Date: 9/6/07
Certification Date: 09/06/2007	Certification Due: 04/16/2008	

Duratek

CALIBRATION CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name: Duratek Inc. - Instrument Services Facility		Manufacturer: Ludlum	
Address: 628 Gallaher Road, Kingston, TN 37763		Model: 2350-1	Serial Number: 126182
Contact Name: Tony Riggs		Probe: N/A	Serial Number: N/A
Customer Purchase Order Number: N/A	Work Order Number: 2007-04609	Calibration Method: Electronic and Source	

INSTRUMENT CALIBRATION INFORMATION

Instrument Range (CPM)	Calibration Standard Value (CPM)	Instrument Response		Comments	
		Before Calibration	After Calibration	Calibrated in accordance with CP-IN-WI-239 Rev 0	
400	400	401	401	Pulser: 101500	Cal Due: 10/06/07
4,000	4,000	3,998	3,998	DVM: 6565015	Cal Due: 10/30/07
40,000	40,000	40,265	40,265	D-814: 2551	Cal Due: 10/18/07
400,000	400,000	400,161	400,161	*Humidity: 958670*	*Cal Due: 05/09/08*
HV Cal Values (M2350 HV Entry)	Desired HV (Voltmeter) (VDC)	As Found (VDC)	As Left (VDC)	EPPROM Version: 37122N28	
600 (540-660)	600	598	598	Temp: 21.1 °C	
1,200 (1,080-1,320)	1,200	1,184	1,184	Pressure: 742 mmHg	
1,800 (1,620-1,980)	1,800	1,768	1,768	Humidity: 55%	
Parameter	Tolerance (±10%)	As Found	As Left		
Threshold T = 100	10 ± (9 to 11) mVDC	10.0	10.0	Geotropism: SAT	ACK/Scroll: SAT
Threshold T = 500	50 ± (45 to 55) mVDC	49.7	49.7	BAT>4.5: SAT	Volume: SAT
Threshold T =1000	100 ± (90 to 110) mVDC	100	100	Count: SAT	Audio Divide: SAT
Window Width W = 100	10 ± (9 to 11) mVDC	10	10	Alarms: SAT	Lamp: SAT
Display-to-mV ratio:	100 to 10 mV			Overload Test: SAT	Physical cond: SAT

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By:		Reviewed By:	Date: 8/28/07
Calibration Date: 08/28/2007		Calibration Due: 08/28/2008	

Duratek

CALIBRATION CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION			DETECTOR INFORMATION
Customer Name: Duratek Instrument Services			Manufacturer: Ludlum
Address: 628 Gallaher Rd Kingston, TN 37763			Detector Model: 44-10
Contact Name: Tony Riggs			Serial Number: 230620
Customer Purchase Order Number: N/A	Work Order Number: 2007-04641		Evaluation Method: Source

DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION			
1) Source Nuclide: Cs^{137}	Serial Number: 019454	Activity: 5μCi nominal	Certification Date: N/A (Used for Plateau Only)
2) Source Nuclide: Cs^{137}	Serial Number: 049711	Activity: Variable	Certification Date: 07/19/07

Scaler Information		Precision Test	mR/Hr (Source #2)
2350-1	#126182	Count 1	2.00
Due Date	08/28/08	Count 2	2.01
Threshold	T=100 (10mV)	Count 3	1.99
Cable Length	5ft.	Average	2.00
D-814: 2551	Temp: 23.0 °C	Tolerance ±10%	All counts within ±10% of Average
D-814: 2551	Press: 743mmHg	Pass/Fail	Pass
Humidity	Humidity: 52%		

Low Sample Activity (400uR/hr): Using Source #2 = 68,934	High Sample Activity (2mR/hr) Using Source #2 = 247,970	Dead Time (DT): 1.697131E-05	Calibration Constant (CC): 5.728537E+10

ATTACHMENTS			DETECTOR DATA: DOSE RATE PROBES (mR/Hr)			
Detector Setup Report	YES √	NO	Desired Exposure	Tolerance ±10%	As Found	As Left
Barcode Report	YES √	NO	0.400	0.360-0.440	0.401	0.399
Voltage Plateau:	YES √	NO	1	0.90-1.10	0.965	0.961
High Voltage: 1000V			2	1.8-2.2	2.00	2.00

COMMENTS

Detectors set up with a 2350-1 may be used with any 2350-1 provided that the setup parameters are scanned into the 2350-1 prior to use with that specific detector

Calibrated with 5ft. Cable

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector Certified By:	Reviewed By:	Date: 8/30/07
Certification Date: 08/28/2007		Certification Due: 08/28/2008

129669

CERTIFICATE OF CALIBRATION

CUSTOM BETA STANDARD

Radionuclide:	Tc-99	Activity:	1.118 kBq (30.21 nCi)
Serial Number:	A3401	Reference Date:	1200 PST June 1, 1995
Half Life[1]:	$(2.13 \pm 0.05) \times 10^5$ years		

PRINCIPAL EMISSIONS[1]

Type	Energy (keV)	Intensity (%)
beta	$E_{max} = 294$ $E_{avg} = 85$	100

SOURCE DESCRIPTION

The activity is deposited in a uniform array on 13.9 mg/cm^2 backed Kapton and covered with 0.9 mg/cm^2 aluminized mylar. The overall dimensions are 7.1 cm (2.8") by 14.2 cm (5.6").

METHOD OF CALIBRATION

The source was calibrated by dispensing a gravimetric aliquot of a solution calibrated by liquid scintillation using an efficiency established through ongoing intercomparisons with the National Institute of Standards and Technology. This standard is indirectly (implicitly) traceable to the National Institute of Standards and Technology.

North American Scientific, Inc. participates in the Radioactivity Measurements Assurance Program conducted by the National Institute of Standards and Technology in cooperation with the Nuclear Energy Institute.

TOTAL UNCERTAINTY (99% Confidence Level)

Systematic uncertainty	2.21%
Weighing uncertainty	0.08%
Total uncertainty (quadratic sum)	± 2.21%

Daniel Kalas
Calibration Laboratory Manager

June 14, 1995
Date

REFERENCES

(1) Table of Radioactive Isotopes, 7th edition, 1986.

• LEAK TEST CERTIFICATION ON REVERSE •

North American Scientific, Inc. 7435 Greenbush Ave., North Hollywood, CA 91605 (818) 503-9201 Fax (818) 503-0764

099603

15 August 1996 Men/wo

Amersham Buchler
GmbH & Co KG
Gieselweg 1
D-38110 Braunschweig
Postfach 11 49
D-38001 Braunschweig

Tel. (05307) 930-0
Fax (05307) 930-293
Fax-Zentrale 930-237

Amersham
The Health Science Group

CERTIFICATE

No. 206432

for a Sealed Radioactive Source

Source Type: Alpha Wide Area Reference Source

Product Code	TZRX1920
Drawing	VZ-1368
Dimensions of Active Surface	Ø 36 mm
Overall Dimensions	Ø 47 mm x 3 mm
Source No.	FD 150
Nuclide	Thorium-230

Measurement Data

Activity	437 Bq
Overall Uncertainty*	± 10 %
Alpha Surface Emission Rate	203 s^{-1} ± 5 % in 2 π steradian
Reference Date	8 August 1996
Traceability*	Defined on page 2

Leakage and Contamination Test(s)

Test Method(s)*	I
Test(s) passed on	14 August 1996

Additional Information

ISO Classification*	C.34645
Recommended Working Life*	10 years
Remark	---

* see page 2 for explanation

Amersham Buchler

i.V.

(Production Manager)

119649

22 August 1996 Men/wo
Page 1 of 2 pages, Issue 07/95

Amersham Buchler
GmbH & Co KG
Gieselweg 1
D-38110 Braunschweig
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D-38001 Braunschweig
Tel. (05307) 930-0
Fax (05307) 930-293
Fax-Zentrale 930-237

Amersham
The Health Science Group

CERTIFICATE

No. 206423

for a Sealed Radioactive Source

Source Type: Beta Wide Area Reference Source

Product Code	TCRX1919
Drawing	VZ-1368
Dimensions of Active Surface	Ø 36 mm
Overall Dimensions	Ø 47 mm x 3 mm
Source No.	FD 176
Nuclide	Technetium-99

Measurement Data

Activity	75.8 Bq
Overall Uncertainty*	± 10 %
Beta Surface Emission Rate	37.3 s^{-1} ± 10 % in 2 π steradian
Reference Date	9 August 1996
Traceability*	Defined on page 2

Leakage and Contamination Test(s)

Test Method(s)*	I
Test(s) passed on	21 August 1996

Additional Information

ISO Classification*	C34645
Recommended Working Life*	10 years
Remark	---

* see page 2 for explanation

Amersham Buchler

(Production Manager)

3.Mai. 2000 13:08 AEA TECHNOLOGY CUSTOMER SERVICE Nr.0349 S.6
05/03 '00 11:44 NO.941 06/16

129668

CERTIFICATE OF CALIBRATION

CUSTOM BETA STANDARD

Radionuclide:	Tc-99	**Activity:**	1.116 kBq (30.17 nCi)
Serial Number:	A3402	**Reference Date:**	1200 PST June 1, 1995
Half Life[1]:	$(2.13 \pm 0.05) \times 10^5$ years		

PRINCIPAL EMISSIONS[1]

Type	Energy (keV)	Intensity (%)
beta	E_{max} = 294 E_{avg} = 85	100

SOURCE DESCRIPTION

The activity is deposited in a uniform array on 13.9 mg/cm^2 backed Kapton and covered with 0.9 mg/cm^2 aluminized mylar. The overall dimensions are 7.1 cm (2.8") by 14.2 cm (5.6").

METHOD OF CALIBRATION

The source was calibrated by dispensing a gravimetric aliquot of a solution calibrated by liquid scintillation using an efficiency established through ongoing intercomparisons with the National Institute of Standards and Technology. This standard is indirectly (implicitly) traceable to the National Institute of Standards and Technology.

North American Scientific, Inc. participates in the Radioactivity Measurements Assurance Program conducted by the National Institute of Standards and Technology in cooperation with the Nuclear Energy Institute.

TOTAL UNCERTAINTY (99% Confidence Level)

Systematic uncertainty	2.21%
Weighing uncertainty	0.08%
Total uncertainty (quadratic sum)	± 2.21%

Daniel Kalas
Calibration Laboratory Manager

June 14, 1995
Date

REFERENCES

(1) Table of Radioactive Isotopes, 7th edition, 1986.

• LEAK TEST CERTIFICATION ON REVERSE •

North American Scientific, Inc. 7435 Greenbush Ave., North Hollywood, CA 91605 (818) 503-9201 Fax (818) 503-0764

Duratek

CALIBRATION CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

Customer Information		Instrument Information	
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum	
Address: 628 Gallaher Road, Kingston, TN 37763		Model: 2929	Serial Number: 182585
Contact Name: Tony Riggs		Probe: 43-10-1	Serial Number: 186558
Customer Purchase Order Number: FS-OR-03-003	Work Order Number: 2007-04386	Calibration Method: Electronic And Source	

Instrument Calibration Information

M&TE	ID Number	Calibration Due Date	Environmental Conditions	
Thermometer	2816	05/04/07	Temperature (°C)	22.6
Barometer	2816	05/04/07	Pressure (mmHg)	739
Hygrometer	5546	06/05/07	Humidity (%)	38
Pulse Generator	120935	05/27/07	Calibrated in accordance with CP-IN-WI-235 Rev. 0	
DVM	6565015	10/30/07		

Isotope	Source ID Number	Original Activity (dpm)	Source Cert. Date	Decayed Activity (dpm)
Th^{230}	119702	20,580	10/14/97	20,580
Pu^{239}	019442	13,613	06/01/92	13,613
Tc^{99}	099608	21,312	08/08/96	21,312

Frequency Calibration

Desired (cpm)	Tolerances (cpm)	Alpha As Found (cpm)	Alpha As Left (cpm)	Beta As Found (cpm)	Beta As Left (cpm)
40	40	40	40	40	40
400	(392-408)	400	400	400	400
4,000	(3,920-4,080)	3,993	3,993	3,999	3,999
40,000	(39.2K-40.8K)	40,050	40,050	39,981	39,981
400,000	(392K-408K)	400,004	400,004	399,929	399,929

Background Determination	Alpha As Found	Alpha As Left	Beta As Found	Beta As Left
Counts, C_b	7	5	1119	1079
Time, T_b (min)	20	20	20	20
Rate, R_b (cpm)	0.35	0.25	55.95	53.95

Statement of Certification

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By:	Reviewed By:	Date: 4/16/07
Calibration Date: 04/16/2007		Calibration Due: 04/16/2008

EFFICIENCY SHEET / CROSS TALK SHEET

Instrument ID: 182585

As Found Alpha Threshold (mv)	As Left Alpha Threshold (mv)
175	175

Alpha Source: Efficiency and Cross Talk-Performed using Pu^{239} #019442

Paramter and Tolerance	Alpha As Found	Alpha As Left	Beta As Found	Beta As Left
Source Count, C_s	24993	24993	1647	1647
Time, T_s (min)	5	5	5	5
Rate, R_s (cpm)	$R_{s[\alpha]} = 4{,}998.6$	$R_{s[\alpha]} = 4{,}998.6$	$R_{s[\beta]} = 329.4$	$R_{s[\beta]} = 329.4$
EFF (% c/d) (>25%)	36.7%	36.7%	N/A	N/A
%Crosstalk [α to β] (< 10%)	$\frac{R_{s[\beta]} - R_{b[\beta]}}{R_{s[\alpha]} - R_{b[\alpha]}} = \frac{329.4 - 53.95}{4998.6 - 0.25} = 5.5\%$			

As Found Beta Low Threshold	As Left Beta Low Threshold	As Found Beta High Threshold	As Left Beta High Threshold
4.0mv	4.0mv	49mv	49mv

Beta Source: Efficiency and Cross Talk-Performed using Tc^{99} #099608

Paramter and Tolerance	Alpha As Found	Alpha As Left	Beta As Found	Beta As Left
Source Count, C_s	2	2	27,859	27,859
Time, T_s (min)	5	5	5	5
Rate, R_s (cpm)	$R_{s[\alpha]} = 0.4$	$R_{s[\alpha]} = 0.4$	$R_{s[\beta]} = 5571.8$	$R_{s[\beta]} = 5571.8$
EFF (% c/d) (>10%)	N/A	N/A	26.1%	26.1%
%Crosstalk [β to α] (< 1%)	$\frac{R_{s[\alpha]} - R_{b[\alpha]}}{R_{s[\beta]} - R_{b[\beta]}} = \frac{0.4 - 0.25}{5571.8 - 53.95} = 0.0027\%$			

High Voltage Power

Desired Voltage	Tolerance	DVM As Found	DVM As Left	2929 Meter As Found	2929 Meter As Left
600	540 – 660	607	607	600	600
800	720 – 880	803	803	800	800
1,000	900 – 1,100	1,004	1,004	1,000	1,000
1,200	1,080 – 1,320	1,209	1,209	1,200	1,200
1,300	1,170 – 1,430	1,321	1,321	1,300	1,300
High Voltage		As Found	Vern Dial Reading	As Left	Vern Dial Reading
		963V	3.84	963V	3.84

Statement of Certification

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: [signature] Reviewed By: [signature] Date: 4/16/07

Calibration Date: 04/16/2007 Calibration Due: 04/16/2008

EFFICIENCY SHEET

Instrument ID: 182585

As Found Alpha Threshold (mv)		As Left Alpha Threshold (mv)		
175		175		
Alpha Source: Th^{230} #119702				
Paramter and Tolerance	Alpha As Found	Alpha As Left	Beta As Found	Beta As Left
Source Count, C_s	35,128	35,128	N/A	N/A
Time, T_s (min)	5	5	N/A	N/A
Rate, R_s (cpm)	$R_{s[\alpha]} = 7{,}025.6$	$R_{s[\alpha]} = 7{,}025.6$	$R_{s[\beta]} = N/A$	$R_{s[\beta]} = N/A$
EFF (% c/d) (>25%)	34.1%	34.1%	N/A	N/A
%Crosstalk [α to β] (< 10%)	$\frac{R_{s[\beta]} - R_{b[\beta]}}{R_{s[\alpha]} - R_{b[\alpha]}} = \frac{N/A}{N/A} =$ N/A			

As Found Beta Low Threshold	As Left Beta Low Threshold	As Found Beta High Threshold	As Left Beta High Threshold
4.0mv	4.0mv	49mv	49mv

Beta Source: N/A				
Paramter and Tolerance	Alpha As Found	Alpha As Left	Beta As Found	Beta As Left
Source Count, C_s	N/A	N/A	N/A	N/A
Time, T_s (min)	N/A	N/A	N/A	N/A
Rate, R_s (cpm)	$R_{s[\alpha]} = N/A$	$R_{s[\alpha]} = N/A$	$R_{s[\beta]} = N/A$	$R_{s[\beta]} = N/A$
EFF (% c/d) (>10%)	N/A	N/A	N/A	N/A
%Crosstalk [β to α] (< 1%)	$\frac{R_{s[\alpha]} - R_{b[\alpha]}}{R_{s[\beta]} - R_{b[\beta]}} = \frac{N/A}{N/A} =$ N/A			

Statement of Certification

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: [signature] Reviewed By: [signature] Date: 4/16/07

Calibration Date: 04/16/2007 Calibration Due: 04/16/2008

Initials/Date:

Instrument ID: 182585

Source and Background Plateau Worksheet								
High Voltage	Background		Alpha Source		Beta Source		Cross Talk	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	α to β	β to α
600								
650								
700								
750								
800	Not	Required:	As	Founds	Within	Tolerance		
850								
900		HV	Left	As	Found			
950								
1000								
1050								
1100								
1150								
1200								
1250								
1300								

Statement of Certification

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: [signature]

Reviewed By: [signature] Date: 4/16/07

Calibration Date: 04/16/2007

Calibration Due: 04/16/2008

Duratek

LARGER PROBE 1 3/4 TO 4 IN (?)

DETECTOR CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		DETECTOR INFORMATION
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum
Address: 628 Gallaher Rd Kingston, TN 37763		Detector Model: 43-98
Contact Name: Tony Riggs		Serial Number: 117963
Customer Purchase Order Number: N/A	Work Order Number: 2007-04641	Evaluation Method: Source

DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION

Source Nuclide: Tc^{99}	Serial Number: 129669	Activity: 67,066dpm	Certification Date: 06/01/95

Parameter	As Found	As Left	Precision Test	CPM (Source #1)
Count 1	1,796	1,796	Count 1(90°)	1,703
Count 2	1,768	1,768	Count 2(180°)	1,883
Count 3	1,748	1,748	Count 3(270°)	1,846
Average	1,770.7	1,770.7	Average	1,810.7
Background (cpm)	102.4	102.4	Tolerance	All counts within ±10% of Average
Net Counts	1,668.3	1,668.3	Pass/Fail	PASS
Efficiency	2.4%	2.4%		

Low Sample Activity: Source #: N/A	High Sample Activity: Source #: N/A	Dead Time (DT): $20.0E^{-6}$	Calibration Constant (CC): 1.0

SCALER INFORMATION		DETECTOR INFORMATION			
Model	Serial Number	Due Date	Background (cpm)	Operating Voltage	Threshold
2350-1	120633	8/28/2008	102.4	1800	100 = 4 mV

Detector Setup Report YES √ NO	Barcode Report YES √ NO	Voltage Plateau YES √ NO

COMMENTS

Calibrated with 50Ft. Cable Efficiencies determined with 2" Geometry at 100+cc/min gas flow

10 minute background Dead Time set to manufacturer's suggested setting

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector Calibrated By: [signature]	Reviewed By: [signature]	Date: 8/30/07
Calibration Date: 8/29/2007		Calibration Due: 8/29/2008

APPENDIX C

FIELD SURVEY DATA SHEETS

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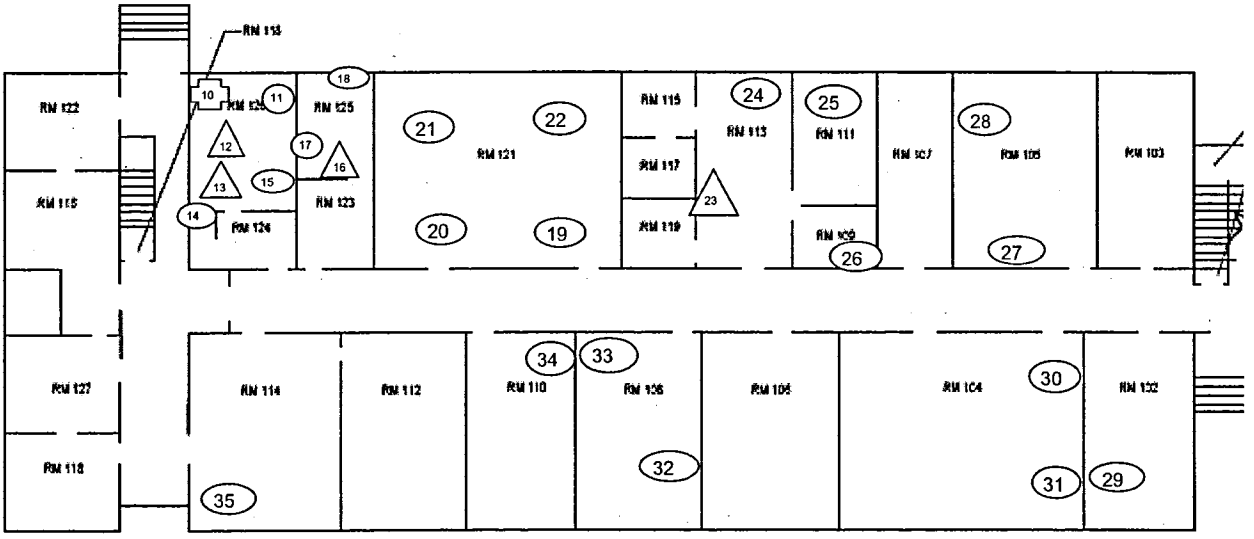
RADIATION/CONTAMINATION SURVEY FORM Page 1 of 3

Date: Time:	INSTRUMENTATION USED						
	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
9/24/2007 09:00							
Survey Number: RSRS-Bldg-233-pipes-092407							
	2360	177117	8/28/2008	α 29.50%	α 7.38%	α 51.53	α 10.76
Location: Building 233	43-68	95526		βγ 34.55%	βγ 8.64%	βγ 351.56	βγ 1148.55
	2929	182585	4/16/2008	α 66.90%	α 16.73%	α 4.33	α 2.99
Surveyor: S.Rolfe/T.Standfuss				βγ 54.20%	βγ 13.55%	βγ 43.32	βγ 517.34
	2350-1	126182	8/28/2008				5426
Reviewed By:	44-10	230620					Kcpm
Isotopes of Concern: ^{226}Ra ^{137}Cs							
Survey Type: Building Release	2360 Static Count Time: 2 Minutes				2350 Static Count Time: 1 Minute		
Description of survey: Pipes and Drain Lines							

FIRST FLOOR



Comments:

○	Urinal Drain Trap
⬭	Sink Drain
△	Floor Drain
✚	Shower Drain

Wipes were taken in all of the drains and pipes and 2 min. alpha/beta statics were performed.

Gamma ststics were taken directly on drains and pipes.

Smears were taken on inside of pipes and drains.

See Photo Page for 1-9 on second floor and Sewer lines.

(#) Shape denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

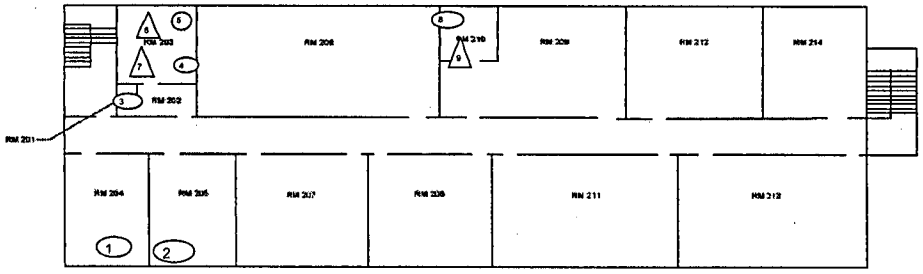
#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

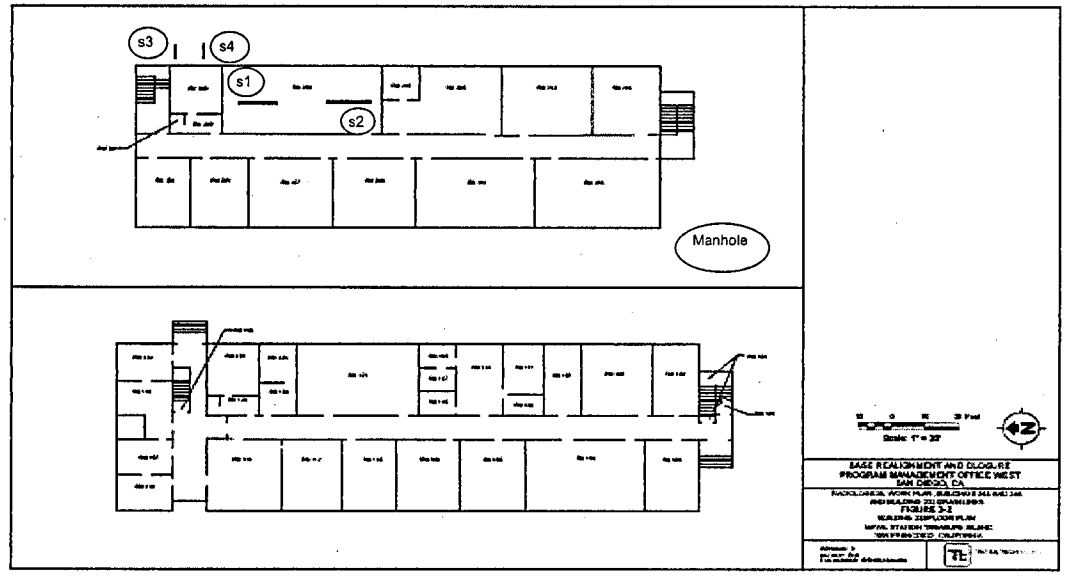
\+ Unless Otherwise Noted

All readings in µR/hr unless otherwise noted

SECOND FLOOR



Legend:
- Urinal Trap
- Sink Drain
- Floor Drain



RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: RSRS-Bldg-233-pipes-092407

SURVEYOR: S.Rolfe/T.Standfuss

LOCATION: Building 233

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1			3587	-10.76	-211.33	-0.75	-19.25	
2			3862	0.00	-220.52	-0.25	-18.63	
3			3926	-5.38	-289.44	-0.75	-17.40	
4			3947	-10.76	-188.36	0.25	-7.56	
5			4155	0.00	-257.28	-0.75	-9.41	
6			3101	0.00	-271.06	-0.75	-12.48	
7			4166	0.00	-234.31	-0.75	-13.71	
8			4087	-10.76	-468.61	-0.75	-17.40	
9			2704	10.76	-390.51	-0.25	-12.48	
10			6018	-10.76	-27.57	0.25	-15.56	
11			5562	-10.76	-36.75	-0.25	-24.78	
12			8457	-10.76	-55.13	-0.75	-32.16	
13			5497	-5.38	-87.29	0.25	-24.78	
14			5017	0.00	-4.59	-0.25	-24.17	
15			5908	0.00	-78.10	-0.75	-29.70	
16			4805	-10.76	-101.07	-0.25	-14.94	
17			5216	-10.76	18.38	-0.75	-11.25	
18			5553	5.38	-64.32	-0.75	-18.02	
19			5447	-10.76	-110.26	-0.75	-28.47	
20			5351	-10.76	-59.72	0.25	-13.71	
21			5667	-10.76	-248.09	-0.25	-18.02	
22			5920	-5.38	-206.74	-0.75	-20.48	
23			6121	-10.76	0.00	-0.75	-25.40	
24			5128	0.00	-119.45	-0.25	-45.08	
25			5234	0.00	-229.71	-0.75	-5.72	
26			5218	-10.76	-252.68	-0.75	-29.09	
27			5929	-5.38	-160.80	-0.75	-11.25	
28			5485	-10.76	-165.39	-0.75	-21.71	
29			4826	-10.76	-87.29	-0.75	-22.32	
30			5286	-5.38	-229.71	-0.25	-25.40	
31			5351	0.00	-128.64	0.75	4.74	
32			4692	0.00	-156.20	-0.75	-10.02	
33			5155	0.00	-294.03	-0.75	-16.79	
34			4781	-10.76	-211.33	-0.25	-23.55	
35			4567	-5.38	-202.15	-0.75	-18.63	

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: RSRS-Bldg-233-pipes-092407

SURVEYOR: S.Rolfe/T.Standfuss

LOCATION: Building 233

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
36			5541	-10.76	-64.32	1.25	-13.10	
37			5635	-10.76	-335.38	-0.75	-25.40	
38			6680	0.00	-179.17	0.25	-15.56	
39			5332	-5.38	-280.25	-0.75	-6.95	

Reviewer: Brian Hodson

Date: 9/30/2007

Time:

RSO/RTM: Doug E. DeLong

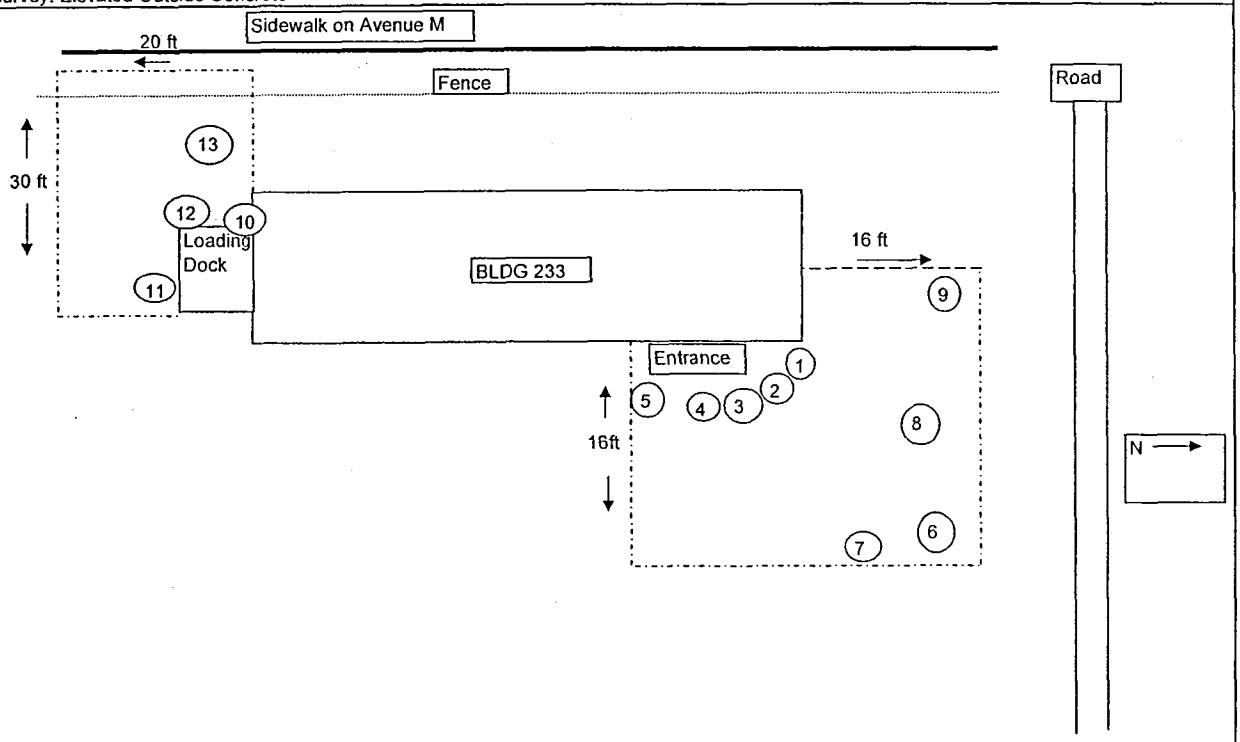
Date: 9/30/2007

Time:

RADIATION/CONTAMINATION SURVEY FORM Page 1 of 2

Date: Time:	INSTRUMENTATION USED						
	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
9/27/2007 09:00							
Survey Number: RSRS-Bldg-233-Outside Concrete							
Location: Building 233							
Surveyor: S.Rolfe/T.Standfuss							
Reviewed By: B Henderson	2350-1 44-10	126182 230620	8/28/2008				5710 Kcpm
Isotopes of Concern: ^{226}Ra							
Survey Type: Building Release	2360 Static Count Time: N/A Minutes				2350 Static Count Time: 1 Minute		

Description of survey: Elevated Outside Concrete



Comments:

Only Gamma Scans and Statics were performed.

Elevated readings were found in all of the lined out areas including area outside fence. Gamma scans were 9-12 Kcpm.

(#) Shape denotes swipe location or fixed gamma readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

\+ Unless Otherwise Noted

All readings in µR/hr unless otherwise noted

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: RSRS-Bldg-233-Outside Concrete-092707

SURVEYOR: S.Rolfe/T.Standfuss

LOCATION: Building 233

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1			53639					
2			30722					
3			19564					
4			28782					
5			15203					
6			21408					
7			22300					
8			34665					
9			16563					
10			24104					
11			66844					
12			55102					
13			77944					

Reviewer	Date: 9/28/2007	RSO/RTM	Date: September 28, 2007
	Time: 1710		Time: 1740

APPENDIX D

LABORATORY DATA QUALITY CONTROL EVALUATION

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0021

APPENDIX D

FINAL

LABORATORY DATA QUALITY CONTROL EVALUATION

October 31, 2008

BUILDING 233
NAVAL STATION TREASURE ISLAND
TREASURE ISLAND, CALIFORNIA

DCN: ECSD-2201-0021-0009

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, California 92101-8536

Cliff Stephan

Brian Maidrand
Project Manager

TABLE OF CONTENTS

PAGE

ABBREVIATIONS AND ACRONYMS.....D.iii

1.0 LABORATORY DATA QUALITY CONTROL EVALUATION.....D.1-1
1.1 FIELD QUALITY CONTROL SAMPLING OBJECTIVES.....D.1-1
1.1.1 Laboratory Duplicate.....D.1-1
1.1.2 Source Blank.....D.1-2
1.1.3 Equipment Blank.....D.1-2
1.1.4 Trip Blanks.....D.1-2
1.2 ANALYTICAL DATA QUALITY OBJECTIVES.....D.1-2
1.2.1 Precision and Accuracy.....D.1-2
1.2.2 Representativeness.....D.1-4
1.2.3 Completeness.....D.1-4
1.2.4 Comparability.....D.1-4
1.3 OVERALL ASSESSMENT OF DATA.....D.1-4

2.0 REFERENCES.....D.2-1

TABLES

Table D.1-1 Summary of Analytical Results

ATTACHMENT

Attachment A Chain-of-Custody Records, Laboratory Analytical Results, and Data Validation Reports

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ABBREVIATIONS AND ACRONYMS

%R	percent recovery
DoD	Department of Defense
EPA	U.S. Environmental Protection Agency
ICP	inductively coupled plasma
MDA	minimum detectable activity
MS/MSD	matrix spike/matrix spike duplicate
QC	quality control
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SWDIV	Southwest Division Naval Facilities Engineering Command
TtEC	Tetra Tech EC, Inc.
VOC	volatile organic compound

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1.0 LABORATORY DATA QUALITY CONTROL EVALUATION

This Quality Control (QC) appendix was prepared to evaluate the implementation of the sampling and analytical procedures detailed in the Sampling and Analysis Plan (SAP) in Appendix A of the *Radiological Work Plan Building 343, 344 and Building 233 Drain Lines, Naval Station Treasure Island, San Francisco, California* (Tetra Tech EC, Inc. [TtEC], 2007). The sampling scope of work included radiological sampling to determine if radiological contamination is present in Building 233 at Naval Station Treasure Island.

Samples were analyzed by Eberline Services for radiological analysis. Eberline Services is a state of California-certified and Navy-evaluated laboratory. Subsequently, a third-party validation company, Laboratory Data Consultants, performed data validation on all sample analyses except for waste characterization sample results. The validation was conducted in accordance with *Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical Data Validation* (Southwest Division Naval Facilities Engineering Command [SWDIV], 2001), the SAP (TtEC, 2007), and the *Quality Systems Manual for Environmental Laboratories* (Department of Defense [DoD], 2006), and the criteria specified in the SAP (TtEC, 2007). Ten percent of the samples were validated in accordance with an U.S. Environmental Protection Agency (EPA) Level IV-equivalent protocol. The remainder of the samples was validated with an EPA Level III-equivalent protocol.

The summary of analytical results from the sampling activities is presented in Table D.1-1. The chain-of-custody records, laboratory analytical results, and data validation reports are included in Attachment A.

The following sections describe the fulfillment of the field QC sampling objectives and analytical QC objectives for this project.

1.1 FIELD QUALITY CONTROL SAMPLING OBJECTIVES

Field QC samples were not required per the SAP (TtEC, 2007) except for a laboratory duplicate sample as indicated in the following sections.

1.1.1 Laboratory Duplicate

Laboratory duplicates samples are performed by preparing an additional aliquot of the same sample for analysis. This duplicate sample is carried through the complete sample preparation process along with the other samples in the batch. The relative percent difference (RPD) values from the original and duplicate results are calculated to evaluate the analytical precision of the method. One laboratory duplicate sample is routinely analyzed for every 20 samples. The RPDs for the laboratory duplicates for this project were within the specified QC limits (<30%) as described in the SAP (TtEC, 2007).

1.1.2 Source Blank

A source blank consists of analyte-free, reagent-grade water provided by the laboratory to be used for the collection of equipment blank samples. Source blank samples were not collected since equipment blank samples were not collected for this project

1.1.3 Equipment Blank

The equipment blank sample evaluates the effectiveness of the decontamination procedure and is required to be collected at a frequency of one per day if nondisposalable sampling equipment is used. Equipment blank samples are analyte-free water collected from the final rinse during the decontamination process and analyzed for the same analytes as the original samples. (Equipment blank samples are not required for waste characterization samples.)

Field samples were collected using disposable sampling equipment for this project. Therefore, decontamination of sample equipment was not required, and equipment blank samples were not collected.

1.1.4 Trip Blanks

Trip blanks are prepared by the laboratory, carried into the field, and stored with groundwater samples for volatile organic compound (VOC) analysis. Trip blanks are used to determine if samples have been cross-contaminated with VOCs during sample collection and transportation to the laboratory. Trip blanks were not required for this project since VOC samples were not collected.

1.2 ANALYTICAL DATA QUALITY OBJECTIVES

The following sections describe the fulfillment of the analytical data quality objectives in terms of precision, accuracy, representativeness, completeness, and comparability parameters, as described in the SAP (TtEC, 2007).

1.2.1 Precision and Accuracy

In accordance with the analytical methods, the *Quality Systems Manual for Environmental Laboratories* (DoD, 2006), and the SAP (TtEC, 2007) specifications, the following parameters were assessed as applicable by the third-party validation company as applicable to analyses:

- Technical holding times
- Instrument performance checks
- Initial and continuing calibration verifications
- Method blanks
- Laboratory control samples

- Target compound identification
- Compound quantitation
- System performance

1.2.1.1 Technical Holding Times

Sample analysis holding times are not defined for radiological analyses; however, 6 months is used as an industry standard for holding time for radiological analysis, calculated from the time of sample collection to analysis. All sample analyses for this project were within the 6 month timeframe.

1.2.1.2 Instrument Performance Checks

Instrument performance checks were completed, and all QC requirements (±3 standard deviation of the average) were met.

1.2.1.3 Initial and Continuing Calibration Verifications

Percent relative standard deviations are calculated for the initial and continuing calibration verification check standards, and all values were within QC requirements (±3 standard deviation of the average).

1.2.1.4 Method Blanks

Sample concentrations were compared to concentrations detected in the method blanks. For sample concentrations either not detected or less than 5 times blank contaminant concentrations, associated results were flagged "U" (not detected). For sample concentrations detected but greater than 5 times blank contaminant concentrations, sample results were not affected. All method blank results were not detected except for the blank associated with sample ID 21-001-MH for Pb-210. Therefore, the qualifier for Pb-210 was revised from 1.84 B to 1.84 U for not detected.

1.2.1.5 Laboratory Control Samples

Laboratory control samples were within QC limits of 75-125 percent as defined in the SAP (TtEC, 2007).

1.2.1.6 Target Compound Identification

All target analytes were correctly identified.

1.2.1.7 Compound Quantitation

Compound quantitations are not applicable to radiological analysis.

1.2.1.8 System Performance

System performance met all QC requirements, and no discrepancies were reported.

1.2.2 Representativeness

Representative data were obtained through selection of sampling locations and analytical parameters to meet the data quality objectives of this project. Proper collection and handling of samples, and the use of established field and laboratory procedures as described in the SAP (TtEC, 2007) were followed.

1.2.3 Completeness

The percent completeness is defined as the percentage of measurements that are judged to be valid. The completeness goal is to generate a sufficient amount of valid data to meet project objectives. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with an "R" flag for rejected. The requirement for completeness is 95 percent for soil and water samples. The percent completeness for soil and water samples is 100 percent for this project, thereby meeting the completeness goals for this project.

1.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data should be comparable with other measurements for similar samples and sample conditions. The objective for the QC program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats.

For this project, sample collection, handling, and analysis were performed in accordance with the SAP (TtEC, 2007), and thereby no deviations from field or analytical procedures are noted.

1.3 OVERALL ASSESSMENT OF DATA

The data collected during field activities is valid and usable and has been qualified for analytical parameters that did not meet criteria as described in Section 1.2. All samples were collected in accordance to the criteria listed in the SAP (TtEC, 2007).

For this report, the qualified data was from method blank contamination where the result was above the minimum detectable activity for gamma spectroscopy analysis. The result for Lead-210 was qualified as "U" for not detected.

All results were qualified based on the SAP (TtEC, 2007) and the Quality Systems Manual (DoD, 2006). The analytes were found to be of appropriate quality to support the data evaluation detailed in this report.

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2.0 REFERENCES

Department of Defense (DoD). 2006. *Quality Systems Manual for Environmental Laboratories.*

Southwest Division (SWDIV). 2001. *Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical Data Validation.*

Tetra Tech EC, Inc. (TtEC). 2007. *Sampling and Analysis Plan (SAP), Radiological Work Plan Building 343, 344 and Building 233 Drain Lines, Naval Station Treasure Island, San Francisco, California.*

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TABLES

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TABLE D.1-1

SUMMARY OF ANALYTICAL RESULTS

	Sample Number:		21-001-MH		021-124-ST-001		021-233-SL-002S		021-233-SL-001N		021-121-SL-005		021-121-SL-006	
	Sample Date:		9/18/2007		9/24/2007		9/25/2007		9/25/2007		9/26/2007		9/26/2007	
Analyte	**Units**	**Method**												
Actinium-228	pCi/g	EPA 901.1	0.305	U	0.884	U	0.523	U	0.211	U	0.682	U	0.799	U
Americium-241	pCi/g	EPA 901.1	0.062	U	0.753	U	0.101	U	0.057	U	0.232	U	0.667	U
Bismuth-212	pCi/g	EPA 901.1	0.828	U	2.40	U	1.48	U	0.548	U	2.23	U	2.51	U
Bismuth-214	pCi/g	EPA 901.1	0.844		0.520		3.15		2.03		0.361	U	0.382	U
Cobalt-60	pCi/g	EPA 901.1	0.056	U	0.457	U	0.121	U	0.054	U	0.166	U	0.197	U
Cesium-137	pCi/g	EPA 901.1	0.120		0.202	U	0.118	U	0.041	U	0.164	U	0.187	U
Europium-152	pCi/g	EPA 901.1	0.483	U	1.43	U	0.931	U	0.313	U	1.05	U	1.39	U
Europium-154	pCi/g	EPA 901.1	0.186	U	0.499	U	0.350	U	0.138	U	0.442	U	0.476	U
Potassium-40	pCi/g	EPA 901.1	7.46		4.82	U	2.75	U	0.845	U	1.84		2.95	
Protactinium-234m	pCi/g	EPA 901.1	9.40	U	28.9	U	20	U	7.16	U	111	U	28.9	U
Lead-210	pCi/g	EPA 901.1	1.84	U	18	U	3.48		1.96		3.39		15.5	U
Lead-212	pCi/g	EPA 901.1	0.392		0.322	U	0.182	U	0.089	U	0.320	U	0.273	U
Lead-214	pCi/g	EPA 901.1	0.863		0.703		3.62		2.38		0.506	U	0.362	U
Radium-226	pCi/g	EPA 901.1	0.820		0.505		3.06		1.97		0.351	U	0.371	U
Thorium-230	pCi/g	EPA 901.1	4.96	U	30.8	U	6.34	U	3.9	U	16.1	U	27.7	U
Thorium-232	pCi/g	EPA 901.1	0.322		1.46	U	0.523	U	0.241		0.682	U	0.799	U
Thorium-234	pCi/g	EPA 901.1	0.035	U	0.117	U	0.041	U	0.024	U	0.236	U	0.114	U
Thallium-208	pCi/g	EPA 901.1	0.089		0.208	U	0.127	U	0.048	U	0.209	U	0.183	U
Uranium-235	pCi/g	EPA 901.1	0.236	U	0.734	U	0.403	U	0.188	U	1.09	U	0.730	U

Abbreviations and Acronyms:

EPA – U.S. Environmental Protection Agency
pCi/g – picocurie per gram
U – not detected

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ATTACHMENT A

CHAIN-OF-CUSTODY RECORDS, LABORATORY ANALYTICAL RESULTS, AND DATA VALIDATION REPORTS

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Eberline Services – Richmond

8808

037 **Chain of Custody**

CLIENT: T+EC - SAN DIEGO

ADDRESS: 12630 Columbia St.
San Diego CA 92101

PROJECT: CTO 021 TREASURE ISLAND
RAD SURVEY

SAMPLERS SIGNATURE: J. Dennett

PURCHASE ORDER NO. #1017112

DATE 9/19/7 PAGE 1 OF 1

TAT (IN DAYS) 21

OBSERVATIONS, COMMENTS, VOLUMES, SPECIAL OR ADDITIONAL TEST
R709115-
8808

PARAMETERS

SAMPLE NO.	DATE	TIME	LOCATION	EPA 901 1 M (SOIL)	gamma spec.										SAMPLE TYPE OR MATRIX (SOIL)	# CONTAINERS	
21-001-MH	9-18-07	15:10	TREASURE ISLAND	1											8oz GLASS AMBER	1	Level III

1) RELINQUISHED BY / DATE: 8/19/07	2) RECEIVED BY / DATE:	3) RELINQUISHED BY / DATE:	4) RECEIVED BY / DATE:	TOTAL NO. OF CONTAINERS: 1
COMPANY: J. Dennett T+ECI	Mel Moran 09/19/7 COMPANY: Eberline	COMPANY:	COMPANY:	METHOD OF SHIPMENT: DELIVERY
5) RELINQUISHED BY / DATE:	6) RECEIVED BY / DATE:	7) RELINQUISHED BY / DATE:	8) RECEIVED BY / DATE:	SPECIAL SHIPMENT-HANDLING, STORAGE REQUIREMENTS, OR POSSIBLE HAZARDS
COMPANY:	COMPANY:	COMPANY:	COMPANY:	

2030 Wright Avenue P.O. Box 4040 Richmond, CA 94804-0040 (510) 235-2633 FAX No. (510) 235-0438

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8808

8808-001 21-001-MH

DATA SHEET

SDG	8808	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709115-01	Client sample id	21-001-MH
Dept sample id	8808-001	Location/Matrix	Treasure Island SOIL
Received	09/19/07	Collected/Weight	09/18/07 15:10 222 g
% moisture	18.0	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	7.46	1.5	0.591			GAM
Cobalt-60	10198-40-0	U		0.056	0.036	U	GAM
Cesium-137	10045-97-3	0.120	0.054	0.058	0.113		GAM
Europium-152	14683-23-9	U		0.483	0.130	U	GAM
Europium-154	15585-10-1	U		0.186	0.230	U	GAM
Thallium-208	14913-50-9	0.089	0.065	0.073			GAM
Lead-210	14255-04-0	1.84	0.62	0.701		B	GAM
Bismuth-212	14913-49-6	U		0.828		U	GAM
Lead-212	15092-94-1	0.392	0.091	0.078			GAM
Bismuth-214	14733-03-0	0.844	0.18	0.114			GAM
Lead-214	15067-28-4	0.863	0.18	0.137			GAM
Radium-226	13982-63-3	0.820	0.18	0.111	1.00		GAM
Actinium-228	14331-83-0	U		0.305		U	GAM
Thorium-230	14269-63-7	U		4.96		U	GAM
Thorium-232	7440-29-1	0.322	0.25	0.272	1.69		GAM
Protactinium-234m	378783-76-7	U		9.40		U	GAM
Thorium-234	15065-10-8	U		0.035		U	GAM
Uranium-235	15117-96-1	U		0.236	0.195	U	GAM
Americium-241	14596-10-2	U		0.062		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Tetra Tech EC, Inc.
1940 E. Deere Avenue, Suite 200
Santa Ana, CA 92705
ATTN: Ms. Sabina Sudoko

November 20, 2007

SUBJECT: Treasure Island, CTO 021, Data Validation

Dear Ms. Sudoko,

Enclosed is the final validation report for the fraction listed below. This SDG was received on November 15, 2007. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 17826:

SDG #	Fraction
R709115-8808	Gamma Spectroscopy

The data validation was performed under EPA Level III guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998

Please feel free to contact us if you have any questions.

Sincerely,

ERauto

Erlinda T. Rauto
Operations Manager/Senior Chemist

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Treasure Island, CTO 021

Collection Date: September 18, 2007

LDC Report Date: November 19, 2007

Matrix: Soil

Parameters: Gamma Spectroscopy

Validation Level: EPA Level III

Laboratory: Eberline Services

Sample Delivery Group (SDG): R709115-8808

Sample Identification

21-001-MH
21-001-MHDUP

Introduction

This data review covers 2 soil samples listed on the cover sheet. The analyses were per EPA Method 901.1 for Gamma Spectroscopy.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the isotope was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the isotope was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination was performed at the required frequencies.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA) with the following exceptions:

Method Blank ID	Sampling Date	Isotope	Concentration	Associated Samples
PBS	9/18/07	Pb-210	196 pCi/g	All samples in SDG R709115-8808

Sample concentrations were compared to concentrations detected in the method blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated method blanks with the following exceptions:

Sample	Isotope	Reported Concentration	Modified Final Concentration
21-001-MH	Pb-210	1.84 pCi/g	1.84U pCi/g

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicates

A matrix spike (MS) analysis was not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Relative percent differences (RPD) were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been summarized.

VIII. Field Duplicates

No field duplicates were identified in this SDG.

IX. Field Blanks

No field blanks were identified in this SDG.

Treasure Island, CTO 021
Gamma Spectroscopy - Data Qualification Summary - SDG R709115-8808

No Sample Data Qualified in this SDG

Treasure Island, CTO 021
Gamma Spectroscopy - Laboratory Blank Data Qualification Summary - SDG R709115-8808

SDG	Sample	Isotope	Modified Final Concentration	A or P
R709115-8808	21-001-MH	Pb-210	1.84U pCi/g	A

LDC #: 17826A35
SDG #: R709115-8808
Laboratory : Eberline Services

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 11-19-07
Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Gamma Spectroscopy (EPA Method 901.1)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 9-18-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	SW	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVb.	Laboratory control samples	A	LCS
V.	Minimum dectectable activity (MDA)	A	
VI.	Sample result verification	N	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	N	
IX.	Field blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples:
soil

1	21-001-MH	11		21		31	
2	21-001-MHDUP	12		22		32	
3	PBS	13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: 21 day set was validated

LDC #: 17826A35
SDG #: R709115-8808

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: MG
2nd Reviewer: LA

METHOD: Radiochemistry (Method: 901.1)

(Y) N N/A Were blank analyses performed as required? If no, please see qualifications below.
(Y) N N/A Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see qualifications below.

Units: pCi/g Associated Samples: all

Isotope	Blank ID	Blank Action Level	Sample Identification									
	PBS		1									
Pb-210	196.	980.	1.84									

Units: Associated Samples:

Isotope	Blank ID	Blank Action Level	Sample Identification									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
If there is activity in the blank above the MDA, sample results within 10x the blank activity will be qualified as not detected "U".

Eberline Services – Richmond

039

Chain of Custody

CLIENT: TETRATECH EC

ADDRESS: 1230 COLUMBIA STREET, SUITE 750
SAN DIEGO, CA 92101

PROJECT: CTO 021 TREASURE ISLAND

CONTACT: SABINA SUDIKO 949-756-7545

SAMPLERS SIGNATURE:

PURCHASE ORDER NO. 107112

DATE 9/26/07 PAGE 1 OF 1

TAT (IN DAYS) (5) AND (21)

SAMPLE NO.	DATE	TIME	LOCATION	EPA 901.1 M (RADIONUCLIDES BY GAMMA SPEC) 5/21 days of	SAMPLE TYPE OR MATRIX	# CONTAINERS	OBSERVATIONS, COMMENTS, VOLUMES, SPECIAL OR ADDITIONAL TEST
✓ 021-124-ST-001	9-24-07	10:15	BLDG 233, ROOM 124	X	SOIL/DEBRIS	1	REPORT RESULTS DOWN TO MDL & "J" FLAG
✓ 021-233-SL-002	9-25-07	14:22	BLDG 233, OUTSIDE	X	SOIL/DEBRIS	1	ANY RESULTS BETWEEN
✓ 021-233-SL-001	9-25-07	14:30	BLDG 233, OUTSIDE	X	SOIL/DEBRIS	1	RL AND MDL FOR
✓ 021-121-SL-005	9-26-07	08:30	BLDG 233, ROOM 121	X	SOIL/DEBRIS	1	ALL SAMPLES.
✓ 021-121-SL-006	9-26-07	08:45	BLDG 233, ROOM 121	X	SOIL/DEBRIS	1	LEVEL III QC

1) RELINQUISHED BY / DATE:	2) RECEIVED BY / DATE:	3) RELINQUISHED BY / DATE:	4) RECEIVED BY / DATE:	TOTAL NO. OF CONTAINERS: 5
COMPANY: 9/27/07	Melissa Marin Eberline Services COMPANY: 9/27/07	COMPANY:	COMPANY:	METHOD OF SHIPMENT:
5) RELINQUISHED BY / DATE:	6) RECEIVED BY / DATE:	7) RELINQUISHED BY / DATE:	8) RECEIVED BY / DATE:	SPECIAL SHIPMENT-HANDLING, STORAGE REQUIREMENTS, OR POSSIBLE HAZARDS
COMPANY:	COMPANY:	COMPANY:	COMPANY:	

2030 Wright Avenue P.O. Box 4040 Richmond, CA 94804-0040 (510) 235-2633 FAX No. (510) 235-0438

Eberline Services – Richmond

040 **Chain of Custody**

CLIENT: TETRATECH EC

ADDRESS: 1230 COLUMBIA STREET, SUITE 750
SAN DIEGO, CA 92101

PROJECT: CTO 021 TREASURE ISLANDS

CONTACT: SABINA SUDOKO 949-756 7545

SAMPLERS SIGNATURE: [signature]

PURCHASE ORDER NO. 1017112

DATE 9/27/07 PAGE 1 OF 1

(5) AND

TAT (IN DAYS) (21)

PARAMETERS

SAMPLE NO.	DATE	TIME	LOCATION	EPA 901.1 M (RADIONUCLIDES) BY GAMMA SPEC	5/21 decay CT	SAMPLE TYPE OR MATRIX	# CONTAINERS	OBSERVATIONS, COMMENTS, VOLUMES, SPECIAL OR ADDITIONAL TEST
021-344-CL-001	9-26-07	15:35	BLDG 544, CEILING			SOLID (CONCRETE)	1	R709160-8811 REPORT RESULTS DOWN TO MDL AND FLAG ANY RESULTS BETWEEN RL AND MDL FOR ALL SAMPLES LEVEL III QC

1) RELINQUISHED BY / DATE:	2) RECEIVED BY / DATE:	3) RELINQUISHED BY / DATE:	4) RECEIVED BY / DATE:	TOTAL NO. OF CONTAINERS: 1
COMPANY: [signature] 9/27/07	Melissa Magan Eberline Services COMPANY: 9/27/07	COMPANY:	COMPANY:	METHOD OF SHIPMENT:
5) RELINQUISHED BY / DATE:	6) RECEIVED BY / DATE:	7) RELINQUISHED BY / DATE:	8) RECEIVED BY / DATE:	SPECIAL SHIPMENT-HANDLING, STORAGE REQUIREMENTS, OR POSSIBLE HAZARDS
COMPANY:	COMPANY:	COMPANY:	COMPANY:	

2030 Wright Avenue P.O. Box 4040 Richmond, CA 94804-0040 (510) 235-2633 FAX No. (510) 235-0438

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-001 021-124-ST-001

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-01	Client sample id	021-124-ST-001
Dept sample id	8811-001	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/24/07 10:15 48 g
% moisture	3.4	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALIFIERS	TEST
Potassium-40	13966-00-2	U		4.82		U	GAM
Cobalt-60	10198-40-0	U		0.457	0.036	U	GAM
Cesium-137	10045-97-3	U		0.202	0.113	U	GAM
Europium-152	14683-23-9	U		1.43	0.130	U	GAM
Europium-154	15585-10-1	U		0.499	0.230	U	GAM
Thallium-208	14913-50-9	U		0.208		U	GAM
Lead-210	14255-04-0	U		18.0		U	GAM
Bismuth-212	14913-49-6	U		2.40		U	GAM
Lead-212	15092-94-1	U		0.322		U	GAM
Bismuth-214	14733-03-0	0.520	0.50	0.442			GAM
Lead-214	15067-28-4	0.703	0.45	0.455			GAM
Radium-226	13982-63-3	0.505	0.49	0.429	1.00		GAM
Actinium-228	14331-83-0	U		0.884		U	GAM
Thorium-230	14269-63-7	U		30.8		U	GAM
Thorium-232	7440-29-1	U		1.46	1.69	U	GAM
Protactinium-234m	378783-76-7	U		28.9		U	GAM
Thorium-234	15065-10-8	U		0.117		U	GAM
Uranium-235	15117-96-1	U		0.734	0.195	U	GAM
Americium-241	14596-10-2	U		0.753		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-002 021-233-SL-002S

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-02	Client sample id	021-233-SL-002S
Dept sample id	8811-002	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/25/07 14:22 116 g
% moisture	2.9	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALIFIERS	TEST
Potassium-40	13966-00-2	U		2.75		U	GAM
Cobalt-60	10198-40-0	U		0.121	0.036	U	GAM
Cesium-137	10045-97-3	U		0.118	0.113	U	GAM
Europium-152	14683-23-9	U		0.931	0.130	U	GAM
Europium-154	15585-10-1	U		0.350	0.230	U	GAM
Thallium-208	14913-50-9	U		0.127		U	GAM
Lead-210	14255-04-0	3.48	1.1	1.29			GAM
Bismuth-212	14913-49-6	U		1.48		U	GAM
Lead-212	15092-94-1	U		0.182		U	GAM
Bismuth-214	14733-03-0	3.15	0.55	0.220			GAM
Lead-214	15067-28-4	3.62	0.63	0.268			GAM
Radium-226	13982-63-3	3.06	0.54	0.214	1.00		GAM
Actinium-228	14331-83-0	U		0.523		U	GAM
Thorium-230	14269-63-7	U		6.34		U	GAM
Thorium-232	7440-29-1	U		0.523	1.69	U	GAM
Protactinium-234m	378783-76-7	U		20.0		U	GAM
Thorium-234	15065-10-8	U		0.041		U	GAM
Uranium-235	15117-96-1	U		0.403	0.195	U	GAM
Americium-241	14596-10-2	U		0.101		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

EBERLINE SERVICES / RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-003 021-233-SL-001N

DATA SHEET

SDG 8811 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1017112

Lab sample id R709160-03 Client sample id 021-233-SL-001N
Dept sample id 8811-003 Location/Matrix Treasure Island SOIL
Received 09/27/07 Collected/Weight 09/25/07 14:30 165 g
% moisture 0.8 Custody/Proj. No. CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		0.845		U	GAM
Cobalt-60	10198-40-0	U		0.054	0.036	U	GAM
Cesium-137	10045-97-3	U		0.041	0.113	U	GAM
Europium-152	14683-23-9	U		0.313	0.130	U	GAM
Europium-154	15585-10-1	U		0.138	0.230	U	GAM
Thallium-208	14913-50-9	U		0.048		U	GAM
Lead-210	14255-04-0	1.96	0.70	0.837			GAM
Bismuth-212	14913-49-6	U		0.548		U	GAM
Lead-212	15092-94-1	U		0.089		U	GAM
Bismuth-214	14733-03-0	2.03	0.34	0.092			GAM
Lead-214	15067-28-4	2.38	0.38	0.106			GAM
Radium-226	13982-63-3	1.97	0.32	0.090	1.00		GAM
Actinium-228	14331-83-0	U		0.211		U	GAM
Thorium-230	14269-63-7	U		3.90		U	GAM
Thorium-232	7440-29-1	0.241	0.17	0.169	1.69		GAM
Protactinium-234m	378783-76-7	U		7.16		U	GAM
Thorium-234	15065-10-8	U		0.024		U	GAM
Uranium-235	15117-96-1	U		0.188	0.195	U	GAM
Americium-241	14596-10-2	U		0.057		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-004 021-121-SL-005

DATA SHEET

SDG 8811 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1017112

Lab sample id R709160-04 Client sample id 021-121-SL-005
Dept sample id 8811-004 Location/Matrix Treasure Island SOIL
Received 09/27/07 Collected/Weight 09/26/07 08:35 46 g
% moisture 3.0 Custody/Proj. No. CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	1.84	1.6	1.49			GAM
Cobalt-60	10198-40-0	U		0.166	0.036	U	GAM
Cesium-137	10045-97-3	U		0.164	0.113	U	GAM
Europium-152	14683-23-9	U		1.05	0.130	U	GAM
Europium-154	15585-10-1	U		0.442	0.230	U	GAM
Thallium-208	14913-50-9	U		0.209		U	GAM
Lead-210	14255-04-0	3.39	1.6	2.13			GAM
Bismuth-212	14913-49-6	U		2.23		U	GAM
Lead-212	15092-94-1	U		0.320		U	GAM
Bismuth-214	14733-03-0	U		0.361		U	GAM
Lead-214	15067-28-4	U		0.506		U	GAM
Radium-226	13982-63-3	U		0.351	1.00	U	GAM
Actinium-228	14331-83-0	U		0.682		U	GAM
Thorium-230	14269-63-7	U		16.1		U	GAM
Thorium-232	7440-29-1	U		0.682	1.69	U	GAM
Protactinium-234m	378783-76-7	U		111		U	GAM
Thorium-234	15065-10-8	U		0.236		U	GAM
Uranium-235	15117-96-1	U		1.09	0.195	U	GAM
Americium-241	14596-10-2	U		0.232		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 11/19/07

EBERLINE SERVICES / RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-005 021-121-SL-006

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-05	Client sample id	021-121-SL-006
Dept sample id	8811-005	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/26/07 08:45 39 g
% moisture	1.9	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	2.95	2.5	1.56			GAM
Cobalt-60	10198-40-0	U		0.197	0.036	U	GAM
Cesium-137	10045-97-3	U		0.187	0.113	U	GAM
Europium-152	14683-23-9	U		1.39	0.130	U	GAM
Europium-154	15585-10-1	U		0.476	0.230	U	GAM
Thallium-208	14913-50-9	U		0.183		U	GAM
Lead-210	14255-04-0	U		15.5		U	GAM
Bismuth-212	14913-49-6	U		2.51		U	GAM
Lead-212	15092-94-1	U		0.273		U	GAM
Bismuth-214	14733-03-0	U		0.382		U	GAM
Lead-214	15067-28-4	U		0.362		U	GAM
Radium-226	13982-63-3	U		0.371	1.00	U	GAM
Actinium-228	14331-83-0	U		0.799		U	GAM
Thorium-230	14269-63-7	U		27.7		U	GAM
Thorium-232	7440-29-1	U		0.799	1.69	U	GAM
Protactinium-234m	378783-76-7	U		28.9		U	GAM
Thorium-234	15065-10-8	U		0.114		U	GAM
Uranium-235	15117-96-1	U		0.730	0.195	U	GAM
Americium-241	14596-10-2	U		0.667		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-006 021-344-CL-001

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-06	Client sample id	021-344-CL-001
Dept sample id	8811-006	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/26/07 15:35 62 g
% moisture	0.9	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		5.74		U	GAM
Cobalt-60	10198-40-0	U		0.256	0.036	U	GAM
Cesium-137	10045-97-3	U		0.225	0.113	U	GAM
Europium-152	14683-23-9	U		1.74	0.130	U	GAM
Europium-154	15585-10-1	U		0.654	0.230	U	GAM
Thallium-208	14913-50-9	U		0.252		U	GAM
Lead-210	14255-04-0	6.87	2.4	2.82			GAM
Bismuth-212	14913-49-6	U		2.96		U	GAM
Lead-212	15092-94-1	U		0.384		U	GAM
Bismuth-214	14733-03-0	U		0.518		U	GAM
Lead-214	15067-28-4	U		0.518		U	GAM
Radium-226	13982-63-3	U		0.503	1.00	U	GAM
Actinium-228	14331-83-0	U		1.05		U	GAM
Thorium-230	14269-63-7	U		12.7		U	GAM
Thorium-232	7440-29-1	U		1.05	1.69	U	GAM
Protactinium-234m	378783-76-7	U		41.2		U	GAM
Thorium-234	15065-10-8	U		0.084		U	GAM
Uranium-235	15117-96-1	U		0.775	0.195	U	GAM
Americium-241	14596-10-2	U		0.194		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Tetra Tech EC, Inc.
1940 E. Deere Avenue, Suite 200
Santa Ana, CA 92705
ATTN: Ms. Sabina Sudoko

November 20, 2007

SUBJECT: Treasure Island, CTO 021, Data Validation

Dear Ms. Sudoko,

Enclosed is the final validation report for the fraction listed below. This SDG was received on November 19, 2007. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 17854:

SDG #	Fraction
R709160-8811	Gamma Spectroscopy

The data validation was performed under EPA Level III guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998

Please feel free to contact us if you have any questions.

Sincerely,

ERauto

Erlinda T. Rauto
Operations Manager/Senior Chemist

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Treasure Island, CTO 021

Collection Date: September 24 through September 26, 2007

LDC Report Date: November 19, 2007

Matrix: Soil

Parameters: Gamma Spectroscopy

Validation Level: EPA Level III

Laboratory: Eberline Services

Sample Delivery Group (SDG): R709160-8811

Sample Identification

021-124-ST-001
021-233-SL-002S
021-233-SL-001N
021-121-SL-005
021-121-SL-006
021-344-CL-001
021-233-SL-001NDUP

Introduction

This data review covers 7 soil samples listed on the cover sheet. The analyses were per EPA Method 901.1 for Gamma Spectroscopy.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the isotope was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the isotope was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination was performed at the required frequencies.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicates

A matrix spike (MS) analysis was not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Relative percent differences (RPD) were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been summarized.

VIII. Field Duplicates

No field duplicates were identified in this SDG.

IX. Field Blanks

No field blanks were identified in this SDG.

Treasure Island, CTO 021
Gamma Spectroscopy - Data Qualification Summary - SDG R709160-8811

No Sample Data Qualified in this SDG

Treasure Island, CTO 021
Gamma Spectroscopy - Laboratory Blank Data Qualification Summary - SDG R709160-8811

No Sample Data Qualified in this SDG

LDC #: 17854A35 **VALIDATION COMPLETENESS WORKSHEET** Date: 11-19-07
SDG #: R709160-8811 Level III Page: 1 of 1
Laboratory : Eberline Services Reviewer: MG
2nd Reviewer: LW

METHOD: Gamma Spectroscopy (EPA Method 901.1)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 9-24-07 through 9-26-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVb.	Laboratory control samples	A	LCS
V.	Minimum dectectable activity (MDA)	A	
VI.	Sample result verification	N	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	N	
IX	Field blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: all soil

1	021-124-ST-001	11		21		31	
2	021-233-SL-002S	12		22		32	
3	021-233-SL-001N	13		23		33	
4	021-121-SL-005	14		24		34	
5	021-121-SL-006	15		25		35	
6	021-344-CL-001	16		26		36	
7	021-233-SL-001NDUP	17		27		37	
8	PBS	18		28		38	
9		19		29		39	
10		20		30		40	

Notes: 21 day set validated

APPENDIX E

PROJECT PHOTOGRAPHS

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PHOTOGRAPH LOG SHEET

Date Submitted: 09-28-07

Roll No.: N/A (Digital)

Contract No.: **N62473-06-D-2201, CTO No. 0021**

Contract Title: **Radiological Surveys Bldg. 343, 344 and drain pipe surveys Bldg. 233, Treasure Island**

Photographer: Jennifer Dessort, PQCM

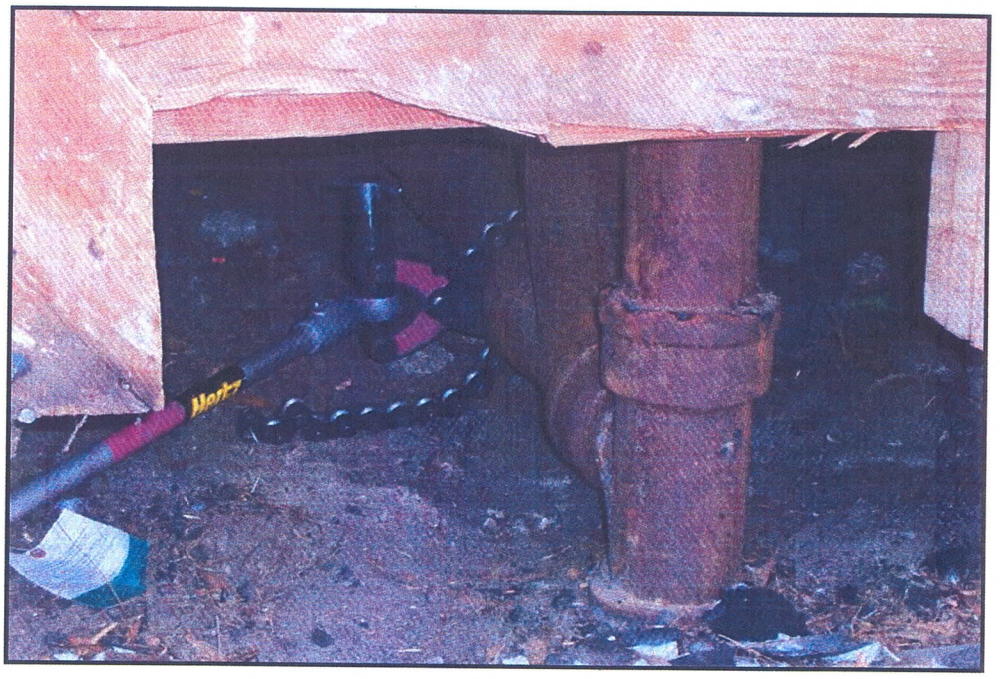
Photo ID	Date	Location/Grid No.	Description/Work No.	Notes
091807_001	9/18/07	Building 233	Manhole	Gamma scan of manhole adjacent to Bldg, 233 prior to sediment sampling
091807_002	9/18/07	Building 233	Manhole	Screening of equipment after sediment sampling
092007_002	9/20/07	Building 233	Scoping survey for drain piping	Sewer line going below ground from building to main connection upgradient from manhole
092107_001	9/21/07	Building 233	Scoping survey for drain piping	Access gained through building siding to sewer line going below ground from building to main connection upgradient from manhole
092107_002	9/21/07	Building 233	Scoping survey for drain piping	Preparing to break sewer line going below ground from building to main connection upgradient from manhole
092107_003	9/21/07	Building 233	Scoping survey for drain piping	Surveying section of broken sewer pipe after breaking sewer line going below ground from building to main connection upgradient from manhole
092407_001	9/24/07	Building 233	Media sampling, piping surveys	Sediment sampling of sink trap in Room 124
092407_002	9/24/07	Building 233	Media sampling, piping surveys	Gamma survey of floor drain in Room 124
092407_003	9/24/07	Building 233	Preliminary scoping survey for drain pipe	Preparing for scoping surveys of drain lines in Room 121
092407_004	9/24/07	Building 233	Preliminary scoping survey for drain pipe	Taking swipe of samples of drain piping in Room 108
092607_001	9/26/07	Building 233	Media sampling, piping surveys	Sampling of drain lines beneath Room 121
092707_002	9/27/07	Building 233	Preliminary scoping survey for drain pipe	Plugging sewer pipe beneath Building 233 after completion of scoping survey with expansive foam
092707_003	9/27/07	Building 233	Preliminary scoping survey for drain pipe	Plugging sink trap in Room 124 after completion of scoping survey with expansive foam
092707_004	9/27/07	Building 233	Preliminary scoping survey for drain pipe	Plugging sewer pipe beneath Building 233 after completion of scoping survey with expansive foam
092807_001	9/28/07	Building 233	Preliminary scoping survey for drain pipe	Closing siding access at exterior of building to sewer pipe beneath Building 233 after completion of scoping survey
092807_003	9/28/06	Building 233	Scoping survey, stairwell and loading bay	Spray paint of statics location and areal extent of scoping survey per RASO instructions, adjacent to Building 233
092807_004	9/28/06	Building 233	Scoping survey, stairwell and loading bay	Spray paint of statics location and areal extent of scoping survey per RASO instructions
092807_005	9/28/06	Building 233	Scoping survey, stairwell and loading bay	Spray paint of statics location and areal extent of scoping survey per RASO instructions

091807-001

091807-002

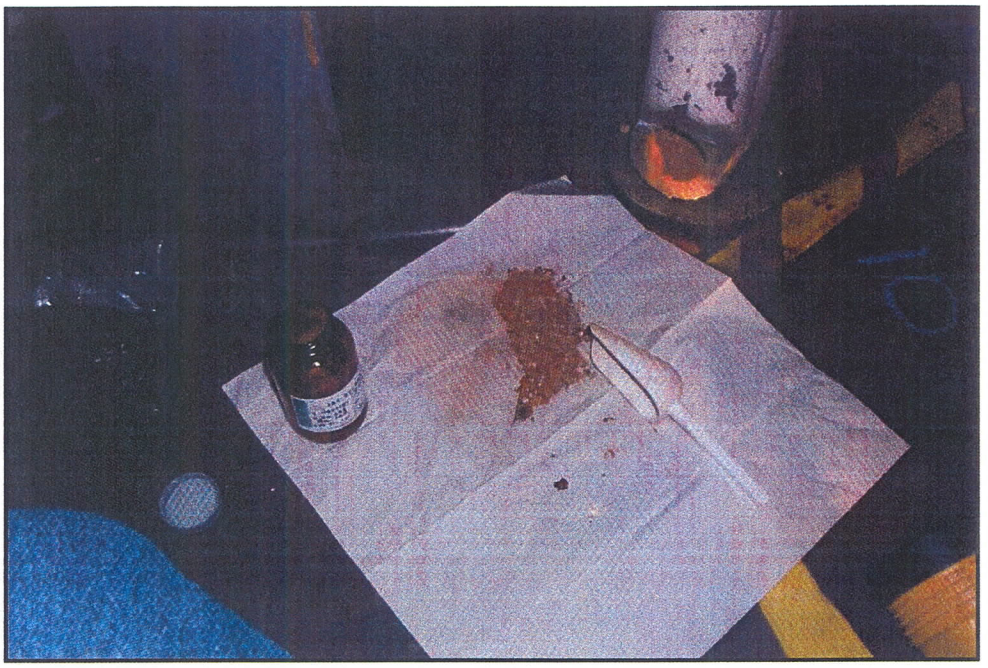
092007_002

092107_001

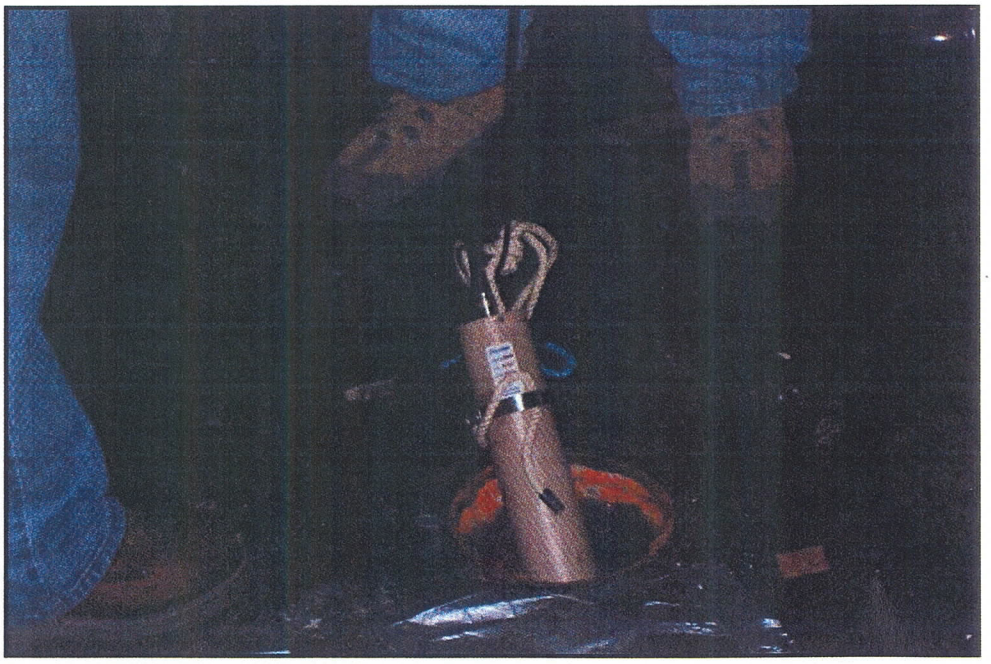


092107_002

092107_003



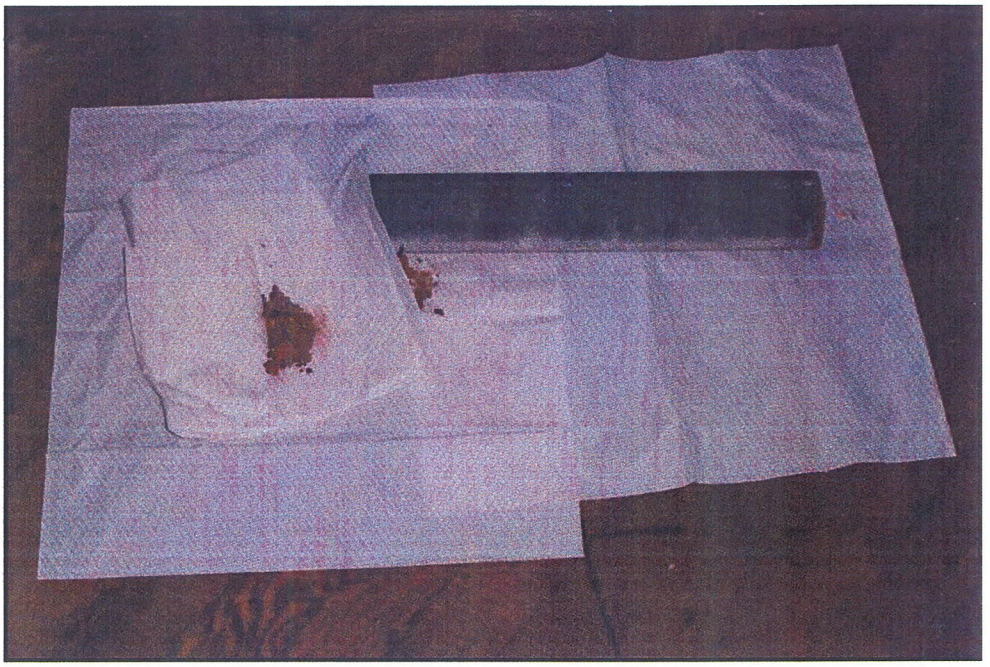
092407_001



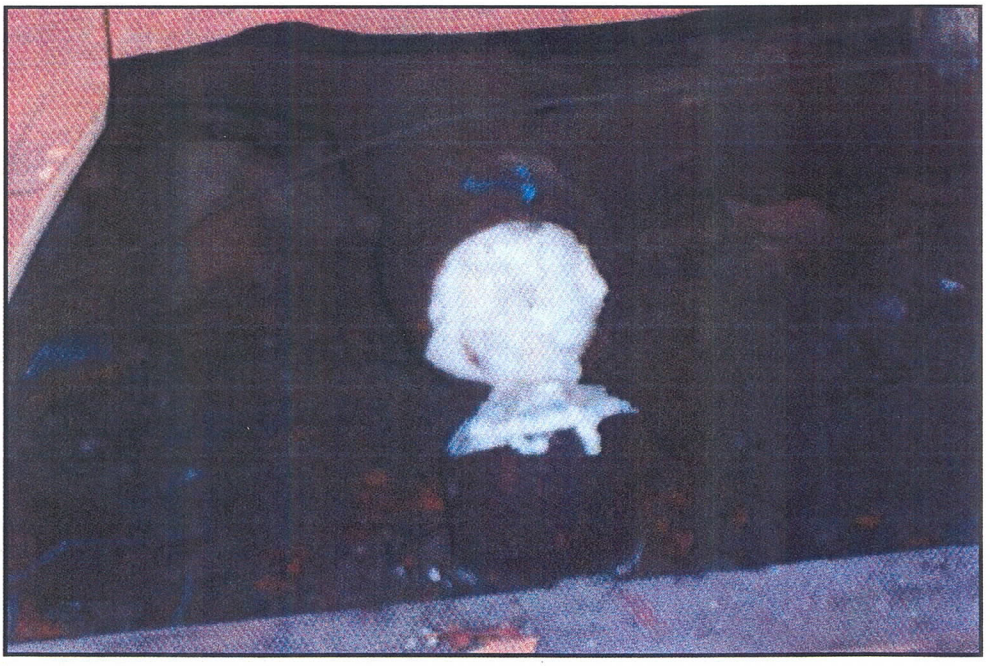
092407_002

092407_003

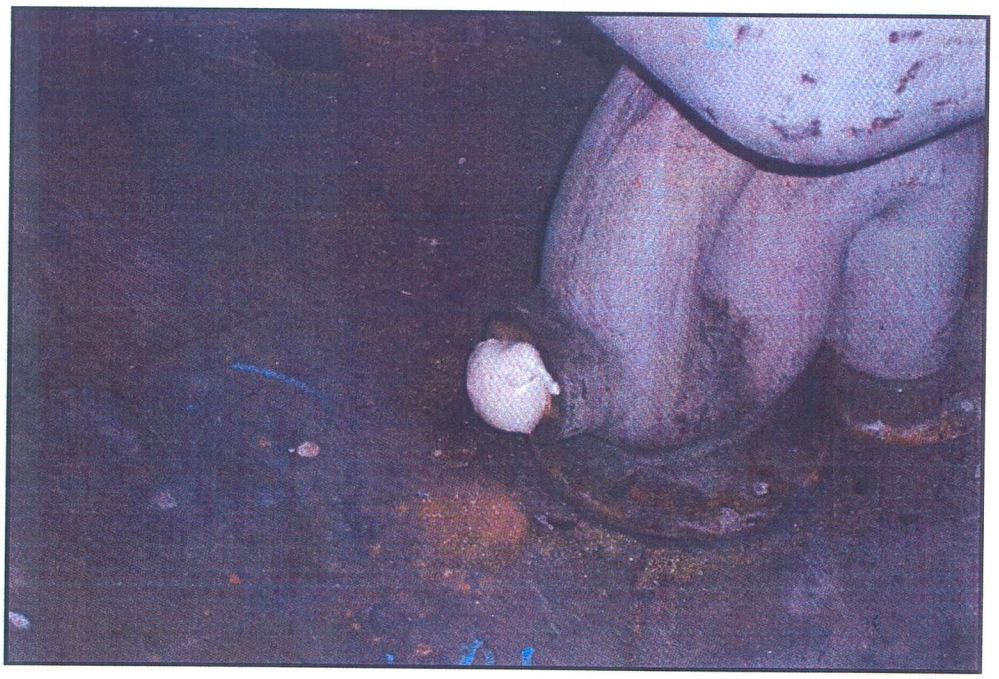
092407_004



092607_001



092707_002

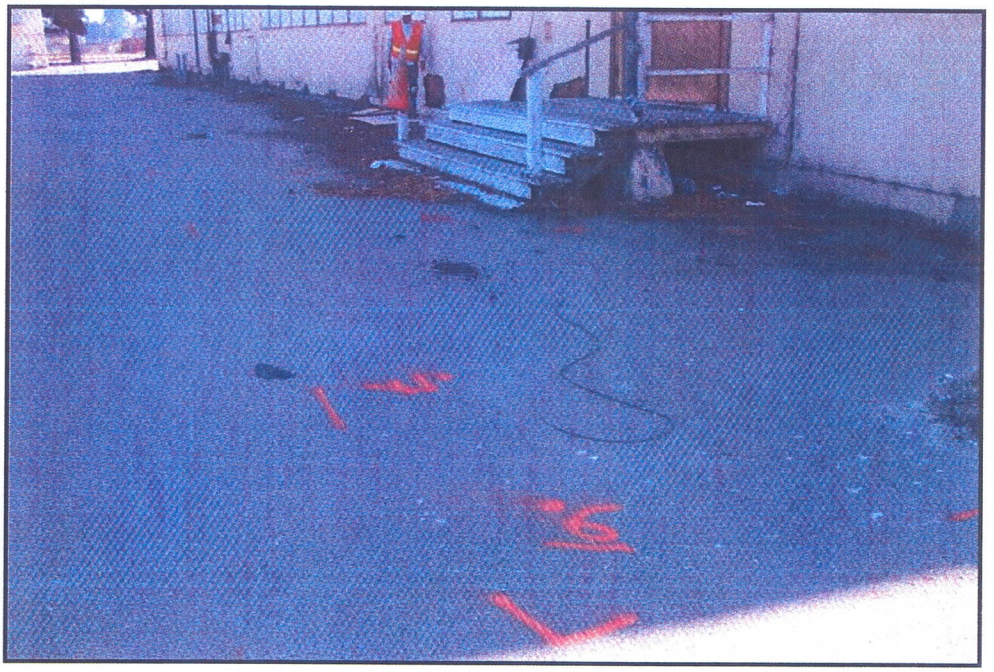


092707_003

092707_004

092707_001

092807_003



092707_004

092807_005

APPENDIX F

RESPONSE TO COMMENTS

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DEPARTMENT OF TOXIC SUBSTANCES CONTROL
COMMENTS ON DRAFT
SCOPING SURVEY REPORT FOR BUILDING 233
DRAIN LINES AND WALL VENTS
DATED MAY 6, 2008
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments dated: June 3, 2008

Comments by: Mr. Ryan Miya, Ph.D.
Senior Hazardous Substances Scientist
Cleanup Program - Berkeley
Department of Toxic Substances Control (DTSC)

SPECIFIC COMMENTS

Comment 1: *Section 1.0 — Site Description and Background. While the text states that decontamination was completed nine months after the 1950 spill, are there any subsequent data available (radon monitoring, airborne alpha readings, etc.) to verify that the rooms in Building 233 were not subject to radiological spills after 1950? This type of information, if available, should be included in the Report. However, if no such data exists, the scoping survey must be expanded to include verification that no additional spill(s) have occurred.*

Response 1: The Historical Radiation Assessment (HRA) provides details regarding the decontamination and post decontamination surveys. The objective of this scoping survey was to evaluate whether the piping and drain lines had been radiologically impacted. The interior of the building has been addressed in the Final Survey Report, Radiological Assessment of Building 233 (Shaw, 2007). During this survey samples were collected (flooring, wallboard, paint chips, etc.) and analyzed for residual radiological contamination. As a result of this study the Navy has awarded a contract to remediate the remaining residual contamination, demolish Building 233, and perform a final status survey (FSS) of the building footprint.

Comment 2: *Section 3.1 — Mobilization. The text states that piping diagrams were used to identify the downstream manhole closest to where the drainage piping from the building connected to the main drainage system. The building drainage piping system should either be added to one of the figures or the piping diagrams referenced should be copied and included as an Appendix to the Report.*

Response 2: There were no as-builts available for the building that showed the piping and drain layout. All sample locations in the building were determined by visual inspection. The location of the nearest downstream manhole was determined from sewer line drawings and a visual inspection of where the piping left the building and where piping entered into the manhole.

Comment 3: *Section 3.5 — Parking Lot. The text states that thirteen locations within the exterior asphalt parking lot were discovered to have elevated gamma (γ) radiation levels. However, a figure presenting the locations of the elevated exterior asphalt gamma measurements has not been presented in the body of the Report. A figure with the thirteen locations in the parking lot should be included in the Report body, and not just in Appendix C. As a result of the scoping survey, the Navy should consider installing temporary fencing around the impacted asphalt parking lot area(s) in order to restrict general public access. The comments section of the Radiation / Contamination Survey Form in Appendix C also states that "Elevated readings were found in all of the lined out areas, including area outside fence." Additional radiological source(s) may be present that require further identification and delineation.*

Response 3: The objective of this scoping survey was to evaluate if the piping and drain lines had been radiologically impacted. The impacts to the parking lot were discovered inadvertently while preparing to scan the piping. The survey information is included in this report for information only. The Navy has awarded a contract to demolish building which will include addressing any residual contamination which was observed in parking lot area adjacent to the two doorways. Therefore, an expanded discussion and evaluations of the elevated readings will not be included in this document.

Comment 4: *Section 6.1 — Reference (Background) Measurements. Please add text specifying [1] the location(s) at which the ambient background measurements for alpha (α), beta (β), and gamma (γ) were obtained, [2] the total number of measurements that were used to calculate the average background level, and [3] the actual reference (background) levels obtained.*

Response 4: Concur. Section 6.1 will be revised as follows:

> The background level for the piping in Building 233 was determined by performing ambient measurements for α, β, and γ radiation. An ambient background was used for the piping surveys, as the expected background from non-impacted piping would be equivalent to ambient readings. A single 2-minute background measurement was taken to obtain

backgrounds for α and β radiation static measurements. A single 1-minute measurement was taken for γ radiation background. The same survey methodology and instruments used to collect the background data were used to perform the measurements during the surveys. Instrumentation was allowed to stabilize before background readings were taken. The single background measurement was performed since the surveys were scoping in nature and intended to identify elevated areas and not to quantify the activity. Quantification was determined via collection of solid samples. The α and β background counts were 0.79 cpm and 99.23 cpm, respectively. The γ background count was 5,426 cpm.

The background measurements were collected from a location across the parking lot approximately 100 feet from the building.

No background data were collected for sediment samples from the piping, as naturally occurring radioactive material would not be expected.

Comment 5: *Section 8.0 — Conclusion. The Report states that the extent of the common waste drain piping system that is radiologically impacted has not been fully surveyed and recommends complete identification of impacted piping prior to building demolition. An additional scoping survey work plan for Building 233 to delineate the extent of radiologically impacted waste drain piping should therefore be submitted for regulatory review and approval.*

Response 5: This report details the results of the scoping survey as delineated in the Work Plan. Recommendations were provided recommending further identification of the portion of the piping that was impacted prior to building demolition. The Navy has awarded a contract to demolish Building 233. This contract will include removing and disposing of residual radioactive contamination prior to demolition and preparing a FSS of the building footprint.

Comment 6: *Table 3-1 - Exterior Asphalt Gamma Measurements. The table presents elevated gamma measurements presented as counts per minute. However, without the ambient background gamma measurement for comparison, it is difficult to determine how elevated these results are. Please include the ambient background gamma measurement in the table for comparison.*

Response 6: The ambient background is listed on the survey form in Appendix C as 5,710 cpm.

Comment 7: *In summary, the Report must be revised to incorporate the above comments. Furthermore, additional radiological survey work must also be implemented in order to [1] verify that no additional radiological spills took place in Building 233 after 1950, [2] delineate the extent of radiologically impacted waste drain piping associated with Building 233, and [3] characterize the extent of radiological impact present in the exterior asphalt areas. Therefore, an additional scoping survey work plan for Building 233 must be drafted for regulatory agency review.*

Response 7: This report details the results of the scoping survey as delineated in the Work Plan. Recommendations were provided recommending further delineation of portion of the piping that was impacted prior to building demolition. As a result of this and the 2007 Shaw report locations of residual contamination have been identified and will be addressed prior to demolishing Building 233. The exterior asphalt areas adjacent to the building will also be addressed as part of the Building 233 demolition.

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH
COMMENTS ON DRAFT
SCOPING SURVEY REPORT FOR BUILDING 233
DRAIN LINES AND WALL VENTS
DATED MAY 6, 2008
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments dated: June 3, 2008

Comments by: Ms. Tracy Jue and Mr. Kurt Jackson
Associate Health Physicists
California Department of Public Health (CDPH)

SPECIFIC COMMENTS

Comment 1: *Based on the history of the building described in the Executive Summary, it is noted that the parking lot remains impacted. Additionally, the soil surrounding impacted pipes needs to be evaluated.*

Response 1: This report details the results of the scoping survey as delineated in the Work Plan. The Navy will further address the portion of the piping during the demolition of Building 233. (See Reponses 1, 3, 5, and 7 to the preceding DTSC comments.)

Comment 2: *Section 8.0, Page 8-1, Paragraph 3 states, "It is recommended the portion of the piping which is radiologically impacted be fully surveyed prior to demolition of the building." Is the Navy going to completely remove the entire piping and perform a complete survey in order to release the building?*

Response 2: This report details the results of the scoping survey as delineated in the Work Plan. Recommendations were provided recommending further investigation of the portion of the piping that was impacted prior to building demolition. Only a small portion of the piping was impacted and this portion will be fully evaluated in future surveys. There is no need to survey the remainder as this survey demonstrated it was not impacted. The Navy will further address the piping and the remainder of the building in future surveys. (See Reponses 1, 3, 5 and 7 to the preceding DTSC comments.)

Comment 3: *Section 6.1, Reference Background: Please briefly include descriptions on how the ambient backgrounds were taken for piping surveys, including instruments used and how the data was obtained. Also, no background measurements for the parking lot and building*

surveys were mentioned. Please provide descriptions or references that discuss how the background was determined.

Response 3: Concur. Section 6.1 has been revised as listed below:

> The background level for the piping in Building 233 was determined by performing ambient measurements for α, β, and γ radiation. An ambient background was used for the piping surveys, as the expected background from non-impacted piping would be equivalent to ambient readings. A single 2-minute background measurement was taken to obtain backgrounds for α and β radiation static measurements. A single 1-minute measurement was taken for γ radiation background. The same survey methodology and instruments used to collect the background data were used to perform the measurements during the surveys. Instrumentation was allowed to stabilize before background readings were taken. The single background measurement was performed since the surveys were scoping in nature and intended to identify elevated areas and not to quantify the activity. Quantification was determined via collection of solid samples. The α and β background counts were 0.79 cpm and 99.23 cpm, respectively. The γ background count was 5,426 cpm.
>
> The background measurements were collected from a location across the parking lot approximately 100 feet from the building.
>
> No background data were collected for sediment samples from the piping, as naturally occurring radioactive material would not be expected.

Comment 4: *Section 6.1 states, "No Background Data were collected for sediment samples in the piping, as naturally occurring radioactive material would not be expected." The Navy should obtain a sediment background sample from another non-impacted location.*

Response 4: The sediment discussed in Section 6.1 was referring to the sediment inside the piping. Since the data were analyzed using the background levels from Hunters Point Shipyard (1.485 pCi/gm) for radium 226, accounting for all activity detected inside the piping as being residual is conservative.

Comment 5: *CDPH has noted that the Navy has identified some of the building piping as impacted and plans to remove piping and fully survey for release during building survey. Is the Navy going to completely remove impacted piping?*

Response 5: This report details the results of the scoping survey as delineated in the Work Plan. Recommendations were provided recommending further investigation of the portion of the piping that was impacted prior to building demolition. Only a small portion of the piping was impacted and this portion will be fully evaluated in future surveys. There is no need to survey the remainder as this survey demonstrated it was not impacted. The Navy will further address the piping and the remainder of the building in future surveys. (See Reponses 1, 3, 5, and 7 to the preceding DTSC comments.)

Comment 6: *Pages 6 and 7 of Appendix H show pictures with expansive foam filling material filled inside the drainage pipe openings. CDPH noted there was no general description of the expansive foam indicating whether it is water proof or degradable. Please provide specifications for the foam filling material.*

Response 6: Concur. Section 3.2. The following sentence will be added to the end of the paragraph.

> Once the survey was complete the piping was resealed with polyurethane foam. The foam expands to form a waterproof seal in the piping. For more information on the foam, go to: http://www.dap.com/docs/tech/00077005001.pdf.

Comment 7: *The manhole data indicates contamination, based on the current radium background used at Hunter Point, so it could be assumed that the manhole is elevated. Therefore, further step outs should be done beyond this manhole. Additionally remediation may be necessary for drains/sewers between 021-233-SL-002S and Manhole.*

Response 7: The investigation level for sediment samples was established at 1 pCi/g for radium-226. This level is consistent with the release criteria agreed upon by stakeholder agencies at other Navy installations. The sediment sample result for the manhole is 0.820 pCi/g which is less than the agreed upon investigation level.

Comment 8: *Please provide drain configuration for 021-233-SL-006 0.371 and 021-233-SL-005 0.351 sink drains and how they link to the manhole.*

Response 8: There were no as-builts available for the building that showed the piping and drain layout. All sample locations were determined by visual inspection. The location of the nearest downstream manhole was determined from sewer line drawings and a visual inspection of where the piping left the building and where the piping entered into the manhole.

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH
COMMENTS ON DRAFT FINAL
SCOPING SURVEY REPORT FOR BUILDING 233
DRAIN LINES AND WALL VENTS
DATED MAY 6, 2008
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments dated: October 3, 2008

Comments by: Ms. Tracy Jue and Mr. Kurt Jackson
Associate Health Physicists
California Department of Public Health (CDPH)

SPECIFIC COMMENTS

Comment 1: *Responses to comments indicated that as a result of this study, the Navy has awarded a contract to remediate the remaining residual contamination, demolish Building 233, and perform a final status survey (FSS) of the building footprint. The responses to comments also indicate that this remediation work will include the parking lot area where elevated measurements were found as reported in this scoping survey.*

a. *If the FSS is being done on the building footprint after building demolition, this seems to indicate that building demolition and building debris waste disposal would occur before the final status survey was done. Will this create problems with classification of the debris and determining whether or not it is decommissioning waste?*

Response 1: Radiation contamination limits will be based on NRC Reg Guide 1.86 limits. Debris, equipment in excess of limits shall be securely wrapped in plastic and placed in sealed containers for appropriate storage and ultimate disposal out of state.

Comment 2:

b. *When a final status survey is to be done on a land area that is remediated, a sampling and analysis plan is normally submitted to regulators for review prior to performing the final status survey or remedial action completion report. The responses to comments indicate that the Navy has awarded a contract to remediate and demolish the building and perform a final status survey on the building footprint. CDPH expects that there will be applicable final status survey planning documents submitted for that work and*

that those documents will include a sampling and analysis plan covering the final status survey.

Response 2: FSS documents will follow standard MARSSIM guidance protocols and the FSS Plans for post demo surveys will be provided.

Comment 3:

c. *CDPH expects that sample analysis method used for Ra-226 in solids such as soil or asphalt will be capable of quantifying background levels of radium in soil. CDPH also expects that the samples collected will include background or reference area samples from Treasure Island. Analytical specifications will be covered in the sampling and analysis plan being submitted for review and we suggest using the applicable guidance agreed upon by DoD and EPA, which is titled Multi-Agency Radiological Analytical Laboratory Protocols Manual (MARLAP)guidance in developing these specifications and can be found at the website listed below:*

http://www.epa.gov/radiation/marlap/

Response 3: Work Plan and SAP specifics are currently under development and will comply with conventional methods.

ENVIRONMENTAL PROTECTION AGENCY (EPA)
COMMENTS ON DRAFT
SCOPING SURVEY REPORT FOR BUILDING 233
DRAIN LINES AND WALL VENTS
DATED MAY 6, 2008
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments dated: May 20, 2008

Comments by: Mr. Robert W. Terry
Environmental Protection Agency (EPA)

GENERAL COMMENTS

Comment 1: *The building is a two-story building where the Radiation Safety School had been housed at one time, and where in 1950 an unspecified quantity of unsealed radium sulfate was spilled and then subsequently spread throughout most of the building before the accident was discovered. Unspecified measurable concentrations of radon and gross alpha radioactivity were found in the building in the weeks after the spill was discovered and before cleanup was completed some months later.*

Response 1: Comment noted.

Comment 2: *The consultant set an investigation level of 1.0 pCi ^{226}Ra/gm in six sediment samples that were collected from drains, vents, and other places where dirt is likely to settle. The consultant found approximately 1.1 pCi/gm in 2 samples that were collected from drain pipes; the other 4 samples contained less than 1.0 pCi/gm. The consultant therefore recommends removal of all pipes from the building prior to demolition, and that the pipe be surveyed for contamination prior to clearance for release.*

Response 2: This report details the results of the scoping survey as delineated in the Work Plan. Recommendations were provided recommending further investigation of the portion of the piping that was impacted prior to building demolition. Only a small portion of the piping was impacted and this portion will be fully evaluated in future surveys. There is no need to survey the remainder as this survey demonstrated it was not impacted. The Navy will further address the piping and the remainder of the building in future surveys. (See Reponses 1, 3, 5, and 7 to the preceding DTSC comments).

Comment 3: *The consultant surveyed and sampled 45 other locations in the building, using a combination of surface contamination measurements and building material samples for laboratory analysis. The consultant lists contamination limits that are specified in the U.S. Nuclear Regulatory Commission's Regulatory Guide No. 1.86 as criteria for unrestricted release of the building and reports that none of the measurements exceeded investigation levels.*

Response 3: Concur. Comment correct.

Comment 4: *In light of the fact that the U.S. Department of Defense uses radioactive materials under various Master Materials Licenses that were issued by AECINRC, Regulatory Guide No. 1.86 provides appropriate criteria for release. Based on the information that the consultant has provided, the procedures, measurement equipment and measurement sensitivity all appear to be adequate for comparison of sample results to the specified release criteria.*

Response 4: Comment noted.

Comment 5: *Please be advised that the report only recommends that the pipes in the building are suitable for removal from the structure and that they will require additional survey measurements before they can be released from the site. The report does not make any recommendations as to the final disposition of the building.*

Response 5: See Reponses 1, 3, 5, and 7 to the preceding DTSC comments.

GEOMATRIX
COMMENTS ON DRAFT
SCOPING SURVEY REPORT FOR BUILDING 233
DRAIN LINES AND WALL VENTS
DATED MAY 6, 2008
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments dated: May 28, 2008

Comments by: Mr. Gary Foote, P.G. #5044
Principal Geologist
Geomatrix

GENERAL COMMENTS

Comment 1: ***Navy Recommendation that Radiologically Impacted Piping be Removed and Fully Surveyed during Building Demolition.*** *On behalf of TIDA, we request that the radiologically impacted piping be removed and surveyed by the Navy as soon as possible, rather than waiting until future building demolition before conducting the work. If it is necessary to demolish the building to access the drain piping for surveying and removal, TIDA would prefer that the Navy proceed with demolition as soon as possible, so that the drain piping can be fully evaluated and removed. TIDA has no plans to use the building in the future. Based on photographs presented in Appendix E, it appears that the cast iron piping is accessible near the outside of Building 233 and/or in the crawl space beneath the building. We are concerned that the impacted drain piping could be accessible to the public. As you are aware, abandoned buildings at TI have attracted vandals who have removed metal for salvage value. As such, the cast iron drain piping may be subject to such activity. Even if the drain piping can be secured in such a way as to prevent any potential access, TIDA prefers that the contaminated piping be fully evaluated and removed by the Navy prior to transfer.*

Response 1: The level of contamination identified within the piping is sufficiently low so as to present a minimal risk to the public. The building has been secured to help preclude unauthorized entry into the structure and thus access to the piping. Furthermore, the access points in the piping used for the survey were filled with a foam sealant (See Reponses 1, 3, 5, and 7 to the preceding DTSC comments).

Comment 2:

Elevated Levels of Gamma Radiation Measured in Parking Lot Surrounding Building 233. *Sections 3.5 and 7.3 of the Draft Scoping Survey Report for Building 233 indicate that elevated levels of gamma radiation were measured in the parking lot surrounding Building 233, but there is no further discussion about the significance of this finding. Based on review of the data presented in Table 3-1 (See ChemRisk comment number 1), we believe these elevated measurements warrant further evaluation to assess (1) whether radiological contamination exists beneath the parking lot, and (2) whether the elevated radiation levels pose a risk to human health. Is the area with the elevated levels of gamma radiation currently accessible to the public? If so, we request that the area be immediately secured until the aforementioned evaluations have been completed.*

Response 2:

The objective of this scoping survey was to evaluate if the piping and drain lines had been radiologically impacted. The impacts to the parking lot were discovered inadvertently while preparing to scan the piping. The survey information is included in this report for information only. The parking lot and the remainder of building will be addressed by other surveys. Therefore, an expanded discussion and evaluations of the elevated readings will not be included in this document. The elevated measurements observed in the parking lot do not pose a hazard. (See Reponses 1, 3, 5, and 7 to the preceding DTSC comments).

Comment 3:

Evaluation of Soil Beneath Building 233. *As ChemRisk has previously indicated in comments submitted on behalf of TIDA dated January 8, 2007 and March 17, 2007, we believe that it is necessary to survey soil beneath the crawl space beneath Building 233; contamination could have been washed onto this soil during the 1950 decontamination activities. The recent finding of elevated gamma radiation in the parking lot surrounding Building 233 increases our level of concern about the potential for soil beneath the building to be contaminated. In the Navy's Response to Comments (RTC) contained in the August 2007 Final Radiological Work Plan (Appendix D), the Navy indicated that sampling of soil beneath the building would be conducted during the Final Status Survey (FSS). The RTC further stated that when the building is demolished, the owner may be required to do an additional soil survey. On behalf of TIDA, we request that the Navy thoroughly evaluate soil beneath Building 233 and, if necessary, completely remediate impacted soil so that there are no future obligations for TIDA to conduct soil surveys. If it is necessary to demolish the building to survey the soil beneath it, TIDA would prefer that the Navy proceed with demolition as soon as possible, so that the Navy can thoroughly evaluated the soil and, if necessary, conduct remediation. As indicated above, TIDA has no plans to use the building in the future.*

Response 3: There was limited decontamination activities performed in the building immediately after the spill. This limited amount of water was most likely washed down the drains. After the initial decontamination, additional decontamination was conducted across the street from the building. The clean up of the building was conducted using dry methods, so no additional liquid was generated. Therefore it is unlikely that any contamination was washed under the building. The contamination in the parking may be due to people tracking it outside immediately after the spill. This report details the results of the scoping survey as delineated in the Work Plan. Recommendations were provided recommending further investigation of the portion of the piping that was impacted prior to building demolition. Only a small portion of the piping was impacted and this portion will be fully evaluated in future surveys. There is no need to survey the remainder as this survey demonstrated it was not impacted. The Navy will further address the piping, the parking lot, and the remainder of the building in future surveys (See Reponses 1, 3, 5, and 7 to the preceding DTSC comments).

Comment 4: *Demolition of Building 233. In the Navy's RTC contained in the August 2007 Final Radiological Work Plan, the Navy stated, "The Navy plans to put restrictions on Building 233 in future transfer or deed documents that will stipulate that Building 233 shall not be re-inhabited. There are no plans by the Navy to demolish Building 233, but the Navy is planning to do an FSS and remediate any contamination found greater that the building debris disposal requirements...It appears from the present Treasure Island Development Authority reuse plans that Building 233 will eventually be removed." Because some radiological contamination has been found inside Building 233, inside the drain piping associated with this building, and potentially beneath the parking lot surrounding this building, and because of the need to thoroughly evaluate soil beneath Building 233, we believe it is prudent for the Navy to consider demolishing Building 233 so that all radiological contamination can be thoroughly evaluated and remediated prior to transfer.*

Response 4: This report details the results of the scoping survey as delineated in the Work Plan. The extent of this activity was to perform scoping surveys of the piping and not the parking lot surrounding the building. Discussion of future investigation/remediation and/or demolition of Building 233 is beyond the scope of this document. (See Reponses 1, 3, 5, and 7 to the preceding DTSC comments).

CHEMRISK®
COMMENTS ON DRAFT
SCOPING SURVEY REPORT FOR BUILDING 233
DRAIN LINES AND WALL VENTS
DATED MAY 6, 2008
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments dated: May 22, 2008

Comments by: Mr. Thomas Widner, M.S., C.H.P., C.I.H.
Principal Health Scientist
Chem*Risk*®

SPECIFIC COMMENTS

Comment 1: *My most important comment deals with the lack of any discussion of the elevated gamma count rates measured in the parking lot. The fact that elevated count rates were measured at 13 locations is stated, but then nothing is said about the significance of those findings or to put those values into perspective. The authors state that the building's piping is a closed system, so radiological contamination found in it poses no hazard to the public. But nothing is said about whether the contamination in the parking lost poses a hazard or whether or not steps have been taken to further characterize the nature of the contamination or to prevent unauthorized access to the contaminated areas. It is not clear why the investigators are not concerned about that contamination, which is up to 12 times background.*

Response 1: This report details the results of the scoping survey as delineated in the Work Plan. The extent of this activity was to perform scoping surveys of the piping and not the parking lot surrounding the building. Further investigation and/or an evaluation of the significance of the measurements in the parking lot are beyond the scope of this document. The elevated measurements observed in the parking lot do not pose a hazard. Remediation of the building and parking lot is being assessed by the Navy. (See Reponses 1, 3, 5, and 7 to the preceding DTSC comments.)

.Comment 2: Section 5.2.3 presents a background count rate for the sodium iodide detector used for surveying drain lines. It would be helpful to know the standard deviation of that background count rate, or the count rate in the reference area if that is from a different location, so that the count rates measured in the parking lot can be evaluated against the investigation level for gamma radiation surveys (mean + 3a).

Response 2: The background count rate for the survey in the parking lot is listed on the survey form in Appendix C as 5,710 [k]cpm. This was obtained by a single one minute count performed across the parking lot approximately 100 feet from the building. For the survey in the parking lot, the intent was only to provide a minimal characterization of the residual radioactivity and not to provide a full characterization and quantification. The Navy will further address the piping, parking lot, and the remainder of the building in future surveys.

Comment 3: *Section 6.2.2 discusses the decision that is being addressed. It would be good to explain why the decision addresses only alpha-emitting radioactivity. Were simplifying assumptions made based on anticipation that Ra-226 would be the most important radionuclide encountered? How will the beta and gamma "inputs to the decision" be used? What exactly was accepted as the null hypothesis?*

Response 3: Radium-226 was the only radionuclide of concern for the building as detailed in the HRA. Radium-226 is an alpha emitter and the only radionuclide of concern thus it is appropriate to have the decision address alpha-emitting radioactivity. The null hypothesis was residual radioactivity is not present above the radium-226 release criteria

Comment 4: *Regarding Section 6.2.6; how do the concepts of Class I and Class II survey units apply here? It does not appear that 100% surveying was conducted of any "units."*

Response 4: Concur. The concept of survey units was not used for the scoping surveys performed in Building 233. This survey was a scoping survey. The use of survey units and the criteria to survey a percentage is not utilized in scoping surveys that are not designed to be final surveys. The text in Section 6.2.6 will be revised as follows:

> Acceptable decision errors for this project were established to enable testing of data relative to guidelines. Surveys were performed on the drain lines and wall vents to ensure that all statistical testing criteria would be meet. These surveys were designed to limit Type I and Type II errors to 5 percent.

Comment 5: *Regarding Section 6.2.8: Was no analysis conducted of the data from the parking lot surveys, which are not mentioned here?*

Response 5: This report details the results of the scoping survey as delineated in the Work Plan. The extent of this activity was to perform scoping surveys of the piping and not the parking lot surrounding the building. The discovery and evaluation of the significance of the contamination found in the parking lot is outside the scope of this report (See Reponses 1, 3, 5, and 7 to the preceding DTSC comments).

Comment 6: *In Table 7-2, for results that are marked as "not detected," what do the numerical values that are presented represent? Are they detection limits determined a priori or results calculated for the actual samples?*

Response 6: As described in Appendix D, samples labeled as "not detected" means the isotope was analyzed for but not detected at or above the stated limit.

Comment 7: *Regarding the photographs in Appendix E, it would be helpful if the location and orientation at which each photo was taken were identified.*

Response 7: The photo log in Appendix E provides a description of the picture contents in the notes section. The location information will be updated to be more descriptive.

Comment 8: *It does not appear that the boards placed over the cutouts in the building's foundation (see Photograph 092707_001) can be counted on to preclude access to the contaminated areas. Are these areas and the contaminated areas of the parking lot fenced off?*

Response 8: The level of contamination identified within the piping is sufficiently low so as to present a minimal risk to the public. The boards used to cover the areas where the piping under the building was accessed provide sufficient protection from unauthorized access.

Tetra Tech EC, Inc							
Contract No. N62473-06-D-2201							
CTO # 21,Treasure Island							
Laboratory Data Packages Submittal							
Box #	**Document Number**	**Site**	**Sample Delivery Group (SDG) #**	**Laboratory Name**	**Sample Collection Dates**	**Matrix**	**Comments**
1	Final Scoping Survey Report for Building 233 Drain Lines and Wall Vents, October 31, 2008, DCN: ECSD-2201-0021-0009 (AR #1568)	Building 233	R709115-8808	Eberline	09/18/07	SOIL	Data Validation attached to this SDG
1	Final Scoping Survey Report for Building 233 Drain Lines and Wall Vents, October 31, 2008, DCN: ECSD-2201-0021-0009 (AR #1568) and Final Status Survey Report for Building 344, October 31, 2008, DCN: ECSD-2201-0021-0010 (AR #1566)	Buidling 233 and Building 344	R709160-8811	Eberline	09/24/2007 to 09/26/2007	SOIL	Data Validation attached to this SDG

N60028_001568
TREASURE ISLAND
SSIC NO. 5090.3

SDG # R709115-8808

Eberline Services – Richmond

8118

037 Chain of Custody

CLIENT: T+EC - SAN DIEGO

ADDRESS: 12030 Columbia St.
San Diego CA 92101

PROJECT: CTO 021 TREASURE ISLAND
RAD SURVEY

SAMPLERS SIGNATURE: J Dessert

PURCHASE ORDER NO. #1017112

DATE 9/19/7 PAGE 1 OF 1

TAT (IN DAYS) 21

OBSERVATIONS, COMMENTS, VOLUMES, SPECIAL OR ADDITIONAL TEST

R7 09115-8808

PARAMETERS

SAMPLE NO.	DATE	TIME	LOCATION *	EPA 901.1M (SOIL)	gamma spec.											SAMPLE TYPE OR MATRIX (SOIL)	# CONTAINERS	
21-001-MH	9-18-07	15:10	~~TREASURE ISLAND~~	1												802 GLASS AMBER	1	
			B233 MAN HOLE															
																		* CHGED PER
																		BRIAN MAIDRAND
																		3-13-08 Sudoko

1) RELINQUISHED BY / DATE: 8/19/07 COMPANY: J. Dessert T+ECI	2) RECEIVED BY / DATE: Mel Moran 09/19/7 COMPANY: Eberline	3) RELINQUISHED BY / DATE: COMPANY:	4) RECEIVED BY / DATE: COMPANY:
5) RELINQUISHED BY / DATE: COMPANY:	6) RECEIVED BY / DATE: COMPANY:	7) RELINQUISHED BY / DATE: COMPANY:	8) RECEIVED BY / DATE: COMPANY:

TOTAL NO. OF CONTAINERS: 1

METHOD OF SHIPMENT: DELIVERY

SPECIAL SHIPMENT-HANDLING, STORAGE REQUIREMENTS, OR POSSIBLE HAZARDS

2030 Wright Avenue P.O. Box 4040 Richmond, CA 94804-0040 (510) 235-2633 FAX No. (510) 235-0438

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Tetra Tech EC, Inc.
1940 E. Deere Avenue, Suite 200
Santa Ana, CA 92705
ATTN: Ms. Sabina Sudoko

November 20, 2007

SUBJECT: Treasure Island, CTO 021, Data Validation

Dear Ms. Sudoko,

Enclosed is the final validation report for the fraction listed below. This SDG was received on November 15, 2007. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 17826:

SDG #	Fraction
R709115-8808	Gamma Spectroscopy

The data validation was performed under EPA Level III guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998

Please feel free to contact us if you have any questions.

Sincerely,

ERauto

Erlinda T. Rauto
Operations Manager/Senior Chemist

Treasure Island, CTO 021
Data Validation Reports
LDC# 17826

Gamma Spectroscopy

LDC Report# 17826A35

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Treasure Island, CTO 021

Collection Date: September 18, 2007

LDC Report Date: November 19, 2007

Matrix: Soil

Parameters: Gamma Spectroscopy

Validation Level: EPA Level III

Laboratory: Eberline Services

Sample Delivery Group (SDG): R709115-8808

Sample Identification

21-001-MH
21-001-MHDUP

Introduction

This data review covers 2 soil samples listed on the cover sheet. The analyses were per EPA Method 901.1 for Gamma Spectroscopy.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the isotope was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the isotope was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination was performed at the required frequencies.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA) with the following exceptions:

Method Blank ID	Sampling Date	Isotope	Concentration	Associated Samples
PBS	9/18/07	Pb-210	196 pCi/g	All samples in SDG R709115-8808

Sample concentrations were compared to concentrations detected in the method blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated method blanks with the following exceptions:

Sample	Isotope	Reported Concentration	Modified Final Concentration
21-001-MH	Pb-210	1.84 pCi/g	1.84U pCi/g

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicates

A matrix spike (MS) analysis was not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Relative percent differences (RPD) were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been summarized.

VIII. Field Duplicates

No field duplicates were identified in this SDG.

IX. Field Blanks

No field blanks were identified in this SDG.

Treasure Island, CTO 021
Gamma Spectroscopy - Data Qualification Summary - SDG R709115-8808

No Sample Data Qualified in this SDG

Treasure Island, CTO 021
Gamma Spectroscopy - Laboratory Blank Data Qualification Summary - SDG R709115-8808

SDG	Sample	Isotope	Modified Final Concentration	A or P
R709115-8808	21-001-MH	Pb-210	1.84U pCi/g	A

LDC #: 17826A35 **VALIDATION COMPLETENESS WORKSHEET** Date: 11-19-07
SDG #: R709115-8808 Level III Page: 1 of 1
Laboratory : Eberline Services Reviewer: MG
2nd Reviewer: [signature]

METHOD: Gamma Spectroscopy (EPA Method 901.1)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 9-18-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	SW	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVb.	Laboratory control samples	A	LCS
V.	Minimum dectectable activity (MDA)	A	
VI.	Sample result verification	N	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	N	
IX	Field blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: soil

1	21-001-MH	11		21		31	
2	21-001-MHDUP	12		22		32	
3	PBS	13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: 21 day set was validated

LDC #: 17826A35
SDG #: R709115-8808

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer: LA

METHOD: Radiochemistry (Method: 901.1).

(Y) N N/A Were blank analyses performed as required? If no, please see qualifications below.
(Y) N N/A Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see qualifications below.

Units: pCi/g Associated Samples: all

Isotope	Blank ID	Blank Action Level	Sample Identification									
	PBS		1									
Pb-210	196.	980.	1.84									

Units: Associated Samples:

Isotope	Blank ID	Blank Action Level	Sample Identification									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
If there is activity in the blank above the MDA, sample results within 10x the blank activity will be qualified as not detected "U".

EBERLINE SERVICES

ORIGINAL

November 5, 2007

Ms. Sabina Sudoko
Chemist
Tetra Tech EC, Inc.
1940 E. Deere Avenue, Suite 200
Santa Ana, CA 92705

Reference: **Treasure Island, San Francisco CA**
Treasure Island, Contract Task Order No. 21
TtECI Subcontract No.: 1017112
Eberline Services W.O. No. R709115-8808
Sample Delivery Group R709115-8808

Dear Ms. Sudoko,

Enclosed is a Level III/IV CLP-like data package for one soil sample received on September 19, 2007.

Please call if you have any questions concerning the attached report.

Sincerely,

Melissa Mannion
Senior Program Manager

MCM/njv

Enclosure: Level III/IV CLP-like Data Package (1 original and 1 copy)
Electronic Data Deliverable (e-mail)

Analytical Services
2030 Wright Avenue
P.O. Box 4040
Richmond, California 94804-0040
(510) 235-2633 Fax (510) 235-0438
Toll Free (800) 841-5487
www.eberlineservices.com

EBERLINE SERVICES / RICHMOND
SAMPLE DELIVERY GROUP 8808

SDG 8808
Contact Melissa C. Mannion

Client Tetra Tech EC, Inc.
Contract 1017112

SUMMARY DATA SECTION

TABLE OF CONTENTS

About this section	1
Sample Summaries	3
Prep Batch Summary	5
Work Summary	6
Method Blanks	7
Lab Control Samples	8
Duplicates	9
Data Sheets	10
Method Summaries	11
Report Guides	12
End of Section	26

Prepared by _____

Reviewed by _____

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-TOC
Version 3.06
Report date 09/26/07

SAMPLE DELIVERY GROUP
R709115-8808

Analysis:
Gamma Spectroscopy

Section 1.0	**Case Narrative**
Section 2.0	**Chain-of-Custody and Sample Receipt Information**
Section 3.0	**CLP-Like Summary Report**
Section 4.0	**Aliquot Information**
Section 5.0	**Preparation Log For Quality Control Samples, Standards and Tracer/Carrier Certification**
Section 6.0	**Sample Analysis Raw Data**
Section 7.0	**Instrument Calibration**

Section 1.0
Case Narrative

1.0 General Comments

Sample Delivery Group 8808 is a CLP-like Level IV data package that consists of the analytical results and supporting documentation for one soil sample. The analysis performed was gamma scan. The sample ID's and reference dates/times are given in the Sample Summary section of the Summary Data report.

The samples were received as stated on the chain-of-custody. Any discrepancies are noted on the Eberline Services Sample Receipt Checklist. No holding times were exceeded.

2.0 Quality Control Summary

Quality Control Samples consisted of a laboratory controlled spike (LCS), a method blank, and a duplicate analysis. Quality control samples apply to all samples in the preparation batch. The QC sample results reported on the "Batch QC Summary Sheet" form of the report have not been divided by the method specific aliquot. The QC sample data sheets indicate Eberline Services standard QC aliquot of 1.0 sample.

All QC sample results were within control limits.

3.0 Method Errors

The error for each result is an estimate of the significant random uncertainties incurred in the measurement process. These are propagated to each final result. They include the counting (Poisson) uncertainty, as well as those intrinsic errors due to carrier or tracer standardization, aliquoting, counter efficiencies, weights, or volumes. The following method errors were propagated to the count error to calculate the 2σ ERR(Total):

Analysis	Method Error
Gamma Spectroscopy	15%

4.0 Analysis Notes

4.1 Gamma Spectroscopy Analyses

The samples were analyzed for gamma activity per Eberline Services Hazardous Waste Procedure "HWP-100, Sample Preparation for Gamma Spectroscopy", Rev. 02, dated 01/28/04. References: EPA 901.1.

Aliquots of the samples were put into standard (calibrated) counting geometries and counted for gamma activity. The samples were counted within 5 days of receipt at Eberline Services. After the initial count the samples were allowed to stand for 21 days and then were recounted. Both sets of data, 5-day and 21-day counts, are reported herein. No problems were encountered during the course of the analyses.

5.0 Case Narrative Certification Statement

"I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data obtained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature."

Melissa Mannion

Melissa C. Mannion
Senior Program Manager

11/5/7

MCM **Date**

EBERLINE SERVICES

RICHMOND, CA LABORATORY
SAMPLE RECEIPT CHECKLIST

9/19/07

Client: TETRA TECH City SAN DIEGO State CA

Date/Time received 09/19/07 @ CoC No. PO # 107112

Container I.D. No. ICE CHEST Requested TAT (Days) 21 P.O. Received Yes [ ] No [ ]

INSPECTION

1. Custody seals on shipping container intact? Yes [ ] No [ ] N/A [Y]
2. Custody seals on shipping container dated & signed? Yes [ ] No [ ] N/A [X]
3. Custody seals on sample containers intact? Yes [X] No [ ] N/A [ ]
4. Custody seals on sample containers dated & signed? Yes [X] No [ ] N/A [ ]
5. Packing material is: Wet [ ] Dry [X]
6. Number of samples in shipping container: 1 Sample Matrix S
7. Number of containers per sample: 1 (Or see CoC _____)
8. Samples are in correct container Yes [Y] No [ ]
9. Paperwork agrees with samples? Yes [X] No [ ]
10. Samples have: Tape [ ] Hazard labels [ ] Rad labels [ ] Appropriate sample labels [Y]
11. Samples are: In good condition [X] Leaking [ ] Broken Container [ ] Missing [ ]
12. Samples are: Preserved [ ] Not preserved [ ] pH _____ Preservative _____
13. Describe any anomalies:

14. Was P.M. notified of any anomalies? Yes [ ] No [ ] Date _____
15. Inspected by _____ Date: 09/19/07 Time: 10:45

Customer Sample No.	cpm	mR/hr	Wipe	Customer Sample No.	cpm	mR/hr	wipe

Ion Chamber Ser. No. _____ Calibration date _____

Alpha Meter Ser. No. _____ Calibration date _____

Beta/Gamma Meter Ser. No. _____ Calibration date _____

Section 3.0
CLP-Like Summary Report

SDG 8808
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

ABOUT THE DATA SUMMARY SECTION

The Data Summary Section of a Data Package has all data, in several useful orders, necessary for first level, routine review of the data package for a Sample Delivery Group (SDG). This section follows the Data Package Narrative, which has an overview of the data package and a discussion of special problems. It is followed by the Raw Data Section, which has full details.

The Data Summary Section has several groups of reports:

SAMPLE SUMMARIES

The Sample and QC Summary Reports show all samples, including QC samples, reported in one SDG. These reports cross-reference client and lab sample identifiers.

PREPARATION BATCH SUMMARY

The Preparation Batch Summary Report shows all preparation batches (lab groupings reflecting how work was organized) relevant to the reported SDG with information necessary to check the completeness and consistency of the SDG.

WORK SUMMARY

The Work Summary Report shows all samples and work done on them relevant to the reported SDG.

METHOD BLANKS

The Method Blank Reports, one for each Method Blank relevant to the SDG, show all results and primary supporting information for the blanks.

LAB CONTROL SAMPLES

The Lab Control Sample Reports, one for each Lab Control Sample relevant to the SDG, show all results, recoveries and primary supporting information for these QC samples.

DUPLICATES

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 09/26/07

SDG 8808
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

ABOUT THE DATA SUMMARY SECTION

The Duplicate Reports, one for each Duplicate and Original sample pair relevant to the SDG, show all results, differences and primary supporting information for these QC samples.

MATRIX SPIKES

The Matrix Spike Reports, one for each Spiked and Original sample pair relevant to the SDG, show all results, recoveries and primary supporting information for these QC samples.

DATA SHEETS

The Data Sheet Reports, one for each client sample in the SDG, show all results and primary supporting information for these samples.

METHOD SUMMARIES

The Method Summary Reports, one for each test used in the SDG, show all results, QC and method performance data for one analyte on one or two pages. (A test is a short code for the method used to do certain work to the client's specification.)

REPORT GUIDES

The Report Guides, one for each of the above groups of reports, have documentation on how to read the associated reports.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 09/26/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8808

LAB SAMPLE SUMMARY

SDG 8808
Contact Melissa C. Mannion

Client Tetra Tech EC, Inc.
Contract 1017112

LAB SAMPLE ID	CLIENT SAMPLE ID	LOCATION	MATRIX	LEVEL	PROJ. NO.	CHAIN OF CUSTODY	COLLECTED
R709115-01	21-001-MH	Treasure Island	SOIL		CTO_21		09/18/07 15:10
R709115-02	Lab Control Sample		SOIL		CTO_21		
R709115-03	Method Blank		SOIL		CTO_21		
R709115-04	Duplicate (R709115-01)	Treasure Island	SOIL		CTO_21		09/18/07 15:10

LAB SUMMARY
Page 1
SUMMARY DATA SECTION
Page 3

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-LS
Version 3.06
Report date 09/26/07

EBERLINE SERVICES/RICHMOND

SDG 8808
Contact Melissa C. Mannion

SAMPLE DELIVERY GROUP 8808

QC SUMMARY

Client Tetra Tech EC, Inc.
Contract 1017112

QC BATCH	CHAIN OF CUSTODY	CLIENT SAMPLE ID	MATRIX	% MOIST	SAMPLE AMOUNT	BASIS AMOUNT	DAYS SINCE RECEIVED	DAYS SINCE COLL	LAB SAMPLE ID	DEPARTMENT SAMPLE ID
3808		21-001-MH	SOIL	18.0	222 g		09/19/07	1	R709115-01	8808-001
		Method Blank	SOIL						R709115-03	8808-003
		Lab Control Sample	SOIL						R709115-02	8808-002
		Duplicate (R709115-01)	SOIL	18.0	222 g		09/19/07	1	R709115-04	8808-004

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-QS
Version 3.06
Report date 09/26/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8808

SDG 8808
Contact Melissa C. Mannion

PREP BATCH SUMMARY

Client Tetra Tech EC, Inc.
Contract 1017112

TEST	MATRIX	METHOD	PREPARATION BATCH	ERROR 2σ %	PLANCHETS ANALYZED CLIENT	MORE	RE	BLANK	LCS	DUP/ORIG	MS/ORIG	QUALIFIERS
Gamma Spectroscopy												
GAM	SOIL	Gamma Scan	6107-192	15.0	1			1	1	1/1		

Duplicates and Matrix Spikes are those with original (Client) sample in this Sample Delivery Group.
Blank and LCS planchets are those in the same preparation batch as some Client, Duplicate or Spike sample.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-PBS
Version 3.06
Report date 09/26/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8808

SDG 8808
Contact Melissa C. Mannion

LAB WORK SUMMARY

Client Tetra Tech EC, Inc.
Contract 1017112

LAB SAMPLE / COLLECTED / RECEIVED	CLIENT SAMPLE ID / LOCATION / CUSTODY	Proj. No.	MATRIX	PLANCHET	TEST	SUF-FIX	ANALYZED	REVIEWED	BY	METHOD
R709115-01 09/18/07 09/19/07	21-001-MH Treasure Island	CTO_21	SOIL	8808-001	GAM		09/24/07	09/25/07	CSS	Gamma Scan
R709115-02	Lab Control Sample	CTO_21	SOIL	8808-002	GAM		09/25/07	09/25/07	CSS	Gamma Scan
R709115-03	Method Blank	CTO_21	SOIL	8808-003	GAM		09/25/07	09/25/07	CSS	Gamma Scan
R709115-04 09/18/07 09/19/07	Duplicate (R709115-01) Treasure Island	CTO_21	SOIL	8808-004	GAM		09/25/07	09/25/07	CSS	Gamma Scan

COUNTS OF TESTS BY SAMPLE TYPE

TEST	Proj. No.	METHOD	REFERENCE	CLIENT	MORE	RE	BLANK	LCS	DUP SPIKE	TOTAL
GAM	CTO_21	Gamma Scan	EPA 901.1	1			1	1	1	4
TOTALS				1			1	1	1	4

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-LWS
Version 3.06
Report date 09/26/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8808

8808-003 **Method Blank**

METHOD BLANK

SDG 8808 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1017112

Lab sample id R709115-03 Client sample id Method Blank
Dept sample id 8808-003 Material/Matrix SOIL
Proj. No. CTO_21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		240		U	GAM
Cobalt-60	10198-40-0	U		9.16	0.036	U	GAM
Cesium-137	10045-97-3	U		10.0	0.113	U	GAM
Europium-152	14683-23-9	U		71.0	0.130	U	GAM
Europium-154	15585-10-1	U		25.9	0.230	U	GAM
Thallium-208	14913-50-9	U		9.56		U	GAM
Lead-210	14255-04-0	U		862		U	GAM
Bismuth-212	14913-49-6	U		120		U	GAM
Lead-212	15092-94-1	U		14.7		U	GAM
Bismuth-214	14733-03-0	U		32.6		U	GAM
Lead-214	15067-28-4	U		38.3		U	GAM
Radium-226	13982-63-3	U		31.7	1.00	U	GAM
Actinium-228	14331-83-0	U		44.5		U	GAM
Thorium-230	14269-63-7	U		1620		U	GAM
Thorium-232	7440-29-1	U		44.5	1.69	U	GAM
Protactinium-234m	378783-76-7	U		1430		U	GAM
Thorium-234	15065-10-8	U		5.89		U	GAM
Uranium-235	15117-96-1	U		37.9	0.195	U	GAM
Americium-241	14596-10-2	U		38.1		U	GAM

Treaure Island

QC-BLANK #62904

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8808

8808-002 Lab Control Sample

LAB CONTROL SAMPLE

SDG 8808 Client Tetra Tech EC, Inc.

Contact Melissa C. Mannion Contract 1017112

Lab sample id R709115-02 Client sample id Lab Control Sample

Dept sample id 8808-002 Material/Matrix SOIL

Proj. No. CTO 21

ANALYTE	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ADDED pCi/g	2σ ERR pCi/g	REC %	2σ LMTS (TOTAL)	PROTOCOL LIMITS
Cobalt-60	555	88	11.5	0.036		GAM	473	19	117	81-119	75-125
Cesium-137	510	80	14.5	0.113		GAM	476	19	107	83-117	75-125
Americium-241	565	87	14.1			GAM	505	20	112	82-118	75-125

Treaure Island

QC-LCS #62903

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-LCS
Version 3.06
Report date 09/26/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8808

8808-004

21-001-MH

DUPLICATE

SDG 8808 | Client Tetra Tech EC, Inc.

Contact Melissa C. Mannion | Contract 1017112

DUPLICATE	ORIGINAL	
Lab sample id R709115-04	Lab sample id R709115-01	Client sample id 21-001-MH
Dept sample id 8808-004	Dept sample id 8808-001	Location/Matrix Treasure Island SOIL
	Received 09/19/07	Collected/Weight 09/18/07 15:10 222 g
% moisture 18.0	% moisture 18.0	Custody/Proj. No. CTO 21

ANALYTE	DUPLICATE pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ORIGINAL pCi/g	2σ ERR (TOTAL)	MDA pCi/g	QUALI-FIERS	RPD %	2σ TOT	DER σ
Potassium-40	5.65	1.2	0.589			GAM	6.00	1.0	0.310		6	27	0.4
Cobalt-60	U		0.056	0.036	U	GAM	U		0.025	U	-		1.0
Cesium-137	U		0.094	0.113	U	GAM	U		0.068	U	-		0.4
Europium-152	U		0.401	0.130	U	GAM	U		0.192	U	-		0.9
Europium-154	U		0.164	0.230	U	GAM	U		0.068	U	-		1.1
Thallium-208	0.108	0.057	0.058			GAM	0.095	0.032	0.028		13	65	0.4
Lead-210	1.67	0.57	0.662			GAM	1.51	0.33	0.306		10	41	0.5
Bismuth-212	0.568	0.57	0.642		U	GAM	U		0.353	U	-		0.6
Lead-212	0.360	0.081	0.072			GAM	0.346	0.060	0.033		4	29	0.3
Bismuth-214	0.487	0.14	0.124			GAM	0.483	0.094	0.058		1	35	0
Lead-214	0.640	0.16	0.141			GAM	0.527	0.10	0.066		19	33	1.2
Radium-226	0.473	0.14	0.120	1.00		GAM	0.469	0.091	0.057		1	35	0
Actinium-228	U		0.276		U	GAM	U		0.126	U	-		1.0
Thorium-230	U		4.65		U	GAM	U		2.16	U	-		1.0
Thorium-232	0.246	0.19	0.242	1.69		GAM	0.244	0.097	0.102		1	88	0
Protactinium-234m	U		8.83		U	GAM	U		3.98	U	-		1.0
Thorium-234	U		0.032		U	GAM	U		0.015	U	-		1.0
Uranium-235	U		0.207	0.195	U	GAM	U		0.094	U	-		1.0
Americium-241	U		0.063		U	GAM	U		0.030	U	-		0.9

Treaure Island

QC-DUP#1 62905

Gamma Spec. Method - EPA 901.1, 5-Day Count

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-DUP
Version 3.06
Report date 09/26/07

DUPLICATES
Page 1
SUMMARY DATA SECTION
Page 9

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8808

8808-001 **21-001-MH**

DATA SHEET

SDG	8808	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709115-01	Client sample id	21-001-MH
Dept sample id	8808-001	Location/Matrix	Treasure Island SOIL
Received	09/19/07	Collected/Weight	09/18/07 15:10 222 g
% moisture	18.0	Custody/Proj. No.	CTO_21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	6.00	1.0	0.310			GAM
Cobalt-60	10198-40-0	U		0.025	0.036	U	GAM
Cesium-137	10045-97-3	U		0.068	0.113	U	GAM
Europium-152	14683-23-9	U		0.192	0.130	U	GAM
Europium-154	15585-10-1	U		0.068	0.230	U	GAM
Thallium-208	14913-50-9	0.095	0.032	0.028			GAM
Lead-210	14255-04-0	1.51	0.33	0.306			GAM
Bismuth-212	14913-49-6	U		0.353		U	GAM
Lead-212	15092-94-1	0.346	0.060	0.033			GAM
Bismuth-214	14733-03-0	0.483	0.094	0.058			GAM
Lead-214	15067-28-4	0.527	0.10	0.066			GAM
Radium-226	13982-63-3	0.469	0.091	0.057	1.00		GAM
Actinium-228	14331-83-0	U		0.126		U	GAM
Thorium-230	14269-63-7	U		2.16		U	GAM
Thorium-232	7440-29-1	0.244	0.097	0.102	1.69		GAM
Protactinium-234m	378783-76-7	U		3.98		U	GAM
Thorium-234	15065-10-8	U		0.015		U	GAM
Uranium-235	15117-96-1	U		0.094	0.195	U	GAM
Americium-241	14596-10-2	U		0.030		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 5-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	09/26/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8808

Test GAM Matrix SOIL
SDG 8808
Contact Melissa C. Mannion

LAB METHOD SUMMARY

GAMMA SCAN

GAMMA SPECTROSCOPY

Client Tetra Tech EC, Inc.
Contract 1017112

RESULTS

LAB SAMPLE ID	RAW TEST	SUF-FIX	PLANCHET	CLIENT SAMPLE ID	Cobalt-60	Cesium-137	Americium-241
Preparation batch 6107-192							
R709115-01			8808-001	21-001-MH	U	U	U
R709115-02			8808-002	Lab Control Sample	ok	ok	ok
R709115-03			8808-003	Method Blank	U	U	U
R709115-04			8808-004	Duplicate (R709115-01)	- U	- U	- U
Nominal values and limits from method				RDLs (pCi/g)	0.036	0.113	
Treaure Island							

METHOD PERFORMANCE

LAB SAMPLE ID	RAW TEST	SUF-FIX	CLIENT SAMPLE ID	MDA pCi/g	ALIQ g	PREP FAC	DILU-TION	YIELD %	EFF %	COUNT min	FWHM keV	DRIFT KeV	DAYS HELD	PREPARED	ANAL-YZED	DETECTOR
Preparation batch 6107-192			2σ prep error 15.0 %	Reference Lab Notebook #6107, pg.192												
R709115-01			21-001-MH	0.025	177					1039			6	09/24/07	09/24	JR,01,00
R709115-02			Lab Control Sample	11.5	1.00					220				09/24/07	09/25	JR,07,00
R709115-03			Method Blank	9.16	1.00					231				09/24/07	09/25	JR,08,00
R709115-04			Duplicate (R709115-01)	0.056	177					231			7	09/24/07	09/25	JR,01,00
Nominal values and limits from method				0.036	1.00					100			180			

PROCEDURES REFERENCE EPA 901.1
HWP-100 Sample Preparation for Gamma Spectrometry, rev 2

AVERAGES ± 2 SD FOR 4 SAMPLES
MDA 5.19 ± 12.0
YIELD ____ ± ____

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-LMS
Version 3.06
Report date 09/26/07

SDG 8808
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

SAMPLE SUMMARY

The Sample and QC Summary Reports show all samples, including QC samples, reported in one Sample Delivery Group (SDG).

The Sample Summary Report fully identifies client samples and gives the corresponding lab sample identification. The QC Summary Report shows at the sample level how the lab organized the samples into batches and generated QC samples. The Preparation Batch and Method Summary Reports show this at the analysis level.

The following notes apply to these reports:

* LAB SAMPLE ID is the lab's primary identification for a sample.

* DEPARTMENT SAMPLE ID is an alternate lab id, for example one assigned by a radiochemistry department in a lab.

* CLIENT SAMPLE ID is the client's primary identification for a sample. It includes any sample preparation done by the client that is necessary to identify the sample.

* QC BATCH is a lab assigned code that groups samples to be processed and QCed together. These samples should have similar matrices.

  QC BATCH is not necessarily the same as SDG, which reflects samples received and reported together.

* All Lab Control Samples, Method Blanks, Duplicates and Matrix Spikes are shown that QC any of the samples. Due to possible reanalyses, not all results for all these QC samples may be relevant to the SDG. The Lab Control Sample, Method Blank, Duplicate, Matrix Spike and Method Summary Reports detail these relationships.

SDG 8808
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

PREPARATION BATCH SUMMARY

The Preparation Batch Summary Report shows all preparation batches in one Sample Delivery Group (SDG) with information necessary to check the completeness and consistency of the SDG.

The following notes apply to this report:

* The preparation batches are shown in the same order as the Method Summary Reports are printed.

* Only analyses of planchets relevant to the SDG are included.

* Each preparation batch should have at least one Method Blank and LCS in it to validate client sample results.

* The QUALIFIERS shown are all qualifiers other than U, J, B, L and H that occur on any analysis in the preparation batch. The Method Summary Report has these qualifiers on a per sample basis.

  These qualifiers should be reviewed as follows:

  X Some data has been manually entered or modified. Transcription errors are possible.

  P One or more results are 'preliminary'. The data is not ready for final reporting.

  2 There were two or more results for one analyte on one planchet imported at one time. The results in DVD may not be the same as on the raw data sheets.

  Other lab defined qualifiers may occur. In general, these should be addressed in the SDG narrative.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 09/26/07

SDG 8808
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

WORK SUMMARY

The Work Summary Report shows all samples, including QC samples, and all relevant analyses in one Sample Delivery Group (SDG). This report is often useful as supporting documentation for an invoice.

The following notes apply to this report:

* TEST is a code for the method used to measure associated analytes. Results and related information for each analyte are on the Data Sheet Report. In special cases, a test code used in the summary data section is not the same as in associated raw data. In this case, both codes are shown on the Work Summary.

* SUFFIX is the lab's code to distinguish multiple analyses (recounts, reworks, reanalyses) of a fraction of the sample. The suffix indicates which result is being reported. An empty suffix normally identifies the first attempt to analyze the sample.

* The LAB SAMPLE ID, TEST and SUFFIX uniquely identify all supporting data for a result. The Method Summary Report for each TEST has method performance data, such as yield, for each lab sample id and suffix and procedures used in the method.

* PLANCHET is an alternate lab identifier for work done for one test. It, combined with the TEST and SUFFIX, may be the best link to raw data.

* For QC samples, only analyses that directly QC some regular sample are shown. The Lab Control Sample, Method Blank, Duplicate, Matrix Spike and Method Summary Reports detail these relationships.

* The SAS (Special Analytical Services) Number is a client or lab assigned code that reflects special processing for samples, such as rapid turn around. Counts of tests done are lists by SAS number since it is likely to affect prices.

SDG 8808
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REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

DATA SHEET

The Data Sheet Report shows all results and primary supporting information for one client sample or Method Blank. This report corresponds to both the CLP Inorganics and Organics Data Sheet.

The following notes apply to this report:

* TEST is a code for the method used to measure an analyte. If the TEST is empty, no data is available; the analyte was not analyzed for.

* The LAB SAMPLE ID and TEST uniquely identify work within the Summary Data Section of a Data Package. The Work Summary and Method Summary Reports further identify raw data that underlies this work.

  The Method Summary Report for each TEST has method performance data, such as yield, for each Lab Sample ID and a list of procedures used in the method.

* ERRORs can be labeled TOTAL or COUNT. TOTAL implies a preparation (non-counting method) error has been added, as square root of sum of squares, to the counting error denoted by COUNT. The preparation errors, which may vary by preparation batch, are shown on the Method Summary Report.

* A RESULT can be 'N.R.' (Not Reported). This means the lab did this work but chooses not to report it now, possibly because it was reported at another time.

* When reporting a Method Blank, a RESULT can be 'N.A.' (Not Applicable). This means there is no reported client sample work in the same preparation batch as the Blank's result. This is likely to occur when the Method Blank is associated with reanalyses of selected work for a few samples in the SDG.

The following qualifiers are defined by the DVD system:

U The RESULT is less than the MDA (Minimum Detectable Activity). If the MDA is blank, the ERROR is used as the limit.

SDG 8808
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

DATA SHEET

J The RESULT is less than the RDL (Required Detection Limit) and no U qualifier is assigned.

B A Method Blank associated with this sample had a result without a U flag and, after correcting for possibly different aliquots, that result is greater than or equal to the MDA for this sample.

Normally, B is not assigned if U is. When method blank subtraction is shown on this report, B flags are assigned based on the unsubtracted values while U's are assigned based on the subtracted ones. Both flags can be assigned in this case.

For each sample result, all Method Blank results in the same preparation batch are compared. The Method Summary Report documents this and other QC relationships.

L Some Lab Control Sample that QC's this sample had a low recovery. The lab can disable assignment of this qualifier.

H Similar to 'L' except the recovery was high.

P The RESULT is 'preliminary'.

X Some data necessary to compute the RESULT, ERROR or MDA was manually entered or modified.

2 There were two or more results available for this analyte. The reported result may not be the same as in the raw data.

Other qualifiers are lab defined. Definitions should be in the SDG narrative.

The following values are underlined to indicate possible problems:

* An MDA is underlined if it is bigger than its RDL.

* An ERROR is underlined if the 1.645 sigma counting error is bigger than both the MDA and the RESULT, implying that the MDA

SDG 8808
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

DATA SHEET

may not be a good estimate of the 'real' minimum detectable activity.

* A negative RESULT is underlined if it is less than the negative of its 2 sigma counting ERROR.

* When reporting a Method Blank, a RESULT is underlined if greater than its MDA. If the MDA is blank, the 2 sigma counting error is used in the comparison.

SDG 8808
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REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

LAB CONTROL SAMPLE

The Lab Control Sample Report shows all results, recoveries and primary supporting information for one Lab Control Sample.

The following notes apply to this report:

* All fields in common with the Data Sheet Report have similar usage. Refer to its Report Guide for details.

* An amount ADDED is the lab's value for the actual amount spiked into this sample with its ERROR an estimate of the error of this amount.

  An amount added is underlined if its ratio to the corresponding RDL is outside protocol specified limits.

* REC (Recovery) is RESULT divided by ADDED expressed as a percent.

* The first, computed limits for the recovery reflect:

  1. The error of RESULT, including that introduced by rounding the result prior to printing.

     If the limits are labeled (TOTAL), they include preparation error in the result. If labeled (COUNT), they do not.

  2. The error of ADDED.

  3. A lab specified, per analyte bias. The bias changes the center of the computed limits.

* The second limits are protocol defined upper and lower QC limits for the recovery.

* The recovery is underlined if it is outside either of these ranges.

SDG 8808
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REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

DUPLICATE

The Duplicate Report shows all results, differences and primary supporting information for one Duplicate and associated Original sample.

The following notes apply to this report:

* All fields in common with the Data Sheet Report have similar usage. This applies both to the Duplicate and Original sample data. Refer to the Data Sheet Report Guide for details.

  If the Duplicate has data for a TEST and the lab did not do this test to the Original, the Original's RESULTs are underlined.

* The RPD (Relative Percent Difference) is the absolute value of the difference of the RESULTs divided by their average expressed as a percent.

  If both RESULTs are less than their MDAs, no RPD is computed and a '-' is printed.

  For an analyte, if the lab did work for both samples but has data for only one, the MDA from the sample with data is used as the other's result in the RPD.

* The first, computed limit is the sum, as square root of sum of squares, of the errors of the results divided by the average result as a percent, hence the relative error of the difference rather than the error of the relative difference. The errors include those introduced by rounding the RESULTs prior to printing.

  If this limit is labeled TOT, it includes the preparation error in the RESULTs. If labeled CNT, it does not.

  This value reported for this limit is at most 999.

* The second limit for the RPD is the larger of:

  1. A fixed percentage specified in the protocol.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 09/26/07

SDG 8808
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

DUPLICATE

2. A protocol factor (typically 2) times the average MDA as a percent of the average result. This limit applies when the results are close to the MDAs.

* The RPD is underlined if it is greater than either limit.

* If specified by the lab, the second limit column is replaced by the Difference Error Ratio (DER), which is the absolute value of the difference of the results divided by the quadratic sum of their one sigma errors, the same errors as used in the first limit.

  Except for differences due to rounding, the DER is the same as the RPD divided by the first RPD limit with the limit scaled to 1 sigma.

* The DER is underlined if it is greater than the sigma factor, typically 2 or 3, shown in the header for the first RPD limit.

SDG 8808
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REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

MATRIX SPIKE

The Matrix Spike Report shows all results, recoveries and primary supporting information for one Matrix Spike and associated Original sample.

The following notes apply to this report:

* All fields in common with the Data Sheet Report have similar usage. This applies both to the Spiked and Original sample data. Refer to the Data Sheet Report Guide for details.

  If the Spike has data for a TEST and the lab did not do this test to the Original, the Original's RESULTs are underlined.

* An amount ADDED is the lab's value for the actual amount spiked into the Spike sample with its ERROR an estimate of the error of this amount.

  An amount is underlined if its ratio to the corresponding RDL is outside protocol specified limits.

* REC (Recovery) is the Spike RESULT minus the Original RESULT divided by ADDED expressed as a percent.

* The first, computed limits for the recovery reflect:

  1. The errors of the two RESULTs, including those introduced by rounding them prior to printing.

     If the limits are labeled (TOTAL), they include preparation error in the result. If labeled (COUNT), they do not.

  2. The error of ADDED.

  3. A lab specified, per analyte bias. The bias changes the center of the computed limits.

* The second limits are protocol defined upper and lower QC limits for the recovery.

SDG 8808
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

MATRIX SPIKE

These limits are left blank if the Original RESULT is more than a protocol defined factor (typically 4) times ADDED. This is a way of accounting for that when the spike is small compared to the amount in the original sample, the recovery is unreliable.

* The recovery is underlined (out of spec) if it is outside either of these ranges.

SDG 8808
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REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

METHOD SUMMARY

The Method Summary Report has two tables. One shows up to five results measured using one method. The other has performance data for the method. There is one report for each TEST, as used on the Data Sheet Report.

The following notes apply to this report:

* Each table is subdivided into sections, one for each preparation batch. A preparation batch is a group of aliquots prepared at roughly the same time in one work area of the lab using the same method.

  There should be Lab Control Sample and Method Blank results in each preparation batch since this close correspondence makes the QC meaningful. Depending on lab policy, Duplicates need not occur in each batch since they QC sample dependencies such as matrix effects.

* The RAW TEST column shows the test code used in the raw data to identify a particular analysis if it is different than the test code in the header of the report. This occurs in special cases due to method specific details about how the lab labels work.

  The Lab Sample or Planchet ID combined with the (Raw) Test Code and Suffix uniquely identify the raw data for each analysis.

* If a result is less than both its MDA and RDL, it is replaced by just 'U' on this report. If it is greater than or equal to the RDL but less than the MDA, the result is shown with a 'U' flag.

  The J and X flags are as on the data sheet.

* Non-U results for Method Blanks are underlined to indicate possible contamination of other samples in the preparation batch. The Method Blank Report has supporting data.

* Lab Control Sample and Matrix Spike results are shown as: ok, No data, LOW or HIGH, with the last two underlined. 'No data' means no amount ADDED was specified. 'LOW' and 'HIGH'

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 09/26/07

METHOD SUMMARY

correspond to when the recovery is underlined on the Lab Control Sample or Matrix Spike Report. See these reports for supporting data.

* Duplicate sample results are shown as: ok, No data, or OUT, with the last two underlined. 'No data' means there was no original sample data found for this duplicate. 'OUT' corresponds to when the RPD is underlined on the Duplicate Report. See this report for supporting data.

* If the MDA column is labeled 'MAX MDA', there was more than one result measured by the reported method and the MDA shown is the largest MDA. If not all these results have the same RDL, the MAX MDA reflects only those results with RDL equal to the smallest one.

  MDAs are underlined if greater than the printed RDL.

* Aliquots are underlined if less than the nominal value specified for the method.

* Prepareation factors are underlined if greater than the nominal value specified for the method.

* Dilution factors are underlined if greater than the nominal value specified for the method.

* Residues are underlined if outside the range specified for the method. Residues are not printed if yields are.

* Yields, which may be gravimetric, radiometric or some type of recovery depending on the method, are underlined if outside the range specified for the method.

* Efficiencies are underlined if outside the range specified for the method. Efficiencies are detector and geometry dependent so this test is only approximate.

* Count times are underlined if less than the nominal value

METHOD SUMMARY

specified for the method.

* Resolutions (as FWHM; Full Width at Half Max) are underlined if greater than the method specified limit.

* Tracer drifts are underlined if their absolute values are greater than the method specified limit. Tracer drifts are not printed if percent moistures are.

* Days Held are underlined if greater than the holding time specified in the protocol.

* Analysis dates are underlined if before their planchet's preparation date or, if a limit is specified, too far after it.

For some methods, ratios as percentages and error estimates for them are computed for pairs of results. A ratio column header like '1÷3' means the ratio of the first result column and the third result column.

Ratios are not computed for Lab Control Sample, Method Blank or Matrix Spike results since their matrices are not necessarily similar to client samples'.

The error estimate for a ratio of results from one planchet reflects only counting errors since other errors should be correlated. For a ratio involving different planchets, if QC limits are computed based on total errors, the error for the ratio allows for the preparation errors for the planchets.

The ratio is underlined (out of spec) if the absolute value of its difference from the nominal value is greater than its error estimate. If no nominal value is specified, this test is not done.

For Gross Alpha or Gross Beta results, there may be a column showing the sum of other Alpha or Beta emitters. This sum includes all relevant results in the DVD database, whether reported or not. Results in the sum are weighted by a particles/decay value specified by the lab for each relevant analyte. Results less than their MDA are not included.

SDG 8808
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

METHOD SUMMARY

No sums are computed for Lab Control, Method Blank or Matrix Spike samples since their various planchets may not be physically related.

If a ratio of total isotopic to Gross Alpha or Beta is shown, the error for the ratio reflects both the error in the Gross result and the sum, as square root of sum of squares, of the errors in the isotopic results.

For total elemental uranium or thorium results, there may be a column showing the total weight computed from associated isotopic results. Ignoring results less than their MDAs, this is a weighted sum of the isotopic results. The weights depend on the molecular weight and half-life of each isotope so as to convert activities (decays) to weight (atoms).

If a ratio of total computed to measured elemental uranium or thorium is shown, the error for the ratio reflects the errors in all the measurements.

21-Day Gamma Count

Section 4.0
Aliquot Information

R709115 TETRATECH_FW
Tetra Tech EC, Inc.
Alameda Point

CTO 021 TREASURE ISLAND

Pr Mgr.... MCM Rcvd... 09/19/07
Charge.... 00-000 Due.... 09/26/07
Chemist... Value... 0.
Created... 21-SEP-07 Billed.. 0.
Billing status.. open
Calc. units..... PCI /Unit alq Min Pri
/ 0

Record book 06107
9/25/07 P. P. 192-193 AK

smp	elm	typ	mg rec	dpm rec Ash wgt	1st sep		2nd sep		aliquot		carr/ trac
1		GLS	0.00	0.0000	0.000	0	0.000	0	177.3 ✓	gram	# 0
2		GLS	0.00	0.0000	0.000	0	0.000	0	1.000 ✓	smpl	# 0
3		GLS	0.00	0.0000	0.000	0	0.000	0	1.000 ✓	smpl	# 0
4		GLS	0.00	0.0000	0.000	0	0.000	0	177.3 ✓	gram	# 0

Carriers/Tracers used -----

8808

LOG-IN VERIFICATION 8808
08:15:14 03-OCT-07
Cust,set 0 0
Page 1

LOG-IN VERIFICATION
All samples
All planchets

Recounts

R709115 TETRATECH_FW
Tetra Tech EC, Inc.
Alameda Point

CTO 021 TREASURE ISLAND

Pr Mgr.... MCM Rcvd... 09/19/07
Charge.... 00-000 Due.... 09/26/07
Chemist... Value... 0.
Created... 21-SEP-07 Billed.. 0.
Billing status.. open
Calc. units..... PCI /Unit alq Min Pri
/ 0

Record book 06107
p. p. 192-193
10/3/07

smp	elm	typ	mg rec	dpm rec Ash wgt	1st sep		2nd sep		aliquot		carr/ trac
1		GLS	0.00	0.0000	0.000	0	0.000	0	177.3 ✓	gram	# 0
2		GLS	0.00	0.0000	0.000	0	0.000	0	1.000 ✓	smpl	# 0
3		GLS	0.00	0.0000	0.000	0	0.000	0	1.000 ✓	smpl	# 0
4		GLS	0.00	0.0000	0.000	0	0.000	0	177.3 ✓	gram	# 0

Carriers/Tracers used -----

192 709115 JK 10/3/07

8808 WORK RECORD

Date	Analysis	Proc. / Steps	Samps	Analyst	Remarks
09-21-07	Soil Temp	SPP 160 REV D	1	MFM	
09-24-07	MC	SPP 161 REV D	1	MFM	
09-24-07	GLS	SPP 159 REV D	1-4		

JK 9/25/07

709115 TETRA TECH JK 10/8/07 193

9.21.07 8808 SOIL Recd: 09.19.07 DUE 09.26.07.

[GLS]

Cust. ID	TO	FRACT	WTS RSV(g)	WTS ALIQ GLS(g)
8808-1	21-001-MH 09.18.07 15:10	1	222.37	177.28
-2	LCS			
-3	BLANK			
-4	Dup. #1 9.18.07 15:10			177.28
	DONE BY:		JFW 09/21	JFW 09/24

% MC

	GWW(g)	TW(g)	NWW(g)	GDW(g)	NDW(g)	% MC	DONE BY:	CKD BY:
8808-1	228.90	6.53	222.37	189.81	183.28	18.03	JFW	

JK 9/25/07

Section 5.0
Preparation Log For Quality Control Samples, Standards and Tracer/Carrier Certification

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 • U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

#410 Rec'd 12/21/05 K Trenton

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

72015A-207 Am^{241} R1

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.768 E3
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	December 19, 2005 12:00 EST 353.708 05
RELATIVE EXPANDED UNCERTAINTY (k=2):	2.0%

Impurities: γ-impurities <0.1%
α-impurities <0.1%

5.06320 grams 1M HCl solution.

P O NUMBER 00003035, Item 1

SOURCE PREPARED BY: M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED: 12-20-2005

Am-241 R1 in 1N HCL Prep'd 9/14/06

5.0371 g × $\frac{3768 \text{ dps}}{5.06320 \text{ g}}$ × $\frac{60 \text{ sec}}{\text{min}}$ × $\frac{1}{100 \text{ mL}}$ = 2249 dpm/mL ± 1.0% @ 353.708 05

K Trenton
v K. Yamamoto 9/14/06

9/14/06 RP

Prep of Am-241 R1

1B QC

Gross wt 78.4395 g
Tare wt 73.4024 g
Net wt 5.0371 g

Balance Used #36

Procedure CT-T03 Rev 03 6/16/06

Tared a 100mL vol. flask + top. Opened Am-241 Analytics 7201SA-207 vial, Log 410 3.768 E3 dPS in 5.06320g on Dec. 19, 2005 12:00 EST

Transferred Am 241 solution into the tared 100mL vol. flask, Weigh Am-241 sol., flask + top.

Diluted to mark with 1NHCL. Mixed. Trasferred To a 4oz PB.

$$5.0371\ g \times \frac{3768\ dPS}{5.06320\ g} \times \frac{60\ sec}{min} \times \frac{1}{100\ mL} = 7249\ dpm/mL \pm 1.0\%$$ @ 353.705 05

R Preston

✓ K. Yamamoto 9/14/06

9/15/06 RP — Verif of Am^{241} RI IB QC

Pipetted into 3ea 50mL beakers;

0.1mL Am^{241} RI + 0.5mL Am^{243} II

Cont'd Procedure CT-VAM-2 Rev03 6/16/06

1501499-501 R Brenton

9/15/06 RY — Prep of U^{232} F-QI-A-(08) 3

Transferred ~250mL U^{232} F-QI-A-(06)

into 8oz WM PB

18.04 dpm/mL ± 0.4 @ 076.766-06

R Brenton

9/18/06 RP — Prep of H^3 AF I-A-(08) BA

Transferred ~100mL H^3 AF I-A

into a 4oz WMPB.

1.324E5 dpm/mL ± 0.9% @ 246.708 98

R Brenton

#361

National Institute of Standards & Technology

Certificate

Co^{60} K1

Standard Reference Material 4915E
Cobalt-60 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive cobalt-60 chloride, non-radioactive cobalt chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of ionization chambers and solid-state gamma-ray spectrometry systems.

Radiological Hazard

The SRM ampoule contains cobalt-60 with a total activity of approximately 400 kBq. Cobalt-60 decays by beta-particle emission. None of the beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 8 to 2500 keV are emitted. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least January 2005.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
April 1995 (Text only revised November 1997)

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

Rec'd 5/5/00 L Brenton

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have an acid concentration and a carrier concentration comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

#361

Co^{60} KI

PROPERTIES OF SRM 4915E
(Certified values are shown in bold type)

Source identification number	NIST SRM 4915E		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.016 ± 0.002) g•mL^{-1} at 22.1 °C** [b]*		
Solution mass	**(5.063 ± 0.002) g** [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol•L^{-1})	Mass Fraction (g•g^{-1})
	H_2O HCl $CoCl_2$ $^{60}CoCl_2$	54 1.0 1×10^{-3} 3×10^{-8}	0.96 0.04 1×10^{-4} 4×10^{-9}
Radiological Properties:			
Radionuclide	**Cobalt-60**		
Reference time	**1200 EST, 1 January 1995**		
Massic activity of the solution [c] (Activity per unit mass of solution)	**75.55 kBq•g^{-1}**		
Relative expanded uncertainty (k=2)	**0.54%** [d]		
Photon-emitting impurities	None detected [e]		
Half lives used	Cobalt-60: (5.2714 ± 0.0005) a [f] Radium-226: (1600 ± 7) a [f]		
Measuring instrument	Pressurized "4π"γ ionization chamber A calibrated using a cobalt-60 solution whose activity was determined by 4πß-γ-coincidence and anticoincidence counting		

Co^{60} KI prep. in 1N HCl.

7/7/00 RP
~~5.06~~

$5.0262g \times 75.55 \frac{kBq}{g} \times 60 \frac{dpm}{Bq} \times 1000 \times \frac{1}{100ml} = 2.278E5\ dpm/ml \pm 0.28$

@ ~~001.833-95~~ 7/ R.
001.708-95
R Prenton 7/7/00
K. Yamamoto 7/10/00

carrier content: 0.1104 mg/ml Co^0

SRM 4915E, page 3 of 6

*Notes and references are on pages 5 and 6.

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [g]	Relative Sensitivity Factor, $\lvert \partial y/\partial x_i \rvert \cdot (x_i/y)$ [h]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [i]
PIC A net response per gram of SRM 4915E, measured relative to RRS10 [j]	Standard deviation of the mean for 350 repeated measurements (A)	0.02	1.0	0.02
PIC A background response, measured relative to RRS10	Standard deviation of the mean for >250 repeated measurements (A)	0.25	0.001 [k]	0.0003
PIC A net response for RRS100, measured relative to RRS10	Standard deviation of the mean for >100 repeated measurements (A)	0.06	1.0	0.06
PIC A net response per Bq of cobalt-60 in solution, measured relative to RRS100.	Standard deviation of the mean for 720 repeated measurements (A)	0.02	1.0	0.02
Gravimetric measurements	Estimated (B)	0.01	1.0	0.01
Half life of cobalt-60 Half life of radium-226	Standard uncertainty of the half life (A)	0.01 [m] 0.44 [m]	0.03 [n] 0.006 [n]	0.0003 0.003
Activity used to calibrate PIC A net response per Bq of cobalt-60 in solution	Standard uncertainty of the activity determined by 4πß-γ-coincidence and anticoincidence counting (B)	0.20	1.0	0.20
Live-time [p]	Estimated (B)	0.10	1.0	0.10
PIC A charge collection	Estimated (B)	0.05	1.0	0.05
Source Positioning	Estimated (B)	0.05	1.0	0.05
Photon-emitting impurities	Limit of detection (B) [q]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.27
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.54

*Notes and references are on pages 5 and 6.

[j] The response of pressurized ionization chamber A (PIC A) is determined from measurement of the time required to collect a given amount of charge on a stable fixed capacitor. All of the response measurements in the NIST pressurized ionization chambers are made relative to the response of one or more artifact standards. These artifact standards consist of microgram quantities of aged radium-226 in small welded stainless-steel capsules. These capsules are encapsulated in plastic rods whose dimensions are similar to those of the standard NIST ampoule. The artifact standards are called **Radium Reference Sources** and are designated as RRSx, where x is the nominal mass (in micrograms) of radium-226 in the capsule.

[k] $|\partial y/\partial x_i| \cdot (x_i/y)$ = (average background response)/(average net sample response)

[m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

[p] The live time is determined by counting the pulses from a gated oscillator.

[q] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i$ = 100%. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of Co-60)}•{(Bq of impurity)/(Bq of Co-60)}. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), January 1995.

#361

Co^{60} K1

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	300	2	0.3

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) \equiv |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] Estimated limits of detection for photon-emitting impurities are:
76 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 90 and 1169 keV,
24 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 1177 and 1328 keV, and
8 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 1336 and 1900 keV, provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of cobalt-60.

[f] The stated uncertainty is the standard uncertainty. See reference [5].

[g] Relative standard uncertainty of the input quantity x_i.

[h] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[i] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

7/7/00 RP

Prep of Co^{60} KI

Gross 84.3604 g
Tare 79.3342 g
Net 5.0262 g

Balance used #7
Satorius Model 1702

Tared a 100 ml. vol. flask and top. Opened Co^{60} Nist 4915E. log #361, 75.55 kBq·g⁻¹ @ 1200 EST. 1 Jan 1995. Transferred Co^{60} solution into a tared vol. flask. Weighed Co^{60} solution, flask and top. Pipetted 1 ml of Co Pl carrier (10.81 mg/ml Co^{0}) into the flask. Diluted to mark with 1N HCl. Transfer To 4oz P.B.

7/7/00 RP

$$5.0262\,g \times 75.55\,\frac{kBq}{g} \times 60\,\frac{dpm}{Bq} \times 1000 \times \frac{1}{100\,ml} = 2.278E5\,dpm/ml \pm 0.28\%$$

@ 001.708-95 ~~@ 001.833-95~~ 7/7/00 RP ~~001.833-95~~

Co^{0} carrier content:

$$\left[\left(5.0262\,g \times \frac{1000\,mg}{g}\,CoCl_2 \times 0.4539\,\frac{Co^{0}}{CoCl_2}\right) + 10.81\,mg\,Co^{0}\right] \times \frac{1}{100\,ml}$$

7/7/00 RP

$= 0.1104\ mg/ml\ Co^{0}$

K Prentiss

Calculations checked, K Yamamoto 7/10/00

6/11/07 TAC Prep of Co^{60} K1-F-(04) 1B

Procedure CT-T04, Rev. 03 6/16/06

Pipetted 4.1 mL (4×1000 mL + 100 mL) ≃ 4.18 g.

of Co^{60} K1 2.278 E5 dpm/mL ± 0.3% into

a 100 mL vol. Flask. Diluted to mark with

1 N HCL. Transferred to a 4 oz wm PB.

9340 dpm/mL ± 0.7% @ 001.708.95

J. Alaoui

6/12/07 TAC Prep of Am^{243} H-H1-A-(04) 3

Transferred 250 mL Am^{243} H-H1-A into

a 8 oz wm PB

25.18 dpm/mL ± 0.90% @ 282.777-06

J Alaoui

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 • U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

409 Rec'd 12/21/05 K Prenton

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

72016-207 Cs^{137} Q1

Cs-137 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated with an ionization chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Cs-137
ACTIVITY (dps):	3.690 E4
HALF-LIFE:	3.007 E1 years
CALIBRATION DATE:	December 19, 2005 12:00 EST 353.708 DS
RELATIVE EXPANDED UNCERTAINTY (k=2):	1.7%

Impurities: γ-impurities <0.1%

5.01264 grams 0.1M HCl solution with 30 µg/g Cs carrier.

P O NUMBER: 00003035, Item 2

SOURCE PREPARED BY: M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED: 12-20-2005

Cs-137 Q1 prep'd 11/10/06 .1N HCl

$4.9808\,g \times \frac{36900\,dps}{5.012649} \times \frac{60\,sec}{min} \times \frac{1}{100\,mL} = 2.200E4\,dpm/mL \pm 0.9\%$ @ 353.708 DS

0.0546 mg/mL Cs_2PtCl_6 carrier content

K Prenton 11/10/06

K. Yamamoto 11/12/06

1/10/06 RP

Prep of Cs^{137} QI

1A QC

Gross wt. 76.0174 g
Tare wt. ~~74.~~ 71.0366
Net wt 4.9808 g

Balance used #36

Procedure CT-T03, Rev 2, 4/15/02

Tared a 100mL vol. flask + top. Opened Cs-137 vial Analytics ~~70~~ 72016-307, Log 409 3.690E4 dps in 5.01264 g on Dec. 19, 2005 12:00 EST. Transferred Cs-137 sol. into the tared vol. flask. Tared Cs-137 sol., vol. flask + top. Added 100µL Cs D-A6 carrier 50.77 mg/mL Cs_2PtCl_6 to the same flask. Diluted to mark with 0.1M HCL. Transferred to 4oz PB.

$$4.9808\,g \times \frac{36900\,dps}{5.01264\,g} \times \frac{60\,sec}{min} \times \frac{L}{100\,mL} = 2.200E4\,dpm/mL \pm 0.9\%\ @\ 353.708\ QS$$

carrier content
0.0546 mg/mL Cs_2PtCl_6

R Brenton

✓ K. Yamamoto 1/12/06

6/27/05 RP

PB.

Standardization of Cs D-A6 carrier

Procedure CT-CCS, Rev 02. 4/15/02
7.2 Standardization, Balance 2 Model 1702 Sartorius
2 mL a/g from Cs D-A5
Prep. see C-3 pg 39

6/27/05 RP	21	22	23	1
Tare wt	12.4876 g	12.5112 g	12.4712 g	12.5446 g
"	~~12.4875~~ 6/27/05 RP	12.5112	12.4712	12.5446
"	12.4876			
Avg wt	12.4876 g	12.5112 g	12.4712 g	12.5446 g
Gross wt	12.5893 g	12.6126 g	12.5732 g	12.6458 g
"	12.5893	12.6127	12.5730	12.6456
Avg "	12.5893 g	12.61265 g	12.5731 g	12.6457 g
Avg Tare wt	12.4876	12.5112	12.4712	12.5446
	0.1017 g	0.10145 g	0.1019 g	0.1011 g

mean $\frac{101.54\ mg}{2\ mL}$ = 50.77 mg/mL Cs_2PtCl_6 ± 0.17% @ 180 05

K Trenton

K. Yamamoto 6/29/05

8/10/07 RP

Prep of Cs-137 Q1-A-(04) 1B QC

Procedure CT-T04, Rev 03, 6/16/06

Pipetted 10mL (10.00 g) of Cs-137 Q1 22000 dpm/mL ± 0.9% into a 100mL vol. flask.

Diluted to mark with 0.1N HCl

Transferred to 402 WM PB

Cs-137 8/10/07 RP

2200 dpm/mL ± ~~0.9~~ 0.9% @ 353.708-05

RP Preston

8/17/07 RP

Verif. of Tc 99 EI 1507 50-55

8/17/07 RP

Pipetted into 3ea LSC ~~Vials~~ vials;

0.1mL Tc-99 EI 97050 dpm/mL 1507 ~~50-53~~ 50-52

8/17/07 RP

0.1mL Tc-99 DI 96840 " 1507 ~~52-54~~ 53-55

Cont'd Procedure CT-VB-1, Rev 02 6/16/06

Blank 1507-301 5mL H_2O + 15mL Ultima Gold AB

RP Preston

lcy 9/4/07

Section 6.0
Sample Analysis Raw Data

5-Day Gamma Count

Thermo/NUtech Ge(Li) Analysis Report

25-SEP-07 PAGE 1

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
21-001-MH	00049335		TMA # (GLS) 8808	1
TZERO = 261.924 2007			177.2800 GRAM	Aliquot
K 40	3.104E-01	(5.995 +/- 0.443) E+00		7.4%
Co 60	2.547E-02	< 2.547E-02		DET LIM
Cs137	3.179E-02	< 6.757E-02		DET LIM
Eu152	1.925E-01	< 1.925E-01		DET LIM
Eu154	6.789E-02	< 6.789E-02		DET LIM
T1208	2.805E-02	(9.523 +/- 2.918) E-02		30.6%
Pb210	3.062E-01	(1.509 +/- 0.240) E+00		15.9%
Bi212	3.229E-01	< 3.533E-01		DET LIM
Pb212	3.326E-02	(3.460 +/- 0.303) E-01		8.8%
Bi214	5.837E-02	(4.834 +/- 0.598) E-01		12.4%
Pb214	6.605E-02	(5.273 +/- 0.642) E-01		12.2%
Ra226	5.669E-02	(4.694 +/- 0.581) E-01		12.4%
Ac228	1.264E-01	< 1.264E-01		DET LIM
Th230	2.160E+00	< 2.160E+00		DET LIM
Th232	1.015E-01	(2.436 +/- 0.903) E-01		37.1%
Th234	1.484E-02	< 1.484E-02		DET LIM
Pa234m	3.981E+00	< 3.981E+00		DET LIM
U 235	9.420E-02	< 9.420E-02		DET LIM
Am241	2.956E-02	< 2.956E-02		DET LIM
C-LCS #62903	00049336		TMA # (GLS) 8808	2
TZERO = 268.760 2007			1.0000 SMPL	Aliquot
K 40	8.482E+01	< 8.482E+01		DET LIM
Co 60	1.149E+01	(5.549 +/- 0.283) E+02		5.1%
Cs137	1.449E+01	(5.103 +/- 0.225) E+02		4.4%
Eu152	1.189E+02	< 1.189E+02		DET LIM
Eu154	2.323E+01	< 2.323E+01		DET LIM
T1208	1.037E+01	< 1.037E+01		DET LIM
Pb210	1.829E+02	< 1.829E+02		DET LIM
Bi212	1.351E+02	< 1.860E+02		DET LIM
Pb212	1.587E+01	< 1.587E+01		DET LIM
Bi214	2.148E+01	< 2.148E+01		DET LIM
Pb214	2.138E+01	< 2.375E+01		DET LIM
Ra226	2.086E+01	< 2.086E+01		DET LIM
Ac228	5.376E+01	< 5.376E+01		DET LIM
Th230	7.879E+02	< 1.554E+03		DET LIM
Th232	5.376E+01	< 5.376E+01		DET LIM
Th234	4.144E+00	< 4.144E+00		DET LIM
Pa234m	2.214E+03	< 2.214E+03		DET LIM
U 235	3.459E+01	< 3.459E+01		DET LIM
Am241	1.409E+01	(5.653 +/- 0.177) E+02		3.1%

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
QC-BLANK #62904	00049337	TMA # (GLS) 8808		3
TZERO = 268.753 2007		1.0000 SMPL		Aliquot
K 40	2.401E+02	< 2.401E+02		DET LIM
Co 60	9.162E+00	< 9.162E+00		DET LIM
Cs137	1.001E+01	< 1.001E+01		DET LIM
Eu152	7.099E+01	< 7.099E+01		DET LIM
Eu154	2.594E+01	< 2.594E+01		DET LIM
Tl208	9.559E+00	< 9.559E+00		DET LIM
Pb210	8.621E+02	< 8.621E+02		DET LIM
Bi212	1.199E+02	< 1.199E+02		DET LIM
Pb212	1.470E+01	< 1.470E+01		DET LIM
Bi214	1.927E+01	< 3.260E+01		DET LIM
Pb214	2.339E+01	< 3.831E+01		DET LIM
Ra226	1.871E+01	< 3.166E+01		DET LIM
Ac228	4.445E+01	< 4.446E+01		DET LIM
Th230	1.622E+03	< 1.622E+03		DET LIM
Th232	4.445E+01	< 4.446E+01		DET LIM
Th234	5.894E+00	< 5.894E+00		DET LIM
Pa234m	1.427E+03	< 1.427E+03		DET LIM
U 235	3.789E+01	< 3.789E+01		DET LIM
Am241	3.808E+01	< 3.808E+01		DET LIM
QC-DUP#1 62905	00049338	TMA # (GLS) 8808		4
TZERO = 261.924 2007		177.2800 GRAM		Aliquot
K 40	5.891E-01	(5.649 +/- 0.856) E+00		15.2%
Co 60	5.566E-02	< 5.566E-02		DET LIM
Cs137	6.287E-02	< 9.406E-02		DET LIM
Eu152	4.010E-01	< 4.010E-01		DET LIM
Eu154	1.637E-01	< 1.637E-01		DET LIM
Tl208	5.766E-02	(1.078 +/- 0.551) E-01		51.1%
Pb210	6.620E-01	(1.668 +/- 0.514) E+00		30.8%
Bi212	6.419E-01	(5.685 +/- 5.621) E-01		98.9%
Pb212	7.166E-02	(3.602 +/- 0.614) E-01		17.0%
Bi214	1.239E-01	(4.874 +/- 1.196) E-01		24.5%
Pb214	1.406E-01	(6.403 +/- 1.329) E-01		20.8%
Ra226	1.203E-01	(4.733 +/- 1.162) E-01		24.5%
Ac228	2.764E-01	< 2.764E-01		DET LIM
Th230	4.647E+00	< 4.647E+00		DET LIM
Th232	2.422E-01	(2.464 +/- 1.920) E-01		77.9%
Th234	3.173E-02	< 3.173E-02		DET LIM
Pa234m	8.825E+00	< 8.826E+00		DET LIM
U 235	2.071E-01	< 2.071E-01		DET LIM
Am241	6.306E-02	< 6.306E-02		DET LIM

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

GLS 8808-2
LCS
62903
PASS

Sample Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (SMPL)	Yield
2	LCS				268.759-07	JR	1	1

Analysis Info

Sample No.	QA Type	Analyte	Result (PCI/SMPL)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/SMPL)
2	LCS	Am241	5.653E+02	1.770E+01	3.1	1.409E+01
2	LCS	Co 60	5.549E+02	2.830E+01	5.1	1.149E+01
2	LCS	Cs137	5.103E+02	2.250E+01	4.4	1.449E+01

Standard Info

Nuclide	Half Life (days)	Standard Id	Qty (ml)	Activity (dpm/mL)	Reference Date	Decay Date	Added (PCI)	Added Error (%)
AM-241	157900	R1	0.5	2249	353.708-2005	268.759-07	5.051E+02	4
CO-60	1925	K1-F-(04)	0.6	9340	001.708-1995	268.759-07	4.731E+02	4
CS-137	11020	Q1-A-(04)	0.5	2200	353.708-2005	268.759-07	4.758E+02	4

Evaluation Info

Analyte	F/A Ratio	Ratio Error (%)	LCL	LWL	UWL	UCL	Status	Flag
Co 60	1.173	6	0.79	0.86	1.14	1.21	PASS	wh
Cs137	1.073	6	0.80	0.87	1.13	1.20	PASS	
Am241	1.119	5	0.75	0.83	1.17	1.25	PASS	

BW 9/26/07

62903

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

GLS 8808-3
BLANK
62904
PASS

Planchet Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (SMPL)	Yield
3	BLANK				268.752-07	JR	1	1

Analytical Results

Sample No.	QA Type	Analyte	Result (PCI/SMPL)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/SMPL)
3	BLANK	Cs137	< 1.001E+01			1.001E+01

QA Evaluation Results

Analyte	Result (PCI/SMPL)	MDA (PCI/SMPL)	Status	Flag
Cs137	< 1.001E+01	1.001E+01	PASS	

9.26.07

62904

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

GLS 8808-4
DUP of 1
62905
PASS

Planchet Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (GRAM)	Yield
4	DUP	261.924-7			268.752-07	JR	177.28	1
1	ORIGINAL	261.924-7			267.988-07	JR	177.28	1

Analytical Results

Sample No.	QA Type	Analyte	Result (PCI/GRAM)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/GRAM)
4	DUP	K 40	5.649E+00	8.560E-01	15.2	5.891E-01
1	ORIGINAL	K 40	5.995E+00	4.430E-01	7.4	3.104E-01

Evaluation Results

Analyte	Result (PCI/GRAM)	MDA (PCI/GRAM)	UCL	RPD	RER	Criterion	Status	Flag
K 40	5.649E+00	5.891E-01	20.00	6			PASS	

BW 9.26.07

62905

8808 GLS 1 G-1 JR 267.989 7 1038.57 MIN 177.28000 GR 745

LIBR=TTIH REF TIME= 261.924 7 100 mL in Parkway Jar

BNG.2517

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G		
1461 (1460.85)	0.110000	0.00644	1.672	2.359E+03 s	3.70%	5.995E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 9.511E-01 3G		
**** (889.26)	1.000000	0.00984	0.082	8.322E+00 s	<	2.223E-02
1121 (1120.52)	1.000000	0.00810	0.253	3.127E+01 s	19.38%	8.355E-02
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.978E-01 4G		
**** (1173.21)	0.999200	0.00779	0.075	9.657E+00 s	<	2.459E-02
**** (1332.48)	1.000000	0.00698	0.070	1.000E+01 s	<	2.547E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 9.326E-01 16G		
969 (968.30)	0.017200	0.00917	0.233	1.478E+03	22.41%	4.027E+00
1044 (1045.10)	0.018400	0.00860	0.066	4.166E+02	44.30%	1.135E+00
**** (1691.00)	0.457000	0.00566	0.043	1.665E+01 s	<	4.538E-02
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.996E-01 3G		
661 (661.64)	0.851000	0.01252	0.193	1.816E+01 s	28.09%	4.617E-02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.991E-01 48G		
**** (121.78)	0.254000	0.04322	0.184	1.680E+01 s	<	4.273E-02
270 (271.05)	0.000700	0.02485	0.097	5.578E+03	63.24%	1.419E+01
295 (295.97)	0.004000	0.02328	0.864	9.278E+03	9.55%	2.360E+01
**** (344.31)	0.245000	0.02075	0.128	2.513E+01 s	<	6.390E-02
768 (768.90)	0.000800	0.01109	0.062	6.968E+03	67.95%	1.772E+01
**** (963.36)	0.132000	0.00921	0.092	7.568E+01 s	<	1.925E-01
**** (1112.04)	0.124000	0.00815	0.074	7.321E+01 s	<	1.862E-01
**** (1408.02)	0.198000	0.00666	0.065	4.968E+01 s	<	1.263E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.986E-01 48G		
**** (123.07)	0.390000	0.04295	0.205	1.226E+01 s	<	3.119E-02
511 (511.20)	0.000600	0.01535	0.170	1.846E+04	52.93%	4.698E+01
583 (582.03)	0.008000	0.01385	0.446	4.023E+03	15.32%	1.024E+01
**** (723.26)	0.202000	0.01166	0.102	4.351E+01 s	<	1.107E-01
**** (1004.75)	0.170000	0.00889	0.080	5.314E+01 s	<	1.352E-01
**** (1274.49)	0.336000	0.00725	0.065	2.668E+01 s	<	6.789E-02
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 9.448E-01 22G		
295 (295.95)	0.290900	0.02328	0.867	1.280E+02	9.55%	3.442E-01
**** (316.50)	0.830700	0.02213	0.143	7.805E+00 s	<	2.099E-02
**** (468.06)	0.476000	0.01642	0.113	1.452E+01 s	<	3.904E-02
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 19G		
511 (510.80)	0.230000	0.01536	0.170	4.813E+01	52.93%	1.223E-01
583 (583.14)	0.860000	0.01383	0.446	3.748E+01 s	15.32%	9.523E-02
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 1G		
46 (46.50)	0.040000	0.05556	1.320	5.940E+02 s	7.94%	1.509E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 22G		
295 (295.10)	0.000240	0.02333	0.864	1.543E+05	9.55%	3.920E+02
511 (510.72)	0.094000	0.01536	0.170	1.178E+02	52.93%	2.992E-01

583	(583.14)	0.310000	0.01383	0.446	1.040E+02	15.32%	2.642E-01
727	(727.17)	0.066500	0.01161	0.048	6.192E+01 s	75.48%	1.573E-01

Pb212 5.133E+12 DAYS LAMBDA= 1.350E-13 DECAY= 1.000E+00 4G

239	(238.63)	0.431000	0.02731	1.603	1.362E+02 s	4.38%	3.460E-01

Bi214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 48G

610	(609.30)	0.470000	0.01335	1.194	1.903E+02 s	6.19%	4.834E-01
768	(768.70)	0.050000	0.01109	0.062	1.115E+02	67.95%	2.832E-01
1121	(1120.40)	0.170000	0.00810	0.253	1.834E+02	19.38%	4.660E-01
1239	(1238.30)	0.060000	0.00743	0.113	2.534E+02	34.52%	6.438E-01
1378	(1379.00)	0.050000	0.00678	0.039	1.158E+02	63.08%	2.943E-01
1765	(1764.00)	0.170000	0.00546	0.162	1.746E+02	21.47%	4.435E-01
1849	(1848.00)	0.020000	0.00524	0.023	2.239E+02	83.81%	5.688E-01

Pb214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 23G

242	(241.90)	0.076000	0.02703	0.665	3.237E+02	10.71%	8.225E-01
295	(295.20)	0.190000	0.02332	0.864	1.949E+02	9.55%	4.953E-01
352	(352.00)	0.360000	0.02040	1.524	2.075E+02 s	6.09%	5.273E-01
463	(462.10)	0.001700	0.01658	0.129	4.582E+03	38.00%	1.164E+01
768	(768.40)	0.000800	0.01109	0.062	6.964E+03	67.95%	1.769E+01

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 1.000E+00 48G

186	(186.10)	0.040000	0.03266	0.787	6.020E+02 s	13.62%	1.530E+00
242	(242.00)	0.078000	0.02703	0.665	3.155E+02	10.71%	8.016E-01
295	(295.20)	0.201000	0.02332	0.864	1.843E+02	9.55%	4.682E-01
352	(351.96)	0.393000	0.02040	1.524	1.901E+02 s	6.09%	4.830E-01
463	(461.80)	0.002200	0.01658	0.129	3.539E+03	38.00%	8.992E+00
610	(609.32)	0.484000	0.01335	1.194	1.848E+02 s	6.19%	4.694E-01
768	(768.40)	0.053200	0.01109	0.062	1.047E+02	67.95%	2.661E-01
1121	(1120.30)	0.160000	0.00810	0.253	1.948E+02	19.38%	4.951E-01
1239	(1238.10)	0.062000	0.00743	0.113	2.452E+02	34.52%	6.230E-01
1378	(1377.60)	0.041800	0.00678	0.039	1.384E+02	63.08%	3.517E-01
1730	(1729.60)	0.030700	0.00555	0.051	2.976E+02	32.48%	7.563E-01
1765	(1764.50)	0.166000	0.00546	0.162	1.788E+02	21.47%	4.544E-01
1849	(1847.40)	0.022000	0.00524	0.023	2.035E+02	83.81%	5.170E-01

Th227 7.951E+03 DAYS LAMBDA= 8.718E-05 DECAY= 9.995E-01 48G

****	(49.80)	0.087000	0.05556	0.210	4.349E+01 s	<	1.106E-01
80	(79.70)	0.018000	0.05314	0.568	5.937E+02 s	27.15%	1.509E+00
93	(94.00)	0.013500	0.04967	0.688	1.025E+03 s	14.15%	2.607E+00
210	(210.60)	0.012600	0.02990	0.220	5.848E+02 s	32.44%	1.487E+00
****	(236.00)	0.115000	0.02753	0.204	6.452E+01 s	<	1.640E-01
****	(254.70)	0.009100	0.02603	0.161	6.800E+02 s	<	1.729E+00
****	(256.20)	0.063000	0.02591	0.148	9.094E+01 s	<	2.312E-01
270	(270.70)	0.000320	0.02488	0.097	1.219E+04	63.24%	3.099E+01
****	(285.60)	0.016500	0.02391	0.151	3.819E+02 s	<	9.709E-01
295	(296.60)	0.003900	0.02324	0.864	9.531E+03	9.55%	2.423E+01
****	(300.00)	0.018900	0.02305	0.158	3.620E+02 s	<	9.202E-01
****	(304.40)	0.013500	0.02279	0.134	4.351E+02 s	<	1.106E+00
****	(329.90)	0.029000	0.02144	0.150	2.409E+02 s	<	6.123E-01
****	(334.40)	0.011500	0.02122	0.132	5.421E+02 s	<	1.378E+00
352	(350.50)	0.000800	0.02047	1.524	9.308E+04	6.09%	2.366E+02

Ac228 5.133E+12 DAYS LAMBDA= 1.350E-13 DECAY= 1.000E+00 41G

****	(911.10)	0.250000	0.00964	0.120	4.976E+01 s	<	1.264E-01

Th230 2.812E+07 DAYS LAMBDA= 2.465E-08 DECAY= 1.000E+00 8G

****	(68.00)	0.005900	0.05550	0.278	8.503E+02 s	<	2.160E+00

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 42G

130	(129.10)	0.025000	0.04171	0.221	2.115E+02	32.28%	5.374E-01
210	(209.40)	0.039000	0.03003	0.220	1.881E+02	32.44%	4.781E-01

270	(270.30)	0.032000	0.02490	0.097	1.218E+02	63.24%	3.094E-01
339	(338.40)	0.104000	0.02103	0.372	1.702E+02	20.74%	4.324E-01
463	(463.00)	0.040000	0.01655	0.129	1.950E+02	38.00%	4.955E-01
727	(727.00)	0.006900	0.01161	0.048	5.966E+02	75.48%	1.516E+00
795	(794.80)	0.042000	0.01079	0.090	1.989E+02	30.60%	5.054E-01
911	(911.10)	0.250000	0.00964	0.231	9.587E+01	s18.54%	2.436E-01
969	(968.90)	0.150000	0.00916	0.232	1.689E+02	s22.41%	4.291E-01
****	(63.81)	0.010101	0.05607	0.287	5.063E+02	s	<r 1.286E+00

Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 10G		
****	(92.30)	0.999999	0.05009	0.293	5.841E+00	s	< 1.484E-02

Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
768	(766.36)	0.002060	0.01112	0.062	2.698E+03	67.95%	6.856E+00
****	(1001.03)	0.006000	0.00892	0.084	1.567E+03	s	< 3.981E+00

U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00 34G		
80	(81.20)	0.006500	0.05279	0.568	1.655E+03	27.15%	4.205E+00
****	(143.78)	0.132600	0.03894	0.191	3.707E+01	s	<r 9.420E-02
164	(163.36)	0.045900	0.03576	0.143	8.726E+01	39.72%	2.217E-01
186	(185.72)	0.540000	0.03271	0.787	4.453E+01	s13.62%	1.131E-01
242	(240.93)	0.000700	0.02711	0.665	3.504E+04	10.71%	8.904E+01

Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00 41G		
****	(59.54)	0.359000	0.05639	0.236	1.163E+01	s	< 2.956E-02

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8808    GLS   1        G-1 JR 267.989  7 1038.57 MIN   177.28000 GR       745
LIBR=TTIH  REF TIME= 261.924  7       100 mL in Parkway Jar
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* Group......................... 8808 * Time of count          267.989 2007 *
* Sample.......................... 1 * Reference GMT........ 261.924 2007 *
* Element.......................... * Elapsed Live Tm.......... 1038.567 *
* Type code...................... GLS * Dead Time Pct............ 0.006418 *
* ID.................... 21-001-MH * Background GMT....... 266.082 2007 *
* Geometry, detector........... JR-1 * Standard GMT......... 266.063 2007 *
* Aliquot.................... 177.28 * Days since TO............ 6.064667 *
* Unit of Aliquot.............. GRAM * Time on.......... 16:44 PDT 24-SEP *
* Data Sheet Units........ PCI /GRAM * Time off......... 10:02 PDT 25-SEP *
* Library...................... TTIH * Calc Time......... 10:07 25-SEP-07 *
*****************************************************************************
* Slope..................... 1.004722 * Width slope.............. 0.004886 *
* Intercept................ 1.970773 * Width offset............. 1.894211 *
* X**2 TERM......... -0.16467935E-05 * Sensitivity.................... 4. *
  NP:[7,67]745.GSP                 40 PEAKS

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PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	19.8	16	6	27	1.59	19	17.8	1.82E-02	113.2	0.063	0	0.00
2	3	26.5	21	12	339	2.65	1264	24.4	1.22E+00	4.6	0.149	0	38.50
3	3	31.0	21	12	1890	4.12	792	28.9	7.63E-01	10.3	0.239	0	0.00
4	0	46.5	41	8	3500	1.90	1371	44.3	1.32E+00	7.9	0.804	0	0.00
5	0	63.3	58	7	4200	1.49	946	61.0	9.11E-01	11.8	5.61	0	0.00
6	10	70.6	65	19	3770	3.37	1227	68.3	1.18E+00	8.5	5.50	0	69.50
7	10	75.4	65	19	6005	3.27	2528	73.1	2.43E+00	6.5	5.40	0	0.00
8	10	80.4	65	19	5735	3.27	590	78.1	5.68E-01	27.1	5.30	0	0.00
9	4	87.5	83	12	1623	1.81	611	85.1	5.88E-01	9.1	5.13	0	19.70
10	4	92.8	83	12	2059	1.82	1855	90.4	1.79E+00	4.6	5.00	0	0.00
11	0	130.0	125	6	2060	2.14	229	127.5	2.21E-01	32.3	4.15	0	0.00
12	0	144.1	139	6	1932	1.77	166	141.4	1.60E-01	43.2	3.89	0	0.00
13	0	163.6	159	5	1464	1.92	149	160.9	1.43E-01	39.7	3.57	0	0.00
14	0	186.1	178	10	2844	1.80	1335	183.3	1.29E+00	8.0	3.27	0	0.00
15	0	210.0	204	7	1810	1.94	229	207.1	2.20E-01	32.4	3.01	0	0.00
16	6	238.7	231	13	1140	1.82	2203	235.7	2.12E+00	3.2	2.74	0	3.89
17	6	241.7	231	13	1288	1.94	691	238.7	6.65E-01	10.7	2.71	0	0.00
18	0	269.6	263	7	1459	1.94	101	266.5	9.70E-02	63.2	2.50	0	0.00
19	0	295.2	288	9	1762	1.92	1001	292.0	9.64E-01	8.2	2.34	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	338.6	330	10	1564	2.16	451	335.2	4.34E-01	17.0	2.14	0	0.00
21	0	352.0	344	11	1763	2.03	1803	348.6	1.74E+00	5.0	2.08	0	0.00
22	0	438.3	432	8	864	3.61	92	434.6	8.90E-02	56.4	1.76	0	0.00
23	0	463.2	456	8	831	2.35	134	459.4	1.29E-01	38.0	1.68	0	0.00
24	0	511.2	501	14	1188	2.86	1579	507.3	1.52E+00	5.2	1.54	0	0.00
25	0	583.3	574	10	822	2.13	639	579.1	6.15E-01	9.4	1.40	0	0.00
26	0	609.6	599	12	996	2.31	1407	605.3	1.35E+00	5.2	1.35	0	0.00
27	0	661.1	651	11	847	2.08	236	656.8	2.27E-01	23.9	1.26	0	0.00
28	0	727.3	721	7	452	1.97	86	722.7	8.26E-02	43.1	1.17	0	0.00
29	0	767.8	759	9	583	2.75	64	763.1	6.18E-02	67.9	1.12	0	0.00
30	0	795.3	788	6	259	2.22	94	790.6	9.01E-02	30.6	1.09	0	0.00
31	0	911.4	902	9	435	2.16	333	906.5	3.21E-01	12.7	0.974	0	0.00
32	0	968.7	958	13	557	2.38	293	963.7	2.82E-01	17.8	0.921	0	0.00
33	0	1044.4	1037	8	256	3.78	68	1039.3	6.56E-02	44.3	0.865	0	0.00
34	0	1120.5	1109	13	471	3.04	308	1115.4	2.97E-01	15.7	0.819	0	0.00
35	0	1238.6	1229	11	352	2.64	147	1233.3	1.41E-01	27.6	0.752	0	0.00
36	0	1377.8	1368	9	167	1.80	74	1372.5	7.11E-02	34.8	0.680	0	0.00
37	0	1461.4	1448	18	350	3.44	1812	1456.1	1.75E+00	3.4	0.648	0	0.00

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 38   0 1730.4 1721   8     58 3.99      59 1725.2  5.68E-02 29.00.563   0   0.00
 39   0 1765.4 1752  16    159 2.81     208 1760.2  2.00E-01 15.70.553   0   0.00
 PK IT    ENRG LEFT WD BKGND FWHM    AREA    CHAN        CPM  ERR   EFF  K   FIT
 40   0 1848.7 1839  10    112 4.34      24 1843.6  2.35E-02 83.80.530   0   0.00
FWHM=SQRT( 4.73685E+00 +  3.59375E-03 *E)

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BACKGROUND INFO 8808    GLS    1        267.989  7 G- 1      BG DATE 266.082  7
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v--------PEAK---------v      v------BACKGROUND------v      v------NET----v
ENERGY       CPM  %ERROR       ENERGY       CPM  %ERROR          CPM  %ERROR

  63.30    0.9109 11.80         62.00  0.7978 14.53          0.1132139.67R
  92.75    1.7863  4.63         92.00  1.0988  4.66          0.6875 14.15
 144.05    0.1596 43.23        143.00  0.0922 41.42          0.0673117.09R
 186.12    1.2857  8.01        186.00  0.4992  5.93          0.7865 13.62
 238.72    2.1214  3.16        238.60  0.5188  4.01          1.6026  4.38
 295.16    0.9643  8.16        295.20  0.1004 24.81          0.8639  9.55
 338.55    0.4340 17.01        338.40  0.0619 36.32          0.3721 20.74
 351.97    1.7356  5.01        351.90  0.2115 15.17          1.5240  6.09
 511.23    1.5200  5.25        511.00  1.3500  3.09          0.1700 52.93
 583.30    0.6151  9.43        583.10  0.1695 21.24          0.4456 15.32
 609.57    1.3548  5.19        609.30  0.1607 14.12          1.1941  6.19
 661.13    0.2272 23.92        661.60  0.0338  0.00          0.1935 28.09
 727.27    0.0826 43.10        727.20  0.0348 16.65          0.0478 75.48
 911.35    0.3207 12.74        911.10  0.0896 14.39          0.2311 18.54
 968.73    0.2823 17.82        968.90  0.0502 26.30          0.2321 22.41
1120.54    0.2965 15.68       1120.30  0.0440 34.80          0.2525 19.38
1238.63    0.1415 27.57       1238.10  0.0285  0.00          0.1130 34.52
1377.83    0.0711 34.81       1377.70  0.0319  0.00          0.0392 63.08
1461.41    1.7452  3.37       1461.00  0.0727 25.86          1.6725  3.70
1730.43    0.0568 29.01       1729.60  0.0061  0.00          0.0507 32.48
1765.38    0.2002 15.74       1764.50  0.0383 38.41          0.1620 21.47
    2 PEAKS REJECTED BY BACKGROUND

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INTERFERING ISOTOPE ANALYSIS 8808    GLS    1        267.989  7 G- 1
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SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 8808 1 GLS RUN AT 267.989/2007

BACKGROUND FOR GELI DETECTOR 1 OF 266.082/2007 2129.4 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.7978	14.53	511.0	1.3500	3.09	1120.3	0.0440	34.80
92.0	1.0988	4.66	583.1	0.1695	21.24	1173.2	0.0272	0.00
143.0	0.0922	41.42	609.3	0.1607	14.12	1238.1	0.0285	0.00
186.0	0.4992	5.93	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0731	22.84	727.2	0.0348	16.65	1377.7	0.0319	0.00
238.6	0.5188	4.01	846.0	0.0664	58.47	1461.0	0.0727	25.86
279.0	0.0000	0.00	860.4	0.0372	0.00	1586.0	0.0000	0.00
295.2	0.1004	24.81	911.1	0.0896	14.39	1591.0	0.0620	0.00
338.4	0.0619	36.32	968.9	0.0502	26.30	1729.6	0.0061	0.00
351.9	0.2115	15.17	1001.0	0.0475	34.54	1764.5	0.0383	38.41

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 9/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
209.734	7	1.8112	17.607	25.
218.883	7	1.7454	14.137	138.
223.775	7	1.7551	14.882	22.
230.918	7	1.7347	13.890	35.
237.741	7	1.7237	13.528	28.
258.777	7	1.7442	14.353	29.
265.711	7	1.7599	15.213	22.
265.864	7	1.5439	11.619	38. NG
265.918	7	1.5464	12.253	26. NG
266.063	7	1.5169	11.690	20. NG
AVERAGE		1.7535	0.028	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
61.983	7	1.0721	3.484	31.
70.013	7	1.0668	4.608	26.
71.872	7	1.0549	5.509	41.
76.856	7	1.0713	7.228	30.
81.670	7	1.0534	5.600	25.
103.972	7	0.8203	15.248	21.
192.664	7	0.9760	34.750	25.
197.727	7	2.1369	18.219	45.
205.876	7	0.9740	30.810	21.
216.753	7	0.9677	15.266	24.
AVERAGE		1.0295	0.048	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 266.063 7
ENERGY= 1.970773 + 1.0047222*CH + -1.646794E-06*CH**2
FWHM =SQRT(1.8942 + 0.004886*ENERGY) (CO60= 2.899)

EFFICIENCIES FOR GEOMETRY JR 1 CALIBRATED 207.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.555600	100.0	4.819200	300.0	2.304700	0.0	0.000000
55.0	5.631600	110.0	4.582500	500.0	1.562100	0.0	0.000000
60.0	5.636600	130.0	4.152700	700.0	1.197600	0.0	0.000000
65.0	5.592800	150.0	3.787300	1000.0	0.892900	0.0	0.000000
70.0	5.516200	170.0	3.479400	1400.0	0.669100		
80.0	5.307100	190.0	3.218900	2000.0	0.489700		
90.0	5.065700	250.0	2.638800	3000.0	0.348600		

8808 1 GLS GSTOR 745

	PK	ENERGY	CPM	%ERR	COMMENT
	1	19.8	0.02	99.9	
	2	26.5	1.22	4.6	
	3	31.0	0.76	10.3	
	4	46.5	1.32	7.9	NO GEN. Pb210s
	6	70.6	1.18	8.5	
	7	75.4	2.43	6.5	
	8	80.4	0.57	27.1	Ce144 I 131 Th227s
	9	87.5	0.59	9.1	Cs136 Cd109
b	10	92.8	0.69	14.1	Th234s Th227s
	11	130.0	0.22	32.3	Ac228 La140
	13	163.6	0.14	39.7	Ba140 Cs136
b	14	186.1	0.79	13.6	Cs136 U 235s Ra226s
	15	210.0	0.22	32.4	Ac228 Th227s
b	16	238.7	1.60	4.4	Th228 Pb212s
	17	241.7	0.67	10.7	Ra226 Th228 La140
	18	269.6	0.10	63.2	Ac228 Fe 59p
b	19	295.2	0.86	9.6	Ra226 Ru103
b	20	338.6	0.37	20.7	Ac228
b	21	352.0	1.52	6.1	Ra226s Pb214s
	22	438.3	0.09	56.4	K 40p Ba140
	23	463.2	0.13	38.0	Ra226 Ac228 Sb125
b	24	511.2	0.17	52.9	Th228 La140 Ru106 Na 22
b	25	583.3	0.45	15.3	Th228 Tl208s
b	26	609.6	1.19	6.2	Ru103 Ra226s Bi214s
b	27	661.1	0.19	28.1	Cs137s
	28	727.3	0.05	75.5	Ac228 Th228 Bi212s
	29	767.8	0.06	67.9	Ra226
	30	795.3	0.09	30.6	Ac228 Cs134
b	31	911.4	0.23	18.5	Th232s Ac228s
b	32	968.7	0.23	22.4	Ac228 Sb124 Th232s
	33	1044.4	0.07	44.3	Sb124
b	34	1120.5	0.25	19.4	Ra226 Sc 46s
b	35	1238.6	0.11	34.5	Ra226
b	36	1377.8	0.04	63.1	Ra226
b	37	1461.4	1.67	3.7	K 40s
b	38	1730.4	0.05	32.5	Ra226
b	39	1765.4	0.16	21.5	Ra226
	40	1848.7	0.02	83.8	Ra226
			REJECTED PEAKS		
B	5	63.3	0.11	99.9	Th232s
B	12	144.1	0.07	99.9	Ce141 U 235s

8808 GLS 2 G-7 JR 268.760 7 220.25 MIN 1.00000 SM 760

LIBR=TTIH REF TIME= 268.760 7 100 mLs in Parkway Jar

DNG.2507

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G		
**** (1460.85)	0.110000	0.00609	0.126	1.883E+02 s	<r	8.482E+01
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 1.000E+00 3G		
**** (889.26)	1.000000	0.01014	0.298	2.940E+01 s	<	1.324E+01
**** (1120.52)	1.000000	0.00806	0.216	2.682E+01 s	<	1.208E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 1.000E+00 4G		
1172 (1173.21)	0.999200	0.00768	8.431	1.098E+03 s 2.70%		4.947E+02
1332 (1332.48)	1.000000	0.00672	8.278	1.232E+03 s 2.55%		5.549E+02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 1.000E+00 16G		
**** (1691.00)	0.457000	0.00518	0.104	4.416E+01 s	<	1.989E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 1.000E+00 3G		
661 (661.64)	0.851000	0.01334	12.864	1.133E+03 s 2.20%		5.103E+02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 1.000E+00 48G		
**** (121.78)	0.254000	0.04799	0.428	3.510E+01 s	<	1.581E+01
**** (344.31)	0.245000	0.02289	0.385	6.872E+01 s	<	3.095E+01
**** (963.36)	0.132000	0.00939	0.327	2.639E+02 s	<	1.189E+02
**** (1112.04)	0.124000	0.00812	0.257	2.550E+02 s	<	1.149E+02
**** (1408.02)	0.198000	0.00634	0.109	8.696E+01 s	<	3.917E+01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 1.000E+00 48G		
**** (123.07)	0.390000	0.04770	0.421	2.262E+01 s	<	1.019E+01
**** (723.26)	0.202000	0.01233	0.227	9.105E+01 s	<	4.101E+01
**** (1004.75)	0.170000	0.00901	0.244	1.591E+02 s	<	7.169E+01
**** (1274.49)	0.336000	0.00704	0.122	5.157E+01 s	<	2.323E+01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 1.000E+00 22G		
**** (316.50)	0.830700	0.02447	0.353	1.738E+01 s	<	7.827E+00
**** (468.06)	0.476000	0.01791	0.382	4.481E+01 s	<	2.018E+01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 19G		
**** (583.14)	0.860000	0.01489	0.295	2.303E+01 s	<	1.037E+01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 1G		
**** (46.50)	0.040000	0.04040	0.656	4.060E+02 s	<	1.829E+02
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 22G		
726 (727.17)	0.066500	0.01226	0.189	2.314E+02 s47.54%		1.042E+02
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 4G		
**** (238.63)	0.431000	0.03035	0.461	3.523E+01 s	<r	1.587E+01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
**** (609.30)	0.470000	0.01434	0.321	4.768E+01 s	<	2.148E+01
Pb214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 23G		
352 (352.00)	0.360000	0.02249	0.207	2.562E+01 s64.12%		1.154E+01

Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00	48G			
****	(186.10)	0.040000	0.03642	0.469	3.218E+02	s		<T	1.449E+02
352	(351.96)	0.393000	0.02250	0.207	2.347E+01	s	64.12%		1.057E+01
****	(609.32)	0.484000	0.01434	0.321	4.631E+01	s		<	2.086E+01
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 1.000E+00	48G			
****	(49.80)	0.087000	0.04963	0.852	1.972E+02	s		<	8.885E+01
****	(79.70)	0.018000	0.05657	0.430	4.223E+02	s		<	1.902E+02
****	(94.00)	0.013500	0.05416	0.499	6.826E+02	s		<T	3.075E+02
****	(210.60)	0.012600	0.03330	0.444	1.057E+03	s		<	4.763E+02
****	(236.00)	0.115000	0.03061	0.421	1.196E+02	s		<	5.385E+01
****	(254.70)	0.009100	0.02890	0.433	1.645E+03	s		<	7.410E+02
****	(256.20)	0.063000	0.02877	0.406	2.242E+02	s		<	1.010E+02
****	(285.60)	0.016500	0.02649	0.358	8.193E+02	s		<	3.691E+02
****	(300.00)	0.018900	0.02551	0.398	8.261E+02	s		<	3.721E+02
****	(304.40)	0.013500	0.02522	0.373	1.094E+03	s		<	4.929E+02
****	(329.90)	0.029000	0.02368	0.361	5.261E+02	s		<	2.370E+02
****	(334.40)	0.011500	0.02343	0.353	1.310E+03	s		<	5.900E+02
352	(350.50)	0.000800	0.02257	0.207	1.149E+04		64.12%		5.175E+03
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	41G			
****	(911.10)	0.250000	0.00991	0.296	1.194E+02	s		<	5.376E+01
Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00	8G			
69	(68.00)	0.005900	0.05696	0.787	2.341E+03	s	28.67%		1.055E+03
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00	42G			
726	(727.00)	0.006900	0.01227	0.189	2.230E+03		47.54%		1.004E+03
****	(911.10)	0.250000	0.00991	0.296	1.194E+02	s		<	5.376E+01
****	(968.90)	0.150000	0.00934	0.284	2.026E+02	s		<	9.124E+01
***	(63.81)	0.010101	0.05644	0.475	8.325E+02	s		<T	3.750E+02
Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	10G			
****	(92.30)	0.999999	0.05450	0.501	9.199E+00	s		<T	4.144E+00
Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G			
****	(1001.03)	0.006000	0.00904	0.267	4.915E+03	s		<	2.214E+03
U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00	34G			
60	(58.60)	0.001000	0.05505	24.947	4.532E+05		1.56%		2.041E+05
****	(143.78)	0.132600	0.04342	0.442	7.679E+01	s		<	3.459E+01
****	(185.72)	0.540000	0.03647	0.469	2.380E+01	s		<T	1.072E+01
Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00	41G			
60	(59.54)	0.359000	0.05537	24.947	1.255E+03	s	1.56%		5.653E+02

8808 GLS 2 G-7 JR 268.760 7 220.25 MIN 1.00000 SM 760

LIBR=TTIH REF TIME= 268.760 7 100 mLs in Parkway Jar

* Group	8808	* Time of count	268.760 2007 *
* Sample	2	* Reference GMT	268.760 2007 *
* Element		* Elapsed Live Tm	220.25 *
* Type code	GLS	* Dead Time Pct	0.030259 *
* ID	QC-LCS #62903	* Background GMT	265.990 2007 *
* Geometry, detector	JR-7	* Standard GMT	265.918 2007 *
* Aliquot	1.	* Days since TO	0.0 *
* Unit of Aliquot	SMPL	* Time on	11:14 PDT 25-SEP *
* Data Sheet Units	PCI /SMPL	* Time off	14:54 PDT 25-SEP *
* Library	TTIH	* Calc Time	15:01 25-SEP-07 *
* Slope	1.006354	* Width slope	0.003462 *
* Intercept	2.745438	* Width offset	1.777184 *
* X**2 TERM	-0.13689643E-05	* Sensitivity	4. *

NP:[7,67]760.GSP 18 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	26.4	21	6	482	1.94	358	23.5	1.63E+00	11.	80.147	0	0.00
2	7	32.0	26	11	750	1.52	614	29.1	2.79E+00	8.	10.262	0	0.90
3	7	36.4	26	11	417	1.15	108	33.5	4.89E-01	27.	80.386	0	0.00
4	0	49.1	42	8	1832	2.46	411	46.1	1.86E+00	18.	80.948	0	0.00
5	7	59.6	51	12	829	1.59	5495	56.5	2.49E+01	1.	6 5.53	0	51.80
6	7	63.4	51	12	249	1.03	81	60.3	3.66E-01	33.	6 5.63	0	0.00
7	0	69.5	63	8	740	3.10	173	66.3	7.87E-01	28.	7 5.70	0	0.00
8	0	92.6	86	7	550	1.33	145	89.3	6.60E-01	28.	5 5.44	0	0.00
9	0	186.8	179	7	535	1.72	67	183.0	3.04E-01	59.	9 3.63	0	0.00
10	0	238.7	232	6	394	1.82	57	234.5	2.59E-01	58.	3 3.05	0	0.00
11	0	351.9	345	6	308	1.71	69	347.2	3.11E-01	42.	5 2.30	0	0.00
12	0	510.7	499	12	367	2.85	252	505.1	1.14E+00	16.	5 1.67	0	0.00
13	0	661.2	650	11	277	1.91	2842	654.9	1.29E+01	2.	2 1.34	0	0.00
14	0	726.5	717	7	120	1.84	47	719.9	2.14E-01	41.	9 1.23	0	0.00
15	0	1172.4	1158	13	141	2.37	1864	1164.1	8.46E+00	2.	70.778	0	0.00
16	0	1331.6	1315	16	56	2.79	1831	1322.9	8.31E+00	2.	50.677	0	0.00
17	0	1372.0	1360	6	9	1.13	12	1363.1	5.60E-02	53.	50.653	0	0.00
18	0	1460.8	1448	8	10	3.15	20	1451.7	9.03E-02	42.	10.613	0	0.00

FWHM=SQRT(3.30553E+00 + 2.10938E-03 *E)

BACKGROUND INFO 8808 GLS 2 268.760 7 G- 7 BG DATE 265.990 7

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
63.39	0.3656	33.60	62.00	0.4732	27.36	-0.1076	165.81R
92.64	0.6598	28.49	92.00	0.6172	6.90	0.0427	451.72R
186.84	0.3037	59.86	186.00	0.3185	12.22	-0.0147	******R
238.69	0.2589	58.32	238.50	0.3053	11.33	-0.0465	333.37R
351.95	0.3113	42.51	351.90	0.1039	13.09	0.2075	64.12
510.70	1.1446	16.52	511.00	1.0110	3.62	0.1336	144.16R
661.20	12.9015	2.20	661.60	0.0377	20.70	12.8638	2.20
726.48	0.2144	41.86	727.20	0.0256	0.00	0.1887	47.54
1172.42	8.4648	2.68	1173.20	0.0344	34.03	8.4304	2.70
1331.61	8.3141	2.53	1332.50	0.0360	53.28	8.2780	2.55
1460.82	0.0903	42.08	1461.00	0.0610	13.45	0.0293	132.58R

6 PEAKS REJECTED BY BACKGROUND

****
INTERFERING ISOTOPE ANALYSIS 8808 GLS 2 268.760 7 G- 7
****
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8808 2 GLS RUN AT 268.760/2007

BACKGROUND FOR GELI DETECTOR 7 OF 265.990/2007 2261.7 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4732	27.36	511.0	1.0110	3.62	1120.3	0.0201	10.97
92.0	0.6172	6.90	583.1	0.0884	32.82	1173.2	0.0344	34.03
143.0	0.0575	27.46	609.3	0.0931	25.68	1238.1	0.0195	0.00
186.0	0.3185	12.22	661.6	0.0377	20.70	1332.5	0.0360	53.28
198.0	0.0686	28.00	727.2	0.0256	0.00	1377.7	0.0253	0.00
238.5	0.3053	11.33	846.0	0.0581	23.39	1461.0	0.0610	13.45
279.0	0.0000	0.00	860.4	0.0351	0.00	1586.0	0.0000	0.00
295.2	0.0595	11.76	911.1	0.0703	30.56	1591.0	0.0333	0.00
338.4	0.0739	11.76	968.9	0.0471	46.72	1729.6	0.0116	0.00
351.9	0.1039	13.09	1001.0	0.0417	34.54	1764.5	0.0201	28.36

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 7 ON 9/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
71.872	7	1.0395	11.486	39.
103.898	7	0.8806	8.120	30.
109.825	7	1.0019	9.030	22.
114.670	7	0.9891	8.186	29.
127.663	7	0.9841	7.790	44.
133.833	7	0.9924	7.542	27.
150.885	7	0.8859	11.264	14.
154.032	7	0.9734	5.981	22.
173.704	7	0.9383	4.693	21.
175.828	7	0.9978	8.266	38.
AVERAGE		0.9683	0.051	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
227.708	7	1.0171	8.560	25.NG
228.781	7	0.9974	7.749	23.
230.893	7	1.0167	8.008	32.
235.819	7	1.0523	14.305	27.
237.860	7	1.0038	8.379	26.
244.938	7	1.0507	12.319	35.
258.777	7	1.0466	12.929	31.
265.711	7	1.0175	9.504	24.
265.864	7	0.8918	13.018	40.
265.918	7	1.0084	7.775	28.
AVERAGE		1.0234	0.021	

CALIBRATION LINE FROM STANDARD FOR G- 7 OF 265.918 7
ENERGY= 2.745438 + 1.0063537*CH + -1.368964E-06*CH**2
FWHM =SQRT(1.7772 + 0.003462*ENERGY) (CO60= 2.528)

EFFICIENCIES FOR GEOMETRY JR 7 CALIBRATED 50.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.023100	100.0	5.287100	300.0	2.551200	0.0	0.000000
55.0	5.347200	110.0	5.062500	500.0	1.699100	0.0	0.000000
60.0	5.551400	130.0	4.620300	700.0	1.270100	0.0	0.000000
65.0	5.663400	150.0	4.223800	1000.0	0.905100	0.0	0.000000
70.0	5.706100	170.0	3.881400	1400.0	0.637600		
80.0	5.653400	190.0	3.588400	2000.0	0.429900		
90.0	5.494600	250.0	2.931100	3000.0	0.279600		

8808 2 GLS GSTOR 760

	PK	ENERGY	CPM	%ERR	COMMENT
	1	26.4	1.63	11.8	
	2	32.0	2.79	8.1	
	3	36.4	0.49	27.8	
	4	49.1	1.86	18.8	Th227s
	5	59.6	24.95	1.6	Am241s
	7	69.5	0.79	28.7	Th230s
b	11	351.9	0.21	64.1	Ra226s Pb214s
b	13	661.2	12.86	2.2	Cs137s
b	14	726.5	0.19	47.5	Ac228 Th228 Bi212s
b	15	1172.4	8.43	2.7	Co 60s
b	16	1331.6	8.28	2.5	Co 60s
	17	1372.0	0.06	53.5	
			REJECTED PEAKS		
B	6	63.4	-0.11	99.9	Th232s
B	8	92.6	0.04	99.9	Th234s Th227s
B	9	186.8	-0.01	99.9	Cs136 U 235s Ra226s
B	10	238.7	-0.05	99.9	Th228 Pb212s
B	12	510.7	0.13	99.9	Ac228 Th228 La140 Ru106 Na 22
B	18	1460.8	0.03	99.9	K 40s

8808 GLS 3 G-8 JR 268.753 7 231.05 MIN 1.00000 SM 761

LIBR=TTIH REF TIME= 268.753 7 100ML IN PARKWAY JAR

Bra.251

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G	
**** (1460.85)	0.110000	0.00870	0.510	5.330E+02 s		<r 2.401E+02
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 1.000E+00	3G	
**** (889.26)	1.000000	0.01312	0.227	1.729E+01 s		< 7.789E+00
**** (1120.52)	1.000000	0.01092	0.271	2.478E+01 s		<r 1.116E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 1.000E+00	4G	
**** (1173.21)	0.999200	0.01051	0.228	2.168E+01 s		< 9.767E+00
**** (1332.48)	1.000000	0.00943	0.192	2.034E+01 s		< 9.162E+00
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 1.000E+00	16G	
**** (1691.00)	0.457000	0.00763	0.153	4.383E+01 s		< 1.974E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 1.000E+00	3G	
**** (661.64)	0.851000	0.01635	0.309	2.222E+01 s		<r 1.001E+01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 1.000E+00	48G	
**** (121.78)	0.254000	0.04555	0.480	4.145E+01 s		< 1.867E+01
295 (295.97)	0.004000	0.02933	0.269	2.296E+03	66.45%	1.034E+03
**** (344.31)	0.245000	0.02585	0.360	5.683E+01 s		< 2.560E+01
**** (963.36)	0.132000	0.01234	0.257	1.576E+02 s		< 7.099E+01
**** (1112.04)	0.124000	0.01099	0.217	1.593E+02 s		< 7.176E+01
**** (1408.02)	0.198000	0.00899	0.201	1.127E+02 s		< 5.076E+01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 1.000E+00	48G	
**** (123.07)	0.390000	0.04559	0.477	2.681E+01 s		< 1.208E+01
**** (723.26)	0.202000	0.01534	0.258	8.339E+01 s		< 3.756E+01
**** (1004.75)	0.170000	0.01194	0.210	1.035E+02 s		< 4.660E+01
**** (1274.49)	0.336000	0.00980	0.190	5.759E+01 s		< 2.594E+01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 1.000E+00	22G	
295 (295.95)	0.290900	0.02934	0.270	3.159E+01	66.45%	1.423E+01
**** (316.50)	0.830700	0.02768	0.395	1.716E+01 s		< 7.731E+00
**** (468.06)	0.476000	0.02081	0.340	3.430E+01 s		< 1.545E+01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G	
**** (583.14)	0.860000	0.01788	0.326	2.122E+01 s		<r 9.559E+00
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G	
**** (46.50)	0.040000	0.00599	0.459	1.914E+03 s		< 8.621E+02
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G	
295 (295.10)	0.000240	0.02942	0.269	3.816E+04	66.45%	1.719E+04
**** (727.17)	0.066500	0.01527	0.270	2.662E+02 s		< 1.199E+02
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G	
**** (238.63)	0.431000	0.03495	0.492	3.263E+01 s		<r 1.470E+01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G	
610 (609.30)	0.470000	0.01732	0.285	3.494E+01 s	64.95%	1.574E+01

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Pb214    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 23G
 242 ( 241.90)   0.076000    0.03466        0.437   1.660E+02   37.46%  7.476E+01
 295 ( 295.20)   0.190000    0.02941        0.269   4.822E+01   66.45%  2.172E+01
 352 ( 352.00)   0.360000    0.02540        0.381   4.171E+01  s62.97%  1.879E+01

Ra226    5.851E+05 DAYS      LAMBDA= 1.185E-06     DECAY= 1.000E+00 48G
**** ( 186.10)   0.040000    0.04006        0.558   3.484E+02  s       <r 1.570E+02
 242 ( 242.00)   0.078000    0.03465        0.437   1.617E+02   37.46%  7.286E+01
 295 ( 295.20)   0.201000    0.02941        0.269   4.558E+01   66.45%  2.053E+01
 352 ( 351.96)   0.393000    0.02541        0.381   3.821E+01  s62.97%  1.721E+01
 610 ( 609.32)   0.484000    0.01732        0.285   3.393E+01  s64.95%  1.528E+01

Th227    7.951E+03 DAYS      LAMBDA= 8.718E-05     DECAY= 1.000E+00 48G
**** (  49.80)   0.087000    0.00736        0.452   7.049E+02  s       <  3.175E+02
**** (  79.70)   0.018000    0.03292        0.475   8.021E+02  s       <  3.613E+02
**** (  94.00)   0.013500    0.04048        0.516   9.440E+02  s       <r 4.252E+02
 140 ( 140.50)   0.000320    0.04504        0.235   1.630E+04   77.71%  7.343E+03
**** ( 210.60)   0.012600    0.03749        0.506   1.071E+03  s       <  4.823E+02
**** ( 236.00)   0.115000    0.03519        0.511   1.264E+02  s       <  5.694E+01
**** ( 254.70)   0.009100    0.03346        0.434   1.426E+03  s       <  6.422E+02
**** ( 256.20)   0.063000    0.03331        0.396   1.887E+02  s       <  8.499E+01
**** ( 285.60)   0.016500    0.03034        0.378   7.541E+02  s       <  3.397E+02
 295 ( 296.60)   0.003900    0.02927        0.269   2.360E+03   66.45%  1.063E+03
**** ( 300.00)   0.018900    0.02895        0.419   7.666E+02  s       <  3.453E+02
**** ( 304.40)   0.013500    0.02860        0.382   9.907E+02  s       <  4.463E+02
**** ( 329.90)   0.029000    0.02675        0.385   4.958E+02  s       <  2.233E+02
**** ( 334.40)   0.011500    0.02646        0.382   1.257E+03  s       <  5.662E+02
 352 ( 350.50)   0.000800    0.02549        0.381   1.871E+04   62.97%  8.427E+03

Ac228    5.133E+12 DAYS      LAMBDA= 1.350E-13     DECAY= 1.000E+00 41G
**** ( 911.10)   0.250000    0.01288        0.318   9.869E+01  s       <r 4.446E+01

Th230    2.812E+07 DAYS      LAMBDA= 2.465E-08     DECAY= 1.000E+00  8G
**** (  68.00)   0.005900    0.02362        0.502   3.600E+03  s       <  1.622E+03

Th232    5.113E+12 DAYS      LAMBDA= 1.356E-13     DECAY= 1.000E+00 42G
**** ( 911.10)   0.250000    0.01288        0.318   9.869E+01  s       <r 4.446E+01
**** ( 968.90)   0.150000    0.01229        0.282   1.530E+02  s       <r 6.890E+01
**** (  63.81)   0.010101    0.01977        0.510   2.555E+03  s       <  1.151E+03

Th234    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 10G
**** (  92.30)   0.999999    0.03980        0.521   1.308E+01  s       <r 5.894E+00

Pa234m   1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 48G
**** (1001.03)   0.006000    0.01198        0.228   3.167E+03  s       <  1.427E+03

U 235    2.571E+11 DAYS      LAMBDA= 2.696E-12     DECAY= 1.000E+00 34G
  85 (  84.24)   0.051000    0.03580        1.046   5.727E+02   15.81%  2.580E+02
 140 ( 140.75)   0.001730    0.04503        0.235   3.017E+03   77.71%  1.359E+03
**** ( 143.78)   0.132600    0.04479        0.500   8.411E+01  s       <  3.789E+01
**** ( 185.72)   0.540000    0.04011        0.523   2.413E+01  s       <r 1.087E+01
 242 ( 240.93)   0.000700    0.03475        0.437   1.797E+04   37.46%  8.096E+03

Am241    1.582E+05 DAYS      LAMBDA= 4.381E-06     DECAY= 1.000E+00 41G
**** (  59.54)   0.359000    0.01576        0.478   8.454E+01  s       <  3.808E+01
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8808   GLS  3      G-8 JR 268.753  7  231.05 MIN     1.00000 SM      761
LIBR=TTIH  REF TIME= 268.753  7       100ML IN PARKWAY JAR
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Group	8808	Time of count	268.753 2007
Sample	3	Reference GMT	268.753 2007
Element		Elapsed Live Tm	231.05
Type code	GLS	Dead Time Pct	0.043261
ID	4 QC-BLANK #62904	Background GMT	265.918 2007
Geometry, detector	JR-8	Standard GMT	265.894 2007
Aliquot	1.	Days since TO	0.0
Unit of Aliquot	SMPL	Time on	11:04 PDT 25-SEP
Data Sheet Units	PCI /SMPL	Time off	14:54 PDT 25-SEP
Library	TTIH	Calc Time	15:02 25-SEP-07
Slope	0.981489	Width slope	0.005591
Intercept	0.191330	Width offset	1.846792
X**2 TERM	-0.13299986E-05	Sensitivity	4.

NP:[7,67]761.GSP 24 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	25.1	23	9	59	1.45	182	25.4	7.86E-01	12.2	0.126	0	0.36
2	5	27.5	23	9	375	1.87	192	27.8	8.30E-01	18.7	0.167	0	0.00
3	0	32.1	31	6	637	4.24	57	32.5	2.48E-01	70.9	0.265	0	0.00
4	0	74.1	70	11	1219	2.97	781	75.3	3.38E+00	9.4	2.83	0	0.00
5	4	84.8	82	10	529	1.53	242	86.3	1.05E+00	15.8	3.58	0	1.34
6	4	87.4	82	10	312	1.11	89	88.9	3.86E-01	30.0	3.72	0	0.00
7	0	93.0	92	7	691	2.00	140	94.6	6.04E-01	32.8	3.98	0	0.00
8	0	139.5	141	6	657	1.70	54	142.0	2.35E-01	77.7	4.49	0	0.00
9	0	186.0	186	7	694	2.29	143	189.3	6.18E-01	32.0	4.01	0	0.00
10	2	238.7	240	10	382	1.59	170	243.1	7.36E-01	19.3	3.49	0	0.45
11	2	241.8	240	10	450	1.91	101	246.3	4.37E-01	37.5	3.47	0	0.00
12	0	295.3	297	8	474	3.41	130	300.8	5.64E-01	30.8	2.94	0	0.00
13	0	351.9	353	11	527	2.09	241	358.5	1.04E+00	19.9	2.63	0	0.00
14	0	510.9	514	13	409	3.13	575	520.7	2.49E+00	8.5	1.97	0	0.00
15	0	582.7	591	8	208	2.14	77	594.0	3.33E-01	37.1	1.81	0	0.00
16	0	609.5	616	11	278	2.16	257	621.3	1.11E+00	14.4	1.75	0	0.00
17	0	660.9	671	9	197	2.55	76	673.7	3.29E-01	37.0	1.65	0	0.00
18	0	911.2	925	13	174	3.04	129	929.3	5.57E-01	23.0	1.30	0	0.00
19	0	967.8	982	15	247	5.46	56	987.2	2.44E-01	61.5	1.23	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1120.4	1138	10	125	3.27	62	1143.1	2.67E-01	38.0	1.10	0	0.00
21	0	1377.7	1404	7	44	2.35	33	1406.1	1.42E-01	40.3	0.918	0	0.00
22	0	1461.0	1484	14	88	3.04	561	1491.3	2.43E+00	5.6	0.875	0	0.00
23	0	1728.4	1761	9	27	2.06	20	1765.0	8.66E-02	60.9	0.759	0	0.00
24	0	1764.0	1793	15	45	2.68	105	1801.4	4.54E-01	15.4	0.745	0	0.00

FWHM=SQRT(5.76394E+00 + 2.46146E-03 *E)

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BACKGROUND INFO 8808    GLS   3        268.753  7 G- 8      BG DATE 265.918  7
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PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
92.99	0.6040	32.83	92.00	0.6823	11.52	-0.0783	272.42R
185.95	0.6176	32.03	186.00	0.5412	10.29	0.0764	269.01R
238.68	0.7358	19.33	238.50	0.8344	14.73	-0.0986	190.65R
295.31	0.5644	30.79	295.20	0.2950	14.61	0.2694	66.45

```
  351.87     1.0438 19.90       351.90  0.6623 18.22        0.3815 62.97
  510.90     2.4876  8.48       511.00  2.6731  5.20       -0.1856136.14R
  582.69     0.3333 37.12       583.10  0.5186 17.10       -0.1853 82.14R
  609.53     1.1137 14.37       609.30  0.8291 11.14        0.2845 64.95
  660.86     0.3287 37.00       661.60  0.2745 13.85        0.0542235.01R
  911.18     0.5573 22.95       911.10  0.4955 11.64        0.0617227.37R
  967.78     0.2441 61.49       968.90  0.3557 25.59       -0.1115157.42R
 1120.42     0.2673 37.96      1120.30  0.3466 15.41       -0.0793144.55R
 1377.67     0.1421 40.29      1377.70  0.0926 22.03        0.0495122.78R
 1460.95     2.4288  5.65      1460.80  3.2491  8.82       -0.8203 38.74R
 1728.38     0.0866 60.88      1729.60  0.0773 30.53        0.0093623.90R
 1763.96     0.4544 15.43      1764.50  0.3773  7.98        0.0772 98.88R
    13 PEAKS REJECTED BY BACKGROUND

*********************************************************************************
INTERFERING ISOTOPE ANALYSIS 8808    GLS   3        268.753  7 G- 8
*********************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 8808 3 GLS RUN AT 268.753/2007

BACKGROUND FOR GELI DETECTOR 8 OF 265.918/2007 2365.1 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.2099	26.64	511.0	2.6731	5.20	1173.2	0.0886	25.30
92.0	0.6823	11.52	583.1	0.5186	17.10	1238.1	0.1394	24.02
143.0	0.1599	0.00	609.3	0.8291	11.14	1332.5	0.1000	33.11
186.0	0.5412	10.29	661.6	0.2745	13.85	1377.7	0.0926	22.03
198.0	0.1432	24.16	727.2	0.1565	27.61	1460.8	3.2491	8.82
238.5	0.8344	14.73	860.0	0.0900	17.33	1586.0	0.1222	0.00
279.0	0.1577	0.00	911.1	0.4955	11.64	1591.0	0.1433	34.81
295.2	0.2950	14.61	968.9	0.3557	25.59	1729.6	0.0773	30.53
338.4	0.2027	32.12	1001.0	0.0596	28.52	1764.5	0.3773	7.98
351.9	0.6623	18.22	1120.3	0.3466	15.41	0.0	0.0000	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 8 ON 9/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.719	3	0.9279	15.753	61.*
322.765	5	0.8833	18.759	31.*
322.789	5	0.8727	17.160	43.*
322.825	5	0.8755	17.370	41.*
352.103	5	0.8703	18.548	21.*
355.939	5	0.8663	19.048	20.*
58.691	6	0.9079	17.307	83.*
312.732	6	0.8798	18.209	22.*
46.689	7	0.9437	22.807	27.
53.871	7	0.9404	23.280	21.
AVERAGE		0.9421	0.002	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
202.750	7	0.6804	59.299	32.NG
204.881	7	1.1362	25.018	46.
217.047	7	1.0416	16.537	20.
223.821	7	1.0227	17.367	23.
230.814	7	1.0609	16.105	21.
235.924	7	1.0859	16.521	23.
237.814	7	1.0688	16.230	26.
244.906	7	1.0631	16.854	25.
258.758	7	1.0718	16.115	25.
265.894	7	1.0763	16.178	23.
AVERAGE		1.0614	0.020	

CALIBRATION LINE FROM STANDARD FOR G- 8 OF 265.894 7
ENERGY= 0.191331 + 0.9814891*CH + -1.329999E-06*CH**2
FWHM =SQRT(1.8468 + 0.005591*ENERGY) (CO60= 3.049)

EFFICIENCIES FOR GEOMETRY JR 8 CALIBRATED 155.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.745100	100.0	4.245900	300.0	2.895100	0.0	0.000000
55.0	1.159800	110.0	4.454100	500.0	1.999200	0.0	0.000000
60.0	1.619100	130.0	4.554100	700.0	1.571400	0.0	0.000000
65.0	2.087900	150.0	4.421700	1000.0	1.198900	0.0	0.000000
70.0	2.537700	170.0	4.201800	1400.0	0.903800		
80.0	3.312100	190.0	3.958600	2000.0	0.656700		
90.0	3.878100	250.0	3.393800	3000.0	0.478800		

8808 3 GLS GSTOR 761

	PK	ENERGY	CPM	%ERR	COMMENT
	1	25.1	0.79	12.2	
	2	27.5	0.83	18.7	
	3	32.1	0.25	70.9	
	4	74.1	3.38	9.4	
	5	84.8	1.05	15.8	
	6	87.4	0.39	30.0	Cs136 Cd109
	8	139.5	0.23	77.7	
	11	241.8	0.44	37.5	Ra226 Th228 La140
b	12	295.3	0.27	66.5	Ra226 Ru103
b	13	351.9	0.38	63.0	Ra226s Pb214s
b	16	609.5	0.28	64.9	Ru103 Ra226s Bi214s
			REJECTED PEAKS		
B	7	93.0	-0.08	99.9	Th234s Th227s
B	9	186.0	0.08	99.9	Cs136 U 235s Ra226s
B	10	238.7	-0.10	99.9	Th228 Pb212s
B	14	510.9	-0.19	99.9	Ac228 Th228 La140 Ru106 Na 22
B	15	582.7	-0.19	82.1	Th228 Tl208s
B	17	660.9	0.05	99.9	Cs137s
B	18	911.2	0.06	99.9	Th232s Ac228s
B	19	967.8	-0.11	99.9	Ac228 Sb124 Th232s
B	20	1120.4	-0.08	99.9	Ra226 Sc 46s
B	21	1377.7	0.05	99.9	Ra226 La140c
B	22	1461.0	-0.82	38.7	K 40s
B	23	1728.4	0.01	99.9	Ra226
B	24	1764.0	0.08	98.9	Ra226

****

8808 GLS 4 G-1 JR 268.753 7 231.28 MIN 177.28000 GR 758

LIBR=TTIH REF TIME= 261.924 7 100 mL in Parkway Jar

****

CWQ-2507

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G		
1461 (1460.85)	0.110000	0.00644	1.576	2.223E+03 s	7.58%	5.649E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 9.451E-01 3G		
**** (889.26)	1.000000	0.00984	0.169	1.718E+01 s	<	4.618E-02
1119 (1120.52)	1.000000	0.00810	0.380	4.692E+01 s	24.84%	1.261E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.975E-01 4G		
**** (1173.21)	0.999200	0.00779	0.174	2.235E+01 s	<	5.694E-02
**** (1332.48)	1.000000	0.00698	0.153	2.185E+01 s	<	5.566E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 9.244E-01 16G		
969 (968.30)	0.017200	0.00917	0.283	1.795E+03	31.61%	4.934E+00
**** (1691.00)	0.457000	0.00566	0.106	4.102E+01 s	<	1.127E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.996E-01 3G		
662 (661.64)	0.851000	0.01252	0.203	1.907E+01 s	56.99%	4.848E-02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.990E-01 48G		
*** (121.78)	0.254000	0.04322	0.406	3.702E+01 s	<	9.416E-02
295 (295.97)	0.004000	0.02328	1.188	1.276E+04	12.76%	3.245E+01
**** (344.31)	0.245000	0.02075	0.289	5.685E+01 s	<	1.446E-01
**** (963.36)	0.132000	0.00921	0.192	1.577E+02 s	<	4.010E-01
**** (1112.04)	0.124000	0.00815	0.166	1.644E+02 s	<	4.182E-01
**** (1408.02)	0.198000	0.00666	0.134	1.017E+02 s	<	2.587E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.985E-01 48G		
**** (123.07)	0.390000	0.04295	0.441	2.632E+01 s	<	6.697E-02
511 (511.20)	0.000600	0.01535	0.424	4.609E+04	42.27%	1.173E+02
583 (582.03)	0.008000	0.01385	0.504	4.552E+03	25.56%	1.158E+01
**** (723.26)	0.202000	0.01166	0.228	9.696E+01 s	<	2.467E-01
**** (1004.75)	0.170000	0.00889	0.175	1.158E+02 s	<	2.948E-01
1119 (1118.20)	0.001000	0.00811	0.380	4.681E+04	24.84%	1.191E+02
1241 (1241.40)	0.001000	0.00742	0.236	3.177E+04	54.29%	8.085E+01
**** (1274.49)	0.336000	0.00725	0.157	6.435E+01 s	<	1.637E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 9.381E-01 22G		
295 (295.95)	0.290900	0.02328	1.189	1.756E+02	12.76%	4.755E-01
**** (316.50)	0.830700	0.02213	0.309	1.681E+01 s	<	4.552E-02
**** (468.06)	0.476000	0.01642	0.249	3.187E+01 s	<	8.633E-02
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 19G		
511 (510.80)	0.230000	0.01536	0.424	1.202E+02	42.27%	3.053E-01
583 (583.14)	0.860000	0.01383	0.504	4.241E+01 s	25.56%	1.078E-01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 1G		
47 (46.50)	0.040000	0.05556	1.459	6.564E+02 s	15.41%	1.668E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 22G		
295 (295.10)	0.000240	0.02333	1.188	2.122E+05	12.76%	5.391E+02
511 (510.72)	0.094000	0.01536	0.424	2.940E+02	42.27%	7.469E-01
583 (583.14)	0.310000	0.01383	0.504	1.177E+02	25.56%	2.990E-01

728 (727.17)	0.066500	0.01161	0.173	2.237E+02 s	49.43%	5.685E-01
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 4G		
239 (238.63)	0.431000	0.02731	1.668	1.418E+02 s	8.52%	3.602E-01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
609 (609.30)	0.470000	0.01335	1.204	1.918E+02 s	12.27%	4.874E-01
1119 (1120.40)	0.170000	0.00810	0.380	2.758E+02	24.84%	7.008E-01
1765 (1764.00)	0.170000	0.00546	0.194	2.087E+02	26.51%	5.304E-01
Pb214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 23G		
242 (241.90)	0.076000	0.02703	0.537	2.611E+02	18.85%	6.635E-01
295 (295.20)	0.190000	0.02332	1.188	2.681E+02	12.76%	6.812E-01
352 (352.00)	0.360000	0.02040	1.851	2.520E+02 s	10.38%	6.403E-01
Ra226 5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00 48G		
186 (186.10)	0.040000	0.03266	0.858	6.563E+02 s	26.02%	1.668E+00
242 (242.00)	0.078000	0.02703	0.537	2.545E+02	18.85%	6.467E-01
295 (295.20)	0.201000	0.02332	1.188	2.534E+02	12.76%	6.439E-01
352 (351.96)	0.393000	0.02040	1.851	2.308E+02 s	10.38%	5.865E-01
609 (609.32)	0.484000	0.01335	1.204	1.863E+02 s	12.27%	4.733E-01
1119 (1120.30)	0.160000	0.00810	0.380	2.930E+02	24.84%	7.445E-01
1731 (1729.60)	0.030700	0.00555	0.094	5.496E+02	66.12%	1.396E+00
1765 (1764.50)	0.166000	0.00546	0.194	2.138E+02	26.51%	5.433E-01
Th227 7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 9.994E-01 48G		
**** (49.80)	0.087000	0.05556	0.468	9.687E+01 s	<	2.463E-01
64 (62.50)	0.002500	0.05620	1.542	1.098E+04	16.19%	2.791E+01
**** (79.70)	0.018000	0.05314	0.687	7.179E+02 s	<	1.825E+00
93 (94.00)	0.013500	0.04967	0.746	1.112E+03 s	34.02%	2.828E+00
**** (210.60)	0.012600	0.02990	0.395	1.048E+03 s	<	2.665E+00
**** (236.00)	0.115000	0.02753	0.448	1.415E+02 s	<	3.596E-01
**** (254.70)	0.009100	0.02603	0.358	1.513E+03 s	<	3.847E+00
**** (256.20)	0.063000	0.02591	0.326	1.996E+02 s	<	5.076E-01
**** (285.60)	0.016500	0.02391	0.336	8.520E+02 s	<	2.166E+00
**** (300.00)	0.018900	0.02305	0.324	7.438E+02 s	<	1.891E+00
**** (304.40)	0.013500	0.02279	0.275	8.929E+02 s	<	2.270E+00
**** (329.90)	0.029000	0.02144	0.308	4.954E+02 s	<	1.260E+00
**** (334.40)	0.011500	0.02122	0.295	1.208E+03 s	<	3.071E+00
Ac228 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 41G		
**** (911.10)	0.250000	0.00964	0.262	1.088E+02 s	<	2.764E-01
Th230 2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00 8G		
**** (68.00)	0.005900	0.05550	0.599	1.829E+03 s	<	4.647E+00
Th232 5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00 42G		
339 (338.40)	0.104000	0.02103	0.194	8.852E+01	64.30%	2.249E-01
511 (509.60)	0.004200	0.01539	0.424	6.568E+03	42.27%	1.669E+01
728 (727.00)	0.006900	0.01161	0.173	2.156E+03	49.43%	5.478E+00
911 (911.10)	0.250000	0.00964	0.234	9.696E+01 s	38.97%	2.464E-01
969 (968.90)	0.150000	0.00916	0.283	2.057E+02 s	31.61%	5.228E-01
**** (63.81)	0.010101	0.05607	0.608	1.074E+03 s	<	2.728E+00
Th234 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 10G		
**** (92.30)	0.999999	0.05009	0.625	1.249E+01 s	<	3.173E-02
Pa234m 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
**** (1001.03)	0.006000	0.00892	0.186	3.473E+03 s	<	8.826E+00
U 235 2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00 34G		
**** (143.78)	0.132600	0.03894	0.421	8.153E+01 s	<r	2.071E-01
186 (185.72)	0.540000	0.03271	0.859	4.855E+01 s	26.02%	1.233E-01

242 (240.93) 0.000700 0.02711 0.537 2.827E+04 18.85% 7.182E+01

Am241 1.582E+05 DAYS LAMBDA= 4.381E-06 DECAY= 1.000E+00 41G
**** (59.54) 0.359000 0.05639 0.502 2.482E+01 s < 6.306E-02

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8808   GLS  4      G-1 JR 268.753  7  231.28 MIN  177.28000 GR      758
LIBR=TTIH  REF TIME= 261.924  7      100 mL in Parkway Jar
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* Group	8808	* Time of count	268.753 2007 *
* Sample	4	* Reference GMT	261.924 2007 *
* Element		* Elapsed Live Tm	231.2833 *
* Type code	GLS	* Dead Time Pct	0.057616 *
* ID	QC-DUP#1 62905	* Background GMT	266.082 2007 *
* Geometry, detector	JR-1	* Standard GMT	266.063 2007 *
* Aliquot	177.28	* Days since TO	6.828491 *
* Unit of Aliquot	GRAM	* Time on	11:04 PDT 25-SEP *
* Data Sheet Units	PCI /GRAM	* Time off	14:56 PDT 25-SEP *
* Library	TTIH	* Calc Time	15:00 25-SEP-07 *
* Slope	1.004722	* Width slope	0.004886 *
* Intercept	1.970773	* Width offset	1.894211 *
* X**2 TERM	-0.16467935E-05	* Sensitivity	4. *

NP: [7,67]758.GSP 28 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	4	26.5	21	15	63	2.03	290	24.4	1.25E+00	9.80	.149	0	3.12
2	4	30.0	21	15	293	2.80	192	27.9	8.32E-01	20.50	.216	0	0.00
3	4	34.0	21	15	540	3.03	125	31.9	5.42E-01	33.50	.314	0	0.00
4	0	46.6	41	8	793	1.75	337	44.4	1.46E+00	15.40	.808	0	0.00
5	8	63.6	58	24	878	2.29	541	61.3	2.34E+00	9.4	5.61	0	28.80
6	8	69.6	58	24	896	2.29	232	67.4	1.00E+00	22.5	5.52	0	0.00
7	8	75.2	58	24	914	2.29	488	72.9	2.11E+00	11.7	5.41	0	0.00
8	0	92.6	87	8	834	1.81	427	90.2	1.84E+00	13.5	5.00	0	0.00
9	0	144.3	138	7	480	2.23	61	141.7	2.65E-01	61.5	3.89	0	0.00
10	0	185.7	178	10	645	1.74	314	182.9	1.36E+00	16.3	3.27	0	0.00
11	7	238.6	230	15	252	1.72	506	235.6	2.19E+00	6.4	2.74	0	1.13
12	7	241.8	230	15	182	1.41	124	238.8	5.37E-01	18.8	2.71	0	0.00
13	0	294.8	288	8	258	1.59	298	291.6	1.29E+00	11.6	2.34	0	0.00
14	0	339.2	332	7	268	1.25	59	335.9	2.56E-01	47.9	2.14	0	0.00
15	0	352.1	344	11	383	2.17	477	348.6	2.06E+00	9.2	2.08	0	0.00
16	0	510.8	500	15	234	2.79	410	506.8	1.77E+00	9.8	1.54	0	0.00
17	0	582.9	575	10	163	2.47	156	578.8	6.74E-01	18.4	1.40	0	0.00
18	0	609.3	600	11	212	1.94	316	605.1	1.36E+00	10.7	1.35	0	0.00
19	0	662.0	653	11	155	2.11	55	657.6	2.37E-01	48.9	1.26	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	727.9	720	9	82	2.99	48	723.3	2.08E-01	41.0	1.17	0	0.00
21	0	910.9	902	10	116	1.82	75	906.0	3.23E-01	27.90	.974	0	0.00
22	0	968.8	958	11	84	3.73	77	963.8	3.33E-01	26.50	.921	0	0.00
23	0	1119.5	1107	13	91	3.67	98	1114.3	4.24E-01	22.00	.819	0	0.00
24	0	1241.2	1229	17	117	4.51	55	1235.9	2.36E-01	54.30	.750	0	0.00
25	0	1461.2	1451	14	57	3.39	381	1455.8	1.65E+00	7.20	.648	0	0.00
26	0	1731.0	1719	14	23	2.84	23	1725.8	9.98E-02	62.10	.563	0	0.00
27	0	1764.6	1754	11	15	2.82	54	1759.4	2.32E-01	21.20	.554	0	0.00
28	0	1972.4	1965	6	9	1.93	8	1967.5	3.33E-02	63.20	.497	0	0.00

FWHM=SQRT(4.44393E+00 + 3.27129E-03 *E)

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BACKGROUND INFO 8808    GLS   4        268.753  7 G- 1      BG DATE 266.082  7
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PEAK			BACKGROUND			NET	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR

63.57	2.3401	9.45	62.00	0.7978	14.53	1.5423	16.19	
92.61	1.8447	13.47	92.00	1.0988	4.66	0.7459	34.02	
144.34	0.2651	61.53	143.00	0.0922	41.42	0.1728	96.91	R
185.70	1.3567	16.30	186.00	0.4992	5.93	0.8575	26.02	
238.64	2.1872	6.43	238.60	0.5188	4.01	1.6684	8.52	
294.78	1.2884	11.61	295.20	0.1004	24.81	1.1880	12.76	
339.23	0.2555	47.91	338.40	0.0619	36.32	0.1936	64.30	
352.06	2.0622	9.18	351.90	0.2115	15.17	1.8507	10.38	
510.75	1.7745	9.83	511.00	1.3500	3.09	0.4244	42.27	
582.93	0.6738	18.36	583.10	0.1695	21.24	0.5043	25.56	
609.34	1.3647	10.70	609.30	0.1607	14.12	1.2039	12.27	
661.98	0.2369	48.86	661.60	0.0338	0.00	0.2031	56.99	
727.85	0.2076	41.04	727.20	0.0348	16.65	0.1727	49.43	
910.87	0.3233	27.88	911.10	0.0896	14.39	0.2337	38.97	
968.80	0.3330	26.55	968.90	0.0502	26.30	0.2828	31.61	
1119.48	0.4237	21.97	1120.30	0.0440	34.80	0.3798	24.84	
1461.17	1.6487	7.15	1461.00	0.0727	25.86	1.5760	7.58	
1731.04	0.0998	62.09	1729.60	0.0061	0.00	0.0937	66.12	
1764.57	0.2319	21.21	1764.50	0.0383	38.41	0.1937	26.51	

1 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 8808 GLS 4 268.753 7 G- 1

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8808 4 GLS RUN AT 268.753/2007

BACKGROUND FOR GELI DETECTOR 1 OF 266.082/2007 2129.4 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.7978	14.53	511.0	1.3500	3.09	1120.3	0.0440	34.80
92.0	1.0988	4.66	583.1	0.1695	21.24	1173.2	0.0272	0.00
143.0	0.0922	41.42	609.3	0.1607	14.12	1238.1	0.0285	0.00
186.0	0.4992	5.93	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0731	22.84	727.2	0.0348	16.65	1377.7	0.0319	0.00
238.6	0.5188	4.01	846.0	0.0664	58.47	1461.0	0.0727	25.86
279.0	0.0000	0.00	860.4	0.0372	0.00	1586.0	0.0000	0.00
295.2	0.1004	24.81	911.1	0.0896	14.39	1591.0	0.0620	0.00
338.4	0.0619	36.32	968.9	0.0502	26.30	1729.6	0.0061	0.00
351.9	0.2115	15.17	1001.0	0.0475	34.54	1764.5	0.0383	38.41

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 9/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
209.734	7	1.8112	17.607	25.
218.883	7	1.7454	14.137	138.
223.775	7	1.7551	14.882	22.
230.918	7	1.7347	13.890	35.
237.741	7	1.7237	13.528	28.
258.777	7	1.7442	14.353	29.
265.711	7	1.7599	15.213	22.
265.864	7	1.5439	11.619	38. NG
265.918	7	1.5464	12.253	26. NG
266.063	7	1.5169	11.690	20. NG
AVERAGE		1.7535	0.028	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
61.983	7	1.0721	3.484	31.
70.013	7	1.0668	4.608	26.
71.872	7	1.0549	5.509	41.
76.856	7	1.0713	7.228	30.
81.670	7	1.0534	5.600	25.
103.972	7	0.8203	15.248	21.
192.664	7	0.9760	34.750	25.
197.727	7	2.1369	18.219	45.
205.876	7	0.9740	30.810	21.
216.753	7	0.9677	15.266	24.
AVERAGE		1.0295	0.048	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 266.063 7
ENERGY= 1.970773 + 1.0047222*CH + -1.646794E-06*CH**2
FWHM =SQRT(1.8942 + 0.004886*ENERGY) (CO60= 2.899)

EFFICIENCIES FOR GEOMETRY JR 1 CALIBRATED 207.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.555600	100.0	4.819200	300.0	2.304700	0.0	0.000000
55.0	5.631600	110.0	4.582500	500.0	1.562100	0.0	0.000000
60.0	5.636600	130.0	4.152700	700.0	1.197600	0.0	0.000000
65.0	5.592800	150.0	3.787300	1000.0	0.892900	0.0	0.000000
70.0	5.516200	170.0	3.479400	1400.0	0.669100		
80.0	5.307100	190.0	3.218900	2000.0	0.489700		
90.0	5.065700	250.0	2.638800	3000.0	0.348600		

8808 4 GLS GSTOR 758

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	26.5	1.25	9.8		
	2	30.0	0.83	20.5	NO GEN.	
	3	34.0	0.54	33.5		
	4	46.6	1.46	15.4		Pb210s
b	5	63.6	1.54	16.2		Th232s
	6	69.6	1.00	22.5		
	7	75.2	2.11	11.7		
b	8	92.6	0.75	34.0		Th234s Th227s
b	10	185.7	0.86	26.0		Cs137c U 235s Ra226s
b	11	238.6	1.67	8.5	Th228	Pb212s
	12	241.8	0.54	18.8	Ra226 Th228	La140
b	13	294.8	1.19	12.8	Ra226	Ru103
b	14	339.2	0.19	64.3	Ac228	Cs136
b	15	352.1	1.85	10.4		Ra226s Pb214s
b	16	510.8	0.42	42.3	Ac228 Th228	La140 Ru106 Na 22
b	17	582.9	0.50	25.6	Th228	Tl208s
b	18	609.3	1.20	12.3		Ru103 Ra226s Bi214s
b	19	662.0	0.20	57.0		Cs137s
b	20	727.9	0.17	49.4	Ac228 Th228	Bi212s
b	21	910.9	0.23	39.0		Th232s Ac228s
b	22	968.8	0.28	31.6	Ac228	Sb124 Th232s
b	23	1119.5	0.38	24.8	Ra226	Co 60c Sc 46s
	24	1241.2	0.24	54.3		
b	25	1461.2	1.58	7.6		K 40s
b	26	1731.0	0.09	66.1	Ra226	
	27	1764.6	0.19	26.5	Ra226	
	28	1972.4	0.03	63.2		
			REJECTED PEAKS			
B	9	144.3	0.17	96.9		Ce141 U 235s

21-Day Gamma Count

Thermo/NUtech Ge(Li) Analysis Report

19-OCT-07 PAGE 1

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
21-001-MH	00049558	TMA # (GLS) 8808 1		
TZERO = 261.924 2007		177.2800 GRAM		Aliquot
K 40	5.908E-01	(7.460 +/- 0.930) E+00		12.5%
Co 60	5.643E-02	< 5.643E-02		DET LIM
Cs137	5.850E-02	(1.198 +/- 0.507) E-01		42.3%
Eu152	4.831E-01	< 4.831E-01		DET LIM
Eu154	1.860E-01	< 1.860E-01		DET LIM
Tl208	7.334E-02	(8.931 +/- 6.415) E-02		71.8%
Pb210	7.010E-01	(1.842 +/- 0.546) E+00		29.6%
Bi212	8.285E-01	< 8.285E-01		DET LIM
Pb212	7.849E-02	(3.921 +/- 0.693) E-01		17.7%
Bi214	1.145E-01	(8.440 +/- 1.333) E-01		15.8%
Pb214	1.366E-01	(8.630 +/- 1.297) E-01		15.0%
Ra226	1.112E-01	(8.196 +/- 1.295) E-01		15.8%
Ac228	3.046E-01	< 3.046E-01		DET LIM
Th230	4.963E+00	< 4.963E+00		DET LIM
Th232	2.718E-01	(3.217 +/- 2.546) E-01		79.1%
Th234	3.548E-02	< 3.548E-02		DET LIM
Pa234m	9.397E+00	< 9.397E+00		DET LIM
U 235	2.363E-01	< 2.363E-01		DET LIM
Am241	6.154E-02	< 6.154E-02		DET LIM
QC-LCS #62903	00049559	TMA # (GLS) 8808 2		
TZERO = 292.699 2007		1.0000 SMPL		Aliquot
K 40	1.140E+02	< 1.140E+02		DET LIM
Co 60	1.502E+01	(5.093 +/- 0.304) E+02		6.0%
Cs137	1.760E+01	(5.299 +/- 0.268) E+02		5.1%
Eu152	1.308E+02	< 1.308E+02		DET LIM
Eu154	3.428E+01	< 3.428E+01		DET LIM
Tl208	1.288E+01	< 1.288E+01		DET LIM
Pb210	1.436E+02	< 1.436E+02		DET LIM
Bi212	1.688E+02	< 1.688E+02		DET LIM
Pb212	1.918E+01	< 1.918E+01		DET LIM
Bi214	2.754E+01	< 2.754E+01		DET LIM
Pb214	2.719E+01	< 2.719E+01		DET LIM
Ra226	2.674E+01	< 2.674E+01		DET LIM
Ac228	6.828E+01	< 6.828E+01		DET LIM
Th230	8.304E+02	< 8.304E+02		DET LIM
Th232	6.828E+01	< 6.828E+01		DET LIM
Th234	5.352E+00	< 5.352E+00		DET LIM
Pa234m	2.747E+03	< 2.747E+03		DET LIM
U 235	4.171E+01	< 4.171E+01		DET LIM
Am241	1.366E+01	(4.992 +/- 0.178) E+02		3.6%

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
QC-BLANK #62904		00049560	TMA # (GLS) 8808	3
TZERO = 290.717 2007			1.0000 SMPL	Aliquot
K 40	3.935E+02	< 3.935E+02		DET LIM
Co 60	1.425E+01	< 1.425E+01		DET LIM
Cs137	1.409E+01	< 1.409E+01		DET LIM
Eu152	1.033E+02	< 1.033E+02		DET LIM
Eu154	4.454E+01	< 4.454E+01		DET LIM
T1208	1.499E+01	< 1.499E+01		DET LIM
Pb210	1.660E+02	(1.962 +/- 1.167) E+02		59.5%
Bi212	1.766E+02	< 1.766E+02		DET LIM
Pb212	2.407E+01	< 2.407E+01		DET LIM
Bi214	3.371E+01	< 3.371E+01		DET LIM
Pb214	3.069E+01	< 4.464E+01		DET LIM
Ra226	3.274E+01	< 3.274E+01		DET LIM
Ac228	6.719E+01	< 6.719E+01		DET LIM
Th230	8.403E+02	< 8.403E+02		DET LIM
Th232	6.719E+01	< 6.719E+01		DET LIM
Th234	5.496E+00	< 5.496E+00		DET LIM
Pa234m	2.360E+03	< 2.360E+03		DET LIM
U 235	5.843E+01	< 5.843E+01		DET LIM
Am241	1.311E+01	< 1.311E+01		DET LIM
QC-DUP#1 62905		00049561	TMA # (GLS) 8808	4
TZERO = 261.924 2007			177.2800 GRAM	Aliquot
K 40	6.338E-01	(6.904 +/- 0.915) E+00		13.2%
Co 60	5.267E-02	< 5.267E-02		DET LIM
Cs137	6.425E-02	(1.132 +/- 0.549) E-01		48.5%
Eu152	4.168E-01	< 4.168E-01		DET LIM
Eu154	1.538E-01	< 1.538E-01		DET LIM
T1208	6.019E-02	(1.126 +/- 0.535) E-01		47.5%
Pb210	7.266E-01	(2.000 +/- 0.575) E+00		28.8%
Bi212	7.309E-01	(6.882 +/- 5.434) E-01		79.0%
Pb212	7.205E-02	(2.786 +/- 0.598) E-01		21.5%
Bi214	1.222E-01	(8.802 +/- 1.310) E-01		14.9%
Pb214	1.335E-01	(9.385 +/- 1.347) E-01		14.4%
Ra226	1.187E-01	(8.548 +/- 1.273) E-01		14.9%
Ac228	2.986E-01	< 2.986E-01		DET LIM
Th230	4.845E+00	< 4.845E+00		DET LIM
Th232	2.325E-01	(3.823 +/- 2.040) E-01		53.4%
Th234	3.358E-02	< 3.358E-02		DET LIM
Pa234m	9.982E+00	< 9.982E+00		DET LIM
U 235	2.167E-01	< 2.167E-01		DET LIM
Am241	6.136E-02	< 6.136E-02		DET LIM

Planchet Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (SMPL)	Yield
2	LCS				292.698-07	JR	1	1

Analytical Results

Sample No.	QA Type	Analyte	Result (PCI/SMPL)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/SMPL)
2	LCS	Am241	4.992E+02	1.780E+01	3.6	1.366E+01
2	LCS	Co 60	5.093E+02	3.040E+01	6.0	1.502E+01
2	LCS	Cs137	5.299E+02	2.680E+01	5.1	1.760E+01

Standard Info

Nuclide	Half Life (days)	Standard Id	Qty (ml)	Activity (dpm/mL)	Reference Date	Decay Date	Added (PCI)	Added Error (%)
AM-241	157900	R1	0.5	2249	353.708-2005	292.698-07	5.050E+02	4
CO-60	1925	K1-F-(04)	0.6	9340	001.708-1995	292.698-07	4.692E+02	4
CS-137	11020	Q1-A-(04)	0.5	2200	353.708-2005	292.698-07	4.751E+02	4

Evaluation Results

Analyte	F/A Ratio	Ratio Error (%)	LCL	LWL	UWL	UCL	Status	Flag
Am241	0.988	5	0.75	0.83	1.17	1.25	PASS	
Co 60	1.085	7	0.79	0.86	1.14	1.21	PASS	
Cs137	1.115	6	0.80	0.87	1.13	1.20	PASS	

10/19/07

62903

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

GLS 8808-3
BLANK
62904
PASS

Planchet Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (SMPL)	Yield
3	BLANK				290.716-07	JR	1	1

Analytical Results

Sample No.	QA Type	Analyte	Result (PCI/SMPL)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/SMPL)
3	BLANK	Cs137	< 1.409E+01			1.409E+01

Evaluation Results

Analyte	Result (PCI/SMPL)	MDA (PCI/SMPL)	Status	Flag
Cs137	< 1.409E+01	1.409E+01	PASS	

BW 10.9.07

62904

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

Planchet Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (GRAM)	Yield
4	DUP	261.924-7			290.864-07	JR	177.28	1
1	ORIGINAL	261.924-7			290.716-07	JR	177.28	1

Analytical Results

Sample No.	QA Type	Analyte	Result (PCI/GRAM)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/GRAM)
4	DUP	K 40	6.904E+00	9.150E-01	13.3	6.338E-01
1	ORIGINAL	K 40	7.460E+00	9.300E-01	12.5	5.908E-01

Evaluation Results

Analyte	Result (PCI/GRAM)	MDA (PCI/GRAM)	UCL	RPD	RER	Criterion	Status	Flag
K 40	6.904E+00	6.338E-01	20.00	8			PASS	

10/19/07

62905

1-4 9/26

8808 GLS 1 G-1 JR 290.717 7 204.62 MIN 177.28000 GR 255

IBR=TTIH REF TIME= 261.924 7 100 mL in Parkway Jar

Gr 10.1807

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G			
1461 (1460.85)	0.110000	0.00644	2.081	2.936E+03 s	6.23%		7.460E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 7.881E-01 3G			
**** (889.26)	1.000000	0.00984	0.204	2.070E+01 s	<		6.674E-02
1120 (1120.52)	1.000000	0.00810	0.485	5.988E+01 s	16.54%		1.931E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.897E-01 4G			
**** (1173.21)	0.999200	0..00779	0.174	2.237E+01 s	<		5.743E-02
**** (1332.48)	1.000000	0.00698	0.153	2.198E+01 s	<		5.643E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 7.178E-01 16G			
970 (968.30)	0.017200	0.00917	0.140	8.890E+02	64.44%		3.147E+00
**** (1691.00)	0.457000	0.00566	0.129	4.995E+01 s	<		1.768E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.982E-01 3G			
662 (661.64)	0.851000	0.01252	0.501	4.707E+01 s	21.14%		1.198E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.959E-01 48G			
*** (121.78)	0.254000	0.04322	0.410	3.732E+01 s	<		9.522E-02
296 (295.97)	0.004000	0.02328	1.861	1.999E+04	11.28%		5.100E+01
328 (329.41)	0.001000	0.02146	0.411	1.913E+04	34.75%		4.880E+01
**** (344.31)	0.245000	0.02075	0.295	5.811E+01 s	<		1.483E-01
770 (768.90)	0.000800	0.01109	0.250	2.819E+04	44.94%		7.193E+01
**** (963.36)	0.132000	0.00921	0.230	1.893E+02 s	<		4.831E-01
**** (1112.04)	0.124000	0.00815	0.172	1.705E+02 s	<		4.351E-01
**** (1408.02)	0.198000	0.00666	0.164	1.245E+02 s	<		3.176E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.936E-01 48G			
**** (123.07)	0.390000	0.04295	0.468	2.794E+01 s	<		7.145E-02
583 (582.03)	0.008000	0.01385	0.418	3.773E+03	35.91%		9.649E+00
**** (723.26)	0.202000	0.01166	0.235	9.971E+01 s	<		2.550E-01
**** (1004.75)	0.170000	0.00889	0.171	1.130E+02 s	<		2.889E-01
**** (1274.49)	0.336000	0.00725	0.177	7.273E+01 s	<		1.860E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 7.637E-01 22G			
296 (295.95)	0.290900	0.02328	1.863	2.750E+02	11.28%		9.151E-01
**** (316.50)	0.830700	0.02213	0.348	1.895E+01 s	<		6.306E-02
**** (468.06)	0.476000	0.01642	0.275	3.515E+01 s	<		1.169E-01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 19G			
583 (583.14)	0.860000	0.01383	0.418	3.515E+01 s	35.91%		8.931E-02
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 1G			
46 (46.50)	0.040000	0.05556	1.611	7.250E+02 s	14.81%		1.842E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 22G			
296 (295.10)	0.000240	0.02333	1.861	3.324E+05	11.28%		8.447E+02
328 (327.96)	0.001400	0.02154	0.411	1.362E+04	34.75%		3.460E+01
583 (583.14)	0.310000	0.01383	0.418	9.751E+01	35.91%		2.478E-01
**** (727.17)	0.066500	0.01161	0.252	3.261E+02 s	<		8.285E-01
787 (785.42)	0.011200	0.	)	1.334E+03	52.69%		3.389E+00

237 (238.63)	0.431000	0.02731	1.816	1.543E+02	s	8.84%	3.922E-01

Bi214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 48G

609 (609.30)	0.470000	0.01335	2.085	3.322E+02	s	7.90%	8.440E-01
770 (768.70)	0.050000	0.01109	0.250	4.509E+02		44.94%	1.146E+00
787 (787.10)	0.012000	0.01088	0.163	1.247E+03		52.69%	3.169E+00
934 (934.80)	0.030000	0.00944	0.154	5.454E+02		51.51%	1.386E+00
1120 (1120.40)	0.170000	0.00810	0.485	3.520E+02		16.54%	8.944E-01
1238 (1238.30)	0.060000	0.00743	0.198	4.447E+02		57.67%	1.130E+00
1510 (1509.00)	0.020000	0.00626	0.129	1.031E+03		37.67%	2.619E+00
1765 (1764.00)	0.170000	0.00546	0.334	3.601E+02		17.01%	9.151E-01

Pb214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 23G

242 (241.90)	0.076000	0.02703	0.961	4.678E+02		16.80%	1.189E+00
296 (295.20)	0.190000	0.02332	1.861	4.200E+02		11.28%	1.067E+00
352 (352.00)	0.360000	0.02040	2.494	3.396E+02	s	7.52%	8.630E-01
462 (462.10)	0.001700	0.01658	0.187	6.642E+03		62.77%	1.688E+01
770 (768.40)	0.000800	0.01109	0.250	2.818E+04		44.94%	7.159E+01
787 (785.90)	0.008600	0.01089	0.163	1.738E+03		52.69%	4.416E+00

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 1.000E+00 48G

186 (186.10)	0.040000	0.03266	0.902	6.900E+02	s	27.11%	1.753E+00
242 (242.00)	0.078000	0.02703	0.961	4.559E+02		16.80%	1.159E+00
296 (295.20)	0.201000	0.02332	1.861	3.970E+02		11.28%	1.009E+00
352 (351.96)	0.393000	0.02040	2.494	3.111E+02	s	7.52%	7.905E-01
462 (461.80)	0.002200	0.01658	0.187	5.130E+03		62.77%	1.304E+01
609 (609.32)	0.484000	0.01335	2.085	3.226E+02	s	7.90%	8.196E-01
770 (768.40)	0.053200	0.01109	0.250	4.237E+02		44.94%	1.077E+00
787 (785.80)	0.012100	0.01089	0.163	1.235E+03		52.69%	3.138E+00
934 (934.10)	0.033400	0.00944	0.154	4.896E+02		51.51%	1.244E+00
1120 (1120.30)	0.160000	0.00810	0.485	3.740E+02		16.54%	9.502E-01
1238 (1238.10)	0.062000	0.00743	0.198	4.303E+02		57.67%	1.093E+00
1377 (1377.60)	0.041800	0.00678	0.217	7.648E+02		31.25%	1.943E+00
1510 (1509.20)	0.023000	0.00626	0.129	8.963E+02		37.67%	2.277E+00
1730 (1729.60)	0.030700	0.00555	0.146	8.590E+02		26.21%	2.183E+00
1765 (1764.50)	0.166000	0.00546	0.334	3.689E+02		17.01%	9.374E-01

Th227 7.951E+03 DAYS LAMBDA= 8.718E-05 DECAY= 9.975E-01 48G

**** (49.80)	0.087000	0.05556	0.443	9.175E+01	s	<	2.337E-01
63 (62.50)	0.002500	0.05620	0.663	4.719E+03		48.72%	1.202E+01
80 (79.70)	0.018000	0.05314	0.882	9.224E+02	s	26.69%	2.350E+00
**** (94.00)	0.013500	0.04967	0.647	9.644E+02	s	<r	2.457E+00
**** (210.60)	0.012600	0.02990	0.419	1.113E+03	s	<	2.835E+00
**** (236.00)	0.115000	0.02753	0.448	1.414E+02	s	<	3.602E-01
**** (254.70)	0.009100	0.02603	0.350	1.477E+03	s	<	3.761E+00
**** (256.20)	0.063000	0.02591	0.346	2.118E+02	s	<	5.396E-01
**** (285.60)	0.016500	0.02391	0.317	8.048E+02	s	<	2.050E+00
296 (296.60)	0.003900	0.02324	1.861	2.053E+04		11.28%	5.231E+01
**** (300.00)	0.018900	0.02305	0.347	7.958E+02	s	<	2.027E+00
**** (304.40)	0.013500	0.02279	0.334	1.085E+03	s	<	2.765E+00
**** (329.90)	0.029000	0.02144	0.333	5.359E+02	s	<	1.365E+00
**** (334.40)	0.011500	0.02122	0.334	1.369E+03	s	<	3.487E+00
352 (350.50)	0.000800	0.02047	2.494	1.523E+05		7.52%	3.880E+02

Ac228 5.133E+12 DAYS LAMBDA= 1.350E-13 DECAY= 1.000E+00 41G

**** (911.10)	0.250000	0.00964	0.289	1.199E+02	s	<	3.046E-01

Th230 2.812E+07 DAYS LAMBDA= 2.465E-08 DECAY= 1.000E+00 8G

**** (68.00)	0.005900	0.05550	0.640	1.953E+03	s	<	4.963E+00

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 42G

328 (328.00)	0.029000	0.02153	0.411	6.574E+02		34.75%	1.670E+00
338 (338.40)	0.104000	0.02103	0.373	1.707E+02		38.57%	4.338E-01
462 (463.00)	0.040000	0.		2.827E+02		62.77%	7.184E-01
911 (911.10)	0.250000	0.00964	0.305	1.266E+02	s	39.57%	3.217E-01

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**** (   83.81)   0.010101   0.05807        0.830   1.113E+03 s      <  2.827E+00

Th234    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 10G
**** (   92.30)   0.999999   0.05009        0.700   1.397E+01 s      <r 3.548E-02

Pa234m   1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 48G
 787 (  786.27)   0.000345   0.01089        0.163   4.334E+04  52.69%  1.101E+02
**** (1001.03)   0.006000   0.00892        0.198   3.698E+03 s      <  9.397E+00

U 235    2.571E+11 DAYS      LAMBDA= 2.696E-12     DECAY= 1.000E+00 34G
  80 (   81.20)   0.006500   0.05279        0.882   2.571E+03  26.69%  6.533E+00
**** (  143.78)   0.132600   0.03894        0.480   9.301E+01 s      <  2.363E-01
 186 (  185.72)   0.540000   0.03271        0.902   5.104E+01 s27.11%  1.297E-01
 242 (  240.93)   0.000700   0.02711        0.961   5.064E+04  16.80%  1.287E+02

Am241    1.582E+05 DAYS      LAMBDA= 4.381E-06     DECAY= 9.999E-01 41G
**** (   59.54)   0.359000   0.05639        0.490   2.422E+01 s      <  6.154E-02
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8808 GLS 1 G-1 JR 290.717 7 204.62 MIN 177.28000 GR 255

LIBR=TTIH REF TIME= 261.924 7 100 mL in Parkway Jar

Group	8808	Time of count	290.717 2007
Sample	1	Reference GMT	261.924 2007
Element		Elapsed Live Tm	204.6167
Type code	GLS	Dead Time Pct	0.016288
ID	21-001-MH	Background GMT	286.979 2007
Geometry, detector	JR-1	Standard GMT	286.721 2007
Aliquot	177.28	Days since TO	28.79285
Unit of Aliquot	GRAM	Time on	10:12 PDT 17-OCT
Data Sheet Units	PCI /GRAM	Time off	13:36 PDT 17-OCT
Library	TTIH	Calc Time	13:24 17-OCT-07
Slope	1.00382	Width slope	0.005401
Intercept	1.918432	Width offset	1.146572
X**2 TERM	-0.15953368E-05	Sensitivity	4.

NP: [7,67]255.GSP 35 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	7	26.3	21	16	80	2.19	208	24.3	1.02E+00	15.50	.146	0	3.20
2	7	29.8	21	16	445	4.66	333	27.7	1.63E+00	17.70	.211	0	0.00
3	7	34.7	21	16	364	2.03	71	32.7	3.49E-01	43.50	.335	0	0.00
4	0	46.4	41	8	693	1.73	330	44.3	1.61E+00	14.80	.801	0	0.00
5	0	63.2	56	9	1015	1.80	287	61.1	1.40E+00	21.1	5.61	0	0.00
6	6	70.9	65	16	950	2.65	336	68.7	1.64E+00	17.1	5.50	0	45.80
7	6	75.3	65	16	918	2.65	666	73.1	3.25E+00	9.4	5.41	0	0.00
8	6	80.3	65	16	657	2.65	181	78.1	8.82E-01	26.7	5.30	0	0.00
9	0	93.0	89	6	626	1.86	275	90.7	1.35E+00	16.2	4.99	0	0.00
10	0	186.1	179	10	632	2.21	286	183.6	1.40E+00	17.3	3.27	0	0.00
11	6	238.7	230	16	236	1.53	476	236.0	2.33E+00	6.8	2.74	0	1.31
12	6	241.9	230	16	232	1.82	197	239.2	9.61E-01	16.8	2.71	0	0.00
13	0	295.7	288	11	364	2.10	400	292.8	1.96E+00	10.6	2.33	0	0.00
14	0	328.3	322	8	220	4.52	84	325.3	4.11E-01	34.7	2.18	0	0.00
15	0	338.0	333	8	249	2.08	88	335.0	4.31E-01	33.2	2.14	0	0.00
16	0	351.9	346	8	280	1.77	556	348.8	2.72E+00	6.8	2.08	0	0.00
17	0	462.4	457	8	184	2.87	38	459.1	1.87E-01	62.8	1.68	0	0.00
18	0	511.2	503	10	233	3.18	287	507.7	1.40E+00	11.8	1.54	0	0.00
19	0	583.3	575	11	209	1.85	118	579.7	5.77E-01	25.7	1.40	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	609.0	599	11	139	2.02	462	605.3	2.26E+00	7.2	1.35	0	0.00
21	0	662.0	655	9	103	2.09	109	658.2	5.35E-01	19.8	1.26	0	0.00
22	0	769.8	761	10	109	5.12	51	765.9	2.50E-01	44.9	1.12	0	0.00
23	0	786.7	778	8	71	3.65	33	782.8	1.63E-01	52.7	1.10	0	0.00
24	0	860.9	853	8	78	2.07	29	856.9	1.41E-01	60.4	1.02	0	0.00
25	0	911.4	902	12	115	2.34	80	907.3	3.93E-01	30.40	.974	0	0.00
26	0	934.1	927	8	69	1.89	32	930.0	1.54E-01	51.50	.952	0	0.00
27	0	969.8	964	8	88	2.07	38	965.7	1.84E-01	48.20	.920	0	0.00
28	0	1120.4	1112	8	34	2.35	109	1116.2	5.34E-01	14.80	.819	0	0.00
29	0	1238.2	1226	15	107	1.67	47	1233.9	2.28E-01	50.20	.752	0	0.00
30	0	1377.1	1368	10	35	1.67	51	1373.0	2.49E-01	27.20	.680	0	0.00
31	0	1461.2	1452	12	44	3.17	440	1457.1	2.15E+00	6.00	.648	0	0.00
32	0	1510.2	1503	8	13	2.83	26	1506.1	1.29E-01	37.70	.632	0	0.00
33	0	1693.4	1684	10	12	1.55	14	1689.6	6.63E-02	64.30	.574	0	0.00
34	0	1730.4	1722	11	8	3.91	31	1726.7	1.53E-01	25.20	.563	0	0.00
35	0	1764.8	1756	11	13	2.71	76	1761.1	3.72E-01	14.80	.553	0	0.00

FWHM=SQRT(6.70524E+00 + 4.94752E-04 *E)

****

v---------PEAK---------v			v------BACKGROUND------v			v------NET----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
63.22	1.4003	21.09	62.00	0.7373	17.75	0.6629	48.72
92.96	1.3459	16.21	92.00	1.1145	3.50	0.2314	95.76R
186.15	1.3988	17.34	186.00	0.4973	6.21	0.9015	27.11
238.72	2.3259	6.78	238.60	0.5096	6.02	1.8163	8.84
295.74	1.9562	10.62	295.20	0.0947	32.40	1.8614	11.28
338.03	0.4307	33.22	338.40	0.0574	28.40	0.3733	38.57
351.87	2.7187	6.80	351.90	0.2244	13.73	2.4943	7.52
511.16	1.4034	11.82	511.00	1.3547	4.94	0.0487	366.80R
583.27	0.5767	25.66	583.10	0.1588	15.81	0.4179	35.91
608.98	2.2566	7.23	609.30	0.1718	12.81	2.0848	7.90
661.97	0.5351	19.81	661.60	0.0338	0.00	0.5013	21.14
860.92	0.1408	60.40	860.40	0.0438	0.00	0.0971	87.64R
911.38	0.3934	30.43	911.10	0.0882	18.03	0.3052	39.57
969.78	0.1843	48.17	968.90	0.0442	37.09	0.1401	64.44
1120.36	0.5341	14.84	1120.30	0.0494	24.71	0.4847	16.54
1238.15	0.2280	50.17	1238.10	0.0296	5.06	0.1983	57.67
1377.13	0.2487	27.24	1377.70	0.0319	0.00	0.2169	31.25
1461.22	2.1520	5.97	1461.00	0.0708	25.70	2.0812	6.23
1730.44	0.1525	25.17	1729.60	0.0061	0.00	0.1464	26.21
1764.80	0.3716	14.81	1764.50	0.0375	37.87	0.3341	17.01

3 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 8808 GLS 1 290.717 7 G- 1

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8808 1 GLS RUN AT 290.717/2007

BACKGROUND FOR GELI DETECTOR 1 OF 286.979/2007 2391.6 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.7373	17.75	511.0	1.3547	4.94	1120.3	0.0494	24.71
92.0	1.1145	3.50	583.1	0.1588	15.81	1173.2	0.0272	0.00
143.0	0.0929	39.19	609.3	0.1718	12.81	1238.1	0.0296	5.06
186.0	0.4973	6.21	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0696	18.24	727.2	0.0348	16.65	1377.7	0.0319	0.00
238.6	0.5096	6.02	846.0	0.0720	46.82	1461.0	0.0708	25.70
279.0	0.0000	0.00	860.4	0.0438	0.00	1586.0	0.0000	0.00
295.2	0.0947	32.40	911.1	0.0882	18.03	1591.0	0.0620	0.00
338.4	0.0574	28.40	968.9	0.0442	37.09	1729.6	0.0061	0.00
351.9	0.2244	13.73	1001.0	0.0460	35.62	1764.5	0.0375	37.87

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 10/17/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
230.918	7	1.7347	13.890	35.
237.741	7	1.7237	13.528	28.
258.777	7	1.7442	14.353	29.
265.711	7	1.7599	15.213	22.
265.864	7	1.5439	11.619	38. NG
265.918	7	1.5464	12.253	26. NG
266.063	7	1.5169	11.690	20. NG
272.730	7	1.5111	11.869	23. NG
278.691	7	1.6797	13.907	20. NG
286.721	7	1.7356	13.726	26.
AVERAGE		1.7396	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.856	7	1.0713	7.228	30.
81.670	7	1.0534	5.600	25.
103.972	7	0.8203	15.248	21.
192.664	7	0.9760	34.750	25.
197.727	7	2.1369	18.219	45.
205.876	7	0.9740	30.810	21.
216.753	7	0.9677	15.266	24.
272.776	7	0.8535	10.320	20.
278.874	7	0.9541	14.321	20.
279.774	7	0.9550	14.786	35.
AVERAGE		0.9931	0.048	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 286.721 7
ENERGY= 1.918432 + 1.0038199*CH + -1.595337E-06*CH**2
FWHM =SQRT(1.1466 + 0.005402*ENERGY) (C060= 2.889)

EFFICIENCIES FOR GEOMETRY JR 1 CALIBRATED 207.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.555600	100.0	4.819200	300.0	2.304700	0.0	0.000000
55.0	5.631600	110.0	4.582500	500.0	1.562100	0.0	0.000000
60.0	5.636600	130.0	4.152700	700.0	1.197600	0.0	0.000000
65.0	5.592800	150.0	3.787300	1000.0	0.892900	0.0	0.000000
70.0	5.516200	170.0	3.479400	1400.0	0.669100		
80.0	5.307100	190.0	3.218900	2000.0	0.489700		
90.0	5.065700	250.0	2.638800	3000.0	0.348600		

8808 1 GLS GSTOR 255

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	26.3	1.02	15.5		
	2	29.8	1.63	17.7		
	3	34.7	0.35	43.5		
	4	46.4	1.61	14.8		Pb210s
b	5	63.2	0.66	48.7	NO GEN.	Th232s
	6	70.9	1.64	17.1		
	7	75.3	3.25	9.4		
	8	80.3	0.88	26.7		Ce144 I 131 Th227s
b	10	186.1	0.90	27.1		Cs136 U 235s Ra226s
b	11	238.7	1.82	8.8	Th228	Pb212s
	12	241.9	0.96	16.8	Ra226 Th228	La140
b	13	295.7	1.86	11.3	Ra226	Ru103
	14	328.3	0.41	34.7	Ac228 Th228	La140
b	15	338.0	0.37	38.6	Ac228	
b	16	351.9	2.49	7.5		Ra226s Pb214s
	17	462.4	0.19	62.8	Ra226 Ac228	Sb125
b	19	583.3	0.42	35.9	Th228	T1208s
b	20	609.0	2.08	7.9		Ru103 Ra226s Bi214s
b	21	662.0	0.50	21.1		Cs137s
	22	769.8	0.25	44.9	Ra226	
	23	786.7	0.16	52.7	Ra226 Th228	
b	25	911.4	0.31	39.6		Th232s Ac228s
	26	934.1	0.15	51.5	Ra226	
b	27	969.8	0.14	64.4	Ac228	Sb124 Th232s
b	28	1120.4	0.48	16.5	Ra226	Sc 46s
b	29	1238.2	0.20	57.7	Ra226	
	30	1377.1	0.22	31.2	Ra226	La140c
b	31	1461.2	2.08	6.2		K 40s
	32	1510.2	0.13	37.7	Ra226 NO GEN.	
	33	1693.4	0.07	64.3		
b	34	1730.4	0.15	26.2	Ra226	
b	35	1764.8	0.33	17.0	Ra226	
			REJECTED PEAKS			
B	9	93.0	0.23	95.8		Th234s Th227s
B	18	511.2	0.05	99.9	Th228	La140 Ru106 Na 22
B	24	860.9	0.10	87.6	Th228	

8808 GLS 2 G-1 JR 292.699 7 181.08 MIN 1.00000 SM 044

LIBR=TTIH REF TIME= 292.699 7 100 mL in Parkway Jar

tw 10-19-07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G		
**** (1460.85)	0.110000	0.00644	0.179	2.532E+02 s		<T 1.140E+02
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 1.000E+00 3G		
**** (889.26)	1.000000	0.00984	0.346	3.519E+01 s		< 1.585E+01
**** (1120.52)	1.000000	0.00810	0.310	3.831E+01 s		< 1.726E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 1.000E+00 4G		
1173 (1173.21)	0.999200	0.00779	8.631	1.109E+03 s	2.97%	4.997E+02
1333 (1332.48)	1.000000	0.00698	7.891	1.131E+03 s	2.98%	5.093E+02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 1.000E+00 16G		
**** (1691.00)	0.457000	0.00566	0.141	5.445E+01 s		< 2.453E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 1.000E+00 3G		
662 (661.64)	0.851000	0.01252	12.530	1.176E+03 s	2.52%	5.299E+02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 1.000E+00 48G		
**** (121.78)	0.254000	0.04322	0.457	4.163E+01 s		< 1.875E+01
**** (344.31)	0.245000	0.02075	0.407	8.009E+01 s		< 3.608E+01
**** (963.36)	0.132000	0.00921	0.353	2.903E+02 s		< 1.308E+02
**** (1112.04)	0.124000	0.00815	0.317	3.134E+02 s		< 1.412E+02
**** (1408.02)	0.198000	0.00666	0.146	1.107E+02 s		< 4.988E+01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 1.000E+00 48G		
**** (123.07)	0.390000	0.04295	0.498	2.971E+01 s		< 1.338E+01
511 (511.20)	0.000600	0.01535	0.390	4.233E+04	69.01%	1.907E+04
**** (723.26)	0.202000	0.01166	0.294	1.248E+02 s		< 5.624E+01
**** (1004.75)	0.170000	0.00889	0.321	2.124E+02 s		< 9.568E+01
**** (1274.49)	0.336000	0.00725	0.185	7.609E+01 s		< 3.428E+01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 1.000E+00 22G		
**** (316.50)	0.830700	0.02213	0.443	2.409E+01 s		< 1.085E+01
**** (468.06)	0.476000	0.01642	0.429	5.486E+01 s		< 2.471E+01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 19G		
511 (510.80)	0.230000	0.01536	0.390	1.103E+02	69.01%	4.970E+01
**** (583.14)	0.860000	0.01383	0.340	2.859E+01 s		< 1.288E+01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 1G		
**** (46.50)	0.040000	0.05556	0.709	3.189E+02 s		< 1.436E+02
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 22G		
511 (510.72)	0.094000	0.01536	0.390	2.700E+02	69.01%	1.216E+02
**** (727.17)	0.066500	0.01161	0.289	3.747E+02 s		< 1.688E+02
)212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 4G		
**** (238.63)	0.431000	0.02731	0.501	4.258E+01 s		<T 1.918E+01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
**** (609.30)	0.470000	0.01335	0.384	6.114E+01 s		< 2.754E+01

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Pb214    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 23G
**** ( 352.00)   0.360000    0.02040       0.443   6.036E+01 s      <T 2.719E+01

Ra226    5.851E+05 DAYS      LAMBDA= 1.185E-06     DECAY= 1.000E+00 48G
**** ( 186.10)   0.040000    0.03266       0.505   3.866E+02 s      <T 1.741E+02
**** ( 351.96)   0.393000    0.02040       0.443   5.529E+01 s      <T 2.491E+01
**** ( 609.32)   0.484000    0.01335       0.384   5.937E+01 s      <  2.674E+01

Th227    7.951E+03 DAYS      LAMBDA= 8.718E-05     DECAY= 1.000E+00 48G
**** (  49.80)   0.087000    0.05556       0.822   1.700E+02 s      <  7.658E+01
  51 (  50.20)   0.087000    0.05560       0.622   1.285E+02  59.22%  5.790E+01
  80 (  79.70)   0.018000    0.05314       0.275   2.880E+02 s71.24%  1.297E+02
**** (  94.00)   0.013500    0.04967       0.589   8.791E+02 s      <T 3.960E+02
**** ( 210.60)   0.012600    0.02990       0.505   1.341E+03 s      <  6.039E+02
**** ( 236.00)   0.115000    0.02753       0.480   1.517E+02 s      <T 6.834E+01
**** ( 254.70)   0.009100    0.02603       0.456   1.926E+03 s      <  8.677E+02
**** ( 256.20)   0.063000    0.02591       0.449   2.753E+02 s      <  1.240E+02
**** ( 285.60)   0.016500    0.02391       0.410   1.041E+03 s      <  4.688E+02
**** ( 300.00)   0.018900    0.02305       0.436   9.999E+02 s      <  4.504E+02
**** ( 304.40)   0.013500    0.02279       0.443   1.441E+03 s      <  6.490E+02
**** ( 329.90)   0.029000    0.02144       0.404   6.494E+02 s      <  2.925E+02
**** ( 334.40)   0.011500    0.02122       0.446   1.829E+03 s      <  8.241E+02

Ac228    5.133E+12 DAYS      LAMBDA= 1.350E-13     DECAY= 1.000E+00 41G
**** ( 911.10)   0.250000    0.00964       0.365   1.516E+02 s      <  6.828E+01

Th230    2.812E+07 DAYS      LAMBDA= 2.465E-08     DECAY= 1.000E+00  8G
**** (  68.00)   0.005900    0.05550       0.604   1.843E+03 s      <  8.304E+02

Th232    5.113E+12 DAYS      LAMBDA= 1.356E-13     DECAY= 1.000E+00 42G
**** ( 911.10)   0.250000    0.00964       0.365   1.516E+02 s      <  6.828E+01
**** ( 968.90)   0.150000    0.00916       0.355   2.581E+02 s      <  1.163E+02
**** (  63.81)   0.010101    0.05607       0.519   9.165E+02 s      <T 4.129E+02

Th234    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 10G
**** (  92.30)   0.999999    0.05009       0.595   1.188E+01 s      <T 5.352E+00

Pa234m   1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 48G
**** (1001.03)   0.006000    0.00892       0.326   6.099E+03 s      <  2.747E+03

U 235    2.571E+11 DAYS      LAMBDA= 2.696E-12     DECAY= 1.000E+00 34G
  60 (  58.60)   0.001000    0.05641      22.432   3.976E+05   1.79%  1.791E+05
  80 (  81.20)   0.006500    0.05279       0.275   8.028E+02  71.24%  3.616E+02
**** ( 143.78)   0.132600    0.03894       0.478   9.259E+01 s      <  4.171E+01
**** ( 185.72)   0.540000    0.03271       0.550   3.115E+01 s      <T 1.403E+01

Am241    1.582E+05 DAYS      LAMBDA= 4.381E-06     DECAY= 1.000E+00 41G
  60 (  59.54)   0.359000    0.05639      22.432   1.108E+03 s 1.79%  4.992E+02
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8808    GLS   2       G-1 JR 292.699  7  181.08 MIN     1.00000 SM       044
LIBR=TTIH  REF TIME= 292.699  7       100 mL in Parkway Jar
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* Group.......................... 8808 * Time of count          292.699 2007 *
* Sample.......................... 2 * Reference GMT........ 292.699 2007 *
* Element.......................... * Elapsed Live Tm.......... 181.0833 *
* Type code...................... GLS * Dead Time Pct............ 0.027604 *
* ID.................. QC-LCS #62903 * Background GMT....... 286.979 2007 *
* Geometry, detector........... JR-1 * Standard GMT......... 286.721 2007 *
* Aliquot.......................... 1. * Days since TO.................. 0.0 *
* Unit of Aliquot.............. SMPL * Time on........... 9:46 PDT 19-OCT *
* Data Sheet Units........ PCI /SMPL * Time off......... 12:48 PDT 19-OCT *
* Library...................... TTIH * Calc Time......... 13:38 19-OCT-07 *
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* Slope...................... 1.00382 * Width slope.............. 0.005401 *
* Intercept................ 1.918432 * Width offset............. 1.146572 *
* X**2 TERM......... -0.15953368E-05 * Sensitivity.................... 4. *
  NP:[7,67]044.GSP                 19 PEAKS

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PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	4	26.5	21	17	52	1.70	483	24.5	2.67E+00	6.5	0.148	0	1.35
2	4	29.1	21	17	206	2.57	340	27.1	1.88E+00	14.4	0.197	0	0.00
3	4	32.2	21	17	253	1.62	632	30.1	3.49E+00	5.9	0.266	0	0.00
4	4	36.3	21	17	436	2.05	190	34.3	1.05E+00	19.2	0.383	0	0.00
5	0	51.0	46	7	1584	1.93	113	48.9	6.22E-01	59.2	5.63	0	0.00
6	2	59.8	53	11	541	1.32	4062	57.7	2.24E+01	1.8	5.64	0	55.60
7	2	63.5	53	11	319	1.32	101	61.3	5.57E-01	32.8	5.61	0	0.00
8	0	69.8	64	8	595	3.17	240	67.6	1.32E+00	19.5	5.52	0	0.00
9	0	80.2	76	6	486	1.11	50	78.0	2.75E-01	71.2	5.30	0	0.00
10	0	93.3	86	8	587	1.87	134	91.1	7.42E-01	33.2	4.98	0	0.00
11	0	185.8	180	7	453	1.92	98	183.2	5.39E-01	38.4	3.27	0	0.00
12	0	237.3	233	6	385	1.05	33	234.6	1.83E-01	96.2	2.75	0	0.00
13	0	351.7	346	7	300	1.46	57	348.7	3.13E-01	53.4	2.08	0	0.00
14	0	511.1	501	15	391	3.03	316	507.7	1.74E+00	14.9	1.54	0	0.00
15	0	661.7	652	12	242	2.13	2275	657.9	1.26E+01	2.5	1.26	0	0.00
16	0	1173.3	1162	13	129	2.59	1568	1169.1	8.66E+00	3.0	0.788	0	0.00
17	0	1332.6	1321	15	71	2.73	1434	1328.4	7.92E+00	3.0	0.702	0	0.00
18	0	1461.6	1454	10	20	1.67	25	1457.5	1.38E-01	46.0	0.648	0	0.00
19	0	1991.6	1981	10	18	2.39	2	1988.4	9.94E-03	464.8	0.492	0	0.00

FWHM=SQRT(3.71410E+00 + 1.30608E-03 *E)

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BACKGROUND INFO 8808    GLS   2       292.699  7 G- 1     BG DATE 286.979  7
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v--------PEAK---------v			v------BACKGROUND------v			v------NET----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
63.45	0.5566	32.79	62.00	0.7373	17.75	-0.1808	124.24R
93.32	0.7424	33.17	92.00	1.1145	3.50	-0.3721	67.02R
185.76	0.5390	38.41	186.00	0.4973	6.21	0.0417	501.45R
237.32	0.1827	96.17	238.60	0.5096	6.02	-0.3269	54.55R
351.74	0.3128	53.39	351.90	0.2244	13.73	0.0884	192.12R
511.12	1.7444	14.94	511.00	1.3547	4.94	0.3898	69.01
661.67	12.5632	2.52	661.60	0.0338	0.00	12.5295	2.52
1173.31	8.6576	2.96	1173.20	0.0272	0.00	8.6304	2.97
1332.57	7.9200	2.97	1332.50	0.0288	0.00	7.8912	2.98
1461.62	0.1381	46.04	1461.00	0.0708	25.70	0.0672	98.35R

6 PEAKS REJECTED BY BACKGROUND

****
INTERFERING ISOTOPE ANALYSIS 8808 GLS 2 292.699 7 G- 1
****
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8808 2 GLS RUN AT 292.699/2007

BACKGROUND FOR GELI DETECTOR 1 OF 286.979/2007 2391.6 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.7373	17.75	511.0	1.3547	4.94	1120.3	0.0494	24.71
92.0	1.1145	3.50	583.1	0.1588	15.81	1173.2	0.0272	0.00
143.0	0.0929	39.19	609.3	0.1718	12.81	1238.1	0.0296	5.06
186.0	0.4973	6.21	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0696	18.24	727.2	0.0348	16.65	1377.7	0.0319	0.00
238.6	0.5096	6.02	846.0	0.0720	46.82	1461.0	0.0708	25.70
279.0	0.0000	0.00	860.4	0.0438	0.00	1586.0	0.0000	0.00
295.2	0.0947	32.40	911.1	0.0882	18.03	1591.0	0.0620	0.00
338.4	0.0574	28.40	968.9	0.0442	37.09	1729.6	0.0061	0.00
351.9	0.2244	13.73	1001.0	0.0460	35.62	1764.5	0.0375	37.87

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 10/19/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
230.918	7	1.7347	13.890	35.
237.741	7	1.7237	13.528	28.
258.777	7	1.7442	14.353	29.
265.711	7	1.7599	15.213	22.
265.864	7	1.5439	11.619	38. NG
265.918	7	1.5464	12.253	26. NG
266.063	7	1.5169	11.690	20. NG
272.730	7	1.5111	11.869	23. NG
278.691	7	1.6797	13.907	20. NG
286.721	7	1.7356	13.726	26.
AVERAGE		1.7396	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.856	7	1.0713	7.228	30.
81.670	7	1.0534	5.600	25.
103.972	7	0.8203	15.248	21.
192.664	7	0.9760	34.750	25.
197.727	7	2.1369	18.219	45.
205.876	7	0.9740	30.810	21.
216.753	7	0.9677	15.266	24.
272.776	7	0.8535	10.320	20.
278.874	7	0.9541	14.321	20.
279.774	7	0.9550	14.786	35.
AVERAGE		0.9931	0.048	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 286.721 7
ENERGY= 1.918432 + 1.0038199*CH + -1.595337E-06*CH**2
FWHM =SQRT(1.1466 + 0.005402*ENERGY) (CO60= 2.889)

EFFICIENCIES FOR GEOMETRY JR 1 CALIBRATED 207.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.555600	100.0	4.819200	300.0	2.304700	0.0	0.000000
55.0	5.631600	110.0	4.582500	500.0	1.562100	0.0	0.000000
60.0	5.636600	130.0	4.152700	700.0	1.197600	0.0	0.000000
65.0	5.592800	150.0	3.787300	1000.0	0.892900	0.0	0.000000
70.0	5.516200	170.0	3.479400	1400.0	0.669100		
80.0	5.307100	190.0	3.218900	2000.0	0.489700		
90.0	5.065700	250.0	2.638800	3000.0	0.348600		

8808 2 GLS GSTOR 044

	PK	ENERGY	CPM	%ERR	COMMENT		
	1	26.5	2.67	6.5			
	2	29.1	1.88	14.4			
	3	32.2	3.49	5.9			
	4	36.3	1.05	19.2			
	5	51.0	0.62	59.2			Th227s
	6	59.8	22.43	1.8	NO GEN.		Am241s
	8	69.8	1.32	19.5			
	9	80.2	0.28	71.2		Ce144 I 131	Th227s
b	14	511.1	0.39	69.0	Th228	La140 Ru106	Na 22
b	15	661.7	12.53	2.5			Cs137s
b	16	1173.3	8.63	3.0		Cs134+	Co 60s
b	17	1332.6	7.89	3.0			Co 60s
	19	1991.6	0.01	99.9			
			REJECTED PEAKS				
B	7	63.5	-0.18	99.9			Th232s
B	10	93.3	-0.37	67.0		Th234s	Th227s
B	11	185.8	0.04	99.9		Cs137c U 235s	Ra226s
B	12	237.3	-0.33	54.5	Th228	Th227s	Pb212s
B	13	351.7	0.09	99.9		Ra226s	Pb214s
B	18	1461.6	0.07	98.4			K 40s

8808 GLS 3 G-6 JR 290.717 7 204.82 MIN 1.00000 SM 258

LIBR=TTIH REF TIME= 290.717 7 100 mLs in JAR

dw 10/4/07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G	
**** (1460.85)	0.110000	0.00722	0.694	8.736E+02 s		<T 3.935E+02
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 1.000E+00	3G	
**** (889.26)	1.000000	0.01119	0.301	2.689E+01 s		< 1.211E+01
**** (1120.52)	1.000000	0.00916	0.378	4.131E+01 s		<T 1.861E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 1.000E+00	4G	
**** (1173.21)	0.999200	0.00879	0.301	3.422E+01 s		< 1.541E+01
**** (1332.48)	1.000000	0.00785	0.248	3.163E+01 s		< 1.425E+01
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 1.000E+00	16G	
**** (1691.00)	0.457000	0.00631	0.169	5.864E+01 s		< 2.641E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 1.000E+00	3G	
**** (661.64)	0.851000	0.01431	0.381	3.128E+01 s		< 1.409E+01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 1.000E+00	48G	
**** (121.78)	0.254000	0.04988	0.790	6.237E+01 s		< 2.809E+01
**** (344.31)	0.245000	0.02391	0.538	9.185E+01 s		< 4.137E+01
**** (963.36)	0.132000	0.01045	0.316	2.293E+02 s		< 1.033E+02
**** (1112.04)	0.124000	0.00922	0.293	2.566E+02 s		< 1.156E+02
**** (1408.02)	0.198000	0.00747	0.263	1.779E+02 s		< 8.013E+01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 1.000E+00	48G	
**** (123.07)	0.390000	0.04958	0.775	4.008E+01 s		< 1.806E+01
**** (723.26)	0.202000	0.01331	0.345	1.282E+02 s		< 5.775E+01
**** (1004.75)	0.170000	0.01008	0.319	1.860E+02 s		< 8.378E+01
**** (1274.49)	0.336000	0.00816	0.271	9.887E+01 s		< 4.454E+01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 1.000E+00	22G	
**** (316.50)	0.830700	0.02553	0.529	2.492E+01 s		< 1.123E+01
**** (468.06)	0.476000	0.01885	0.421	4.692E+01 s		< 2.114E+01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G	
**** (583.14)	0.860000	0.01583	0.453	3.327E+01 s		<T 1.499E+01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G	
47 (46.50)	0.040000	0.04546	0.792	4.355E+02 s29.74%		1.962E+02
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G	
**** (727.17)	0.066500	0.01325	0.346	3.920E+02 s		<T 1.766E+02
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G	
**** (238.63)	0.431000	0.03160	0.728	5.343E+01 s		<T 2.407E+01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G	
**** (609.30)	0.470000	0.01529	0.538	7.483E+01 s		<T 3.371E+01
Pb214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	23G	
352 (352.00)	0.360000	0.02351	0.359	4.246E+01 s80.83%		1.913E+01
Ra226 5.851E+05 DAYS		LAM		DECAY= 1.000E+00	48G	
**** (186.10)	0.040000	0.03787	0.748	4.938E+02 s		<T 2.224E+02

**** (609.32)	0.484000	0.01529	0.538	7.267E+01 s		<τ 3.274E+01
Th227	7.951E+03 DAYS	LAMBDA= 8.718E-05		DECAY= 1.000E+00	48G	
**** (49.80)	0.087000	0.05585	0.562	1.156E+02 s		< 5.207E+01
**** (79.70)	0.018000	0.05957	0.639	5.964E+02 s		< 2.686E+02
**** (94.00)	0.013500	0.05657	0.764	9.998E+02 s		<τ 4.503E+02
**** (210.60)	0.012600	0.03464	0.728	1.669E+03 s		< 7.516E+02
**** (236.00)	0.115000	0.03186	0.645	1.761E+02 s		< 7.932E+01
**** (254.70)	0.009100	0.03010	0.613	2.238E+03 s		< 1.008E+03
**** (256.20)	0.063000	0.02997	0.627	3.321E+02 s		< 1.496E+02
**** (285.60)	0.016500	0.02761	0.597	1.310E+03 s		< 5.901E+02
**** (300.00)	0.018900	0.02660	0.572	1.137E+03 s		< 5.124E+02
**** (304.40)	0.013500	0.02631	0.574	1.617E+03 s		< 7.283E+02
**** (329.90)	0.029000	0.02472	0.513	7.155E+02 s		< 3.223E+02
**** (334.40)	0.011500	0.02446	0.554	1.968E+03 s		< 8.864E+02
Ac228	5.133E+12 DAYS	LAMBDA= 1.350E-13		DECAY= 1.000E+00	41G	
**** (911.10)	0.250000	0.01096	0.409	1.492E+02 s		<τ 6.719E+01
Th230	2.812E+07 DAYS	LAMBDA= 2.465E-08		DECAY= 1.000E+00	8G	
**** (68.00)	0.005900	0.06080	0.669	1.865E+03 s		< 8.403E+02
Th232	5.113E+12 DAYS	LAMBDA= 1.356E-13		DECAY= 1.000E+00	42G	
**** (911.10)	0.250000	0.01096	0.409	1.492E+02 s		<τ 6.719E+01
**** (968.90)	0.150000	0.01040	0.382	2.450E+02 s		<τ 1.104E+02
**** (63.81)	0.010101	0.06071	0.692	1.129E+03 s		<τ 5.086E+02
Th234	1.633E+12 DAYS	LAMBDA= 4.245E-13		DECAY= 1.000E+00	10G	
**** (92.30)	0.999999	0.05697	0.695	1.220E+01 s		<τ 5.496E+00
Pa234m	1.633E+12 DAYS	LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G	
**** (1001.03)	0.006000	0.01012	0.318	5.238E+03 s		< 2.360E+03
U 235	2.571E+11 DAYS	LAMBDA= 2.696E-12		DECAY= 1.000E+00	34G	
85 (84.24)	0.051000	0.05873	4.503	1.503E+03	8.70%	6.772E+02
**** (143.78)	0.132600	0.04511	0.776	1.297E+02 s		< 5.843E+01
**** (185.72)	0.540000	0.03792	0.743	3.628E+01 s		<τ 1.634E+01
Am241	1.582E+05 DAYS	LAMBDA= 4.381E-06		DECAY= 1.000E+00	41G	
**** (59.54)	0.359000	0.06016	0.629	2.911E+01 s		< 1.311E+01

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8808    GLS   3       G-6 JR 290.717  7  204.82 MIN     1.00000 SM       258
LIBR=TTIH  REF TIME= 290.717  7       100 mLs in JAR
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* Group.......................... 8808 * Time of count          290.717 2007 *
* Sample.......................... 3 * Reference GMT........ 290.717 2007 *
* Element.......................... * Elapsed Live Tm.......... 204.8167 *
* Type code...................... GLS * Dead Time Pct.................. 0.0 *
* ID............. 4  QC-BLANK #62904 * Background GMT....... 286.941 2007 *
* Geometry, detector........... JR-6 * Standard GMT......... 286.761 2007 *
* Aliquot.......................... 1. * Days since TO................. 0.0 *
* Unit of Aliquot.............. SMPL * Time on.......... 10:12 PDT 17-OCT *
* Data Sheet Units........ PCI /SMPL * Time off......... 13:36 PDT 17-OCT *
* Library...................... TTIH * Calc Time......... 13:44 17-OCT-07 *
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* Slope..................... 0.992854 * Width slope.............. 0.014320 *
* Intercept................ 1.751356 * Width offset.................. 0.0 *
* X**2 TERM......... -0.13336789E-05 * Sensitivity..................... 4. *
  NP:[7,67]258.GSP                  20 PEAKS

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 PK  IT    ENRG LEFT WD BKGND FWHM    AREA    CHAN        CPM  ERR   EFF  K  FIT
  1   0    25.3   20  9   578 3.13     525    23.7  2.56E+00  9.40.130  0  0.00
  2   0    47.2   43  6   834 2.79     162    45.7  7.92E-01 29.70.840  0  0.00
  3   0    63.2   59  7  1305 1.64     155    61.9  7.55E-01 40.1 6.06  0  0.00
  4   0    74.4   69 11  2196 2.74    2576    73.2  1.26E+01  4.1 6.02  0  0.00
  5   0    85.0   80  9  1703 1.98     922    83.9  4.50E+00  8.7 5.85  0  0.00
  6   0    92.7   90  6  1128 1.82     140    91.6  6.81E-01 39.5 5.68  0  0.00
  7   0   186.0  183  7  1247 2.10     142   185.6  6.95E-01 42.4 3.79  0  0.00
  8   0   238.7  233 12  1575 1.95     269   238.7  1.32E+00 30.5 3.17  0  0.00
  9   0   295.4  293  6   557 1.70     127   295.9  6.22E-01 31.7 2.69  0  0.00
 10   0   352.1  348 10   613 2.73     302   353.0  1.48E+00 17.0 2.40  0  0.00
 11   0   511.2  508 11   393 3.15     556   513.5  2.72E+00  8.5 1.77  0  0.00
 12   0   571.4  570 11   338 5.90      79   574.2  3.85E-01 47.3 1.63  0  0.00
 13   0   583.1  582  8   284 3.03     112   586.0  5.46E-01 28.3 1.60  0  0.00
 14   0   608.8  607 12   434 2.43     243   611.9  1.19E+00 18.0 1.55  0  0.00
 15   0   727.5  729  8   152 2.81      55   731.7  2.69E-01 44.6 1.33  0  0.00
 16   0   909.9  908 16   281 3.96     165   915.8  8.07E-01 25.4 1.11  0  0.00
 17   0   968.7  968 14   199 5.09     127   975.2  6.18E-01 26.3 1.04  0  0.00
 18   0  1119.3 1121 19   288 4.92     109  1127.3  5.32E-01 41.20.926  0  0.00
 19   0  1461.5 1463 19   106 4.72     859  1473.1  4.19E+00  4.90.726  0  0.00
 PK  IT    ENRG LEFT WD BKGND FWHM    AREA    CHAN        CPM  ERR   EFF  K  FIT
 20   0  1764.5 1773 12    24 5.70     106  1779.7  5.18E-01 14.60.616  0  0.00
FWHM=SQRT( 3.71066E+00 +  1.56924E-02 *E)

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BACKGROUND INFO 8808    GLS   3       290.717  7 G- 6     BG DATE 286.941  7
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v---------PEAK---------v     v------BACKGROUND------v     v------NET----v
ENERGY       CPM  %ERROR       ENERGY       CPM  %ERROR          CPM  %ERROR

  63.24     0.7546 40.09        62.00   0.4821 15.81          0.2724114.51R
  92.71     0.6814 39.49        92.00   0.8203 13.13         -0.1389208.64R
 185.95     0.6951 42.36       186.00   0.5252 13.84          0.1699178.53R
 238.65     1.3153 30.47       238.60   1.3628 16.97         -0.0475974.42R
 295.41     0.6224 31.71       295.20   0.5033 18.08          0.1191182.50R
 352.06     1.4761 17.02       351.90   1.1168 13.06          0.3593 80.83
 511.19     2.7164  8.51       511.00   2.7769  4.83         -0.0606441.27R
 583.08     0.5464 28.26       583.10   0.7085 18.21         -0.1621124.09R
 608.81     1.1872 18.02            140        3.42         -0.1008237.89R
 727.50     0.2685 44.65       727.20   0.1734 21.80          0.0951132.19R
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 968.67     0.6183 26.31        968.90  0.5050 12.45          0.1132154.01R
1119.32     0.5323 41.24       1120.30  0.4554  9.82          0.0770290.99R
1461.48     4.1936  4.88       1461.00  4.1815  8.57          0.0122******R
1764.50     0.5175 14.55       1764.50  0.4655  9.88          0.0520169.64R
   14 PEAKS REJECTED BY BACKGROUND

*************************************************************************
INTERFERING ISOTOPE ANALYSIS 8808    GLS   3        290.717  7 G- 6
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SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 8808 3 GLS RUN AT 290.717/2007

BACKGROUND FOR GELI DETECTOR 6 OF 286.941/2007 2445.5 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4821	15.81	511.0	2.7769	4.83	1120.3	0.4554	9.82
92.0	0.8203	13.13	583.1	0.7085	18.21	1173.2	0.0379	0.00
143.0	0.1882	0.00	609.3	1.2880	8.42	1238.1	0.1934	20.68
186.0	0.5252	13.84	661.6	0.1623	52.49	1332.5	0.0681	6.46
198.0	0.1669	0.00	727.2	0.1734	21.80	1337.7	0.0000	0.00
238.6	1.3628	16.97	846.0	0.0548	10.58	1461.0	4.1815	8.57
279.0	0.1161	0.00	860.4	0.1085	24.04	1586.0	0.0773	0.00
295.2	0.5033	18.08	911.1	0.5665	10.47	1591.0	0.1828	22.75
338.4	0.2671	20.48	968.9	0.5050	12.45	1729.6	0.1164	19.24
351.9	1.1168	13.06	1001.0	0.0936	0.00	1764.5	0.4655	9.88

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 10/17/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
207.753	7	1.0155	14.364	58.
223.821	7	0.9971	14.563	22.
230.795	7	1.0016	13.550	25.
237.814	7	1.0021	13.672	25.
244.906	7	0.9920	12.742	24.
258.758	7	0.9774	13.193	24.
265.838	7	1.0076	13.473	34.
272.710	7	0.9943	13.548	26.
279.758	7	0.9902	15.691	21.
286.761	7	0.9816	13.627	22.
AVERAGE		0.9959	0.011	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
61.811	7	1.3744	14.949	20. NG
69.906	7	1.3635	14.524	20.
76.810	7	1.3438	13.154	35.
81.696	7	1.3658	13.879	25.
104.028	7	1.3821	15.760	22.
110.905	7	0.9898	14.446	38. *
124.980	7	0.9907	14.749	36. *
133.855	7	0.9852	15.294	24. *
154.043	7	0.9860	15.339	32. *
216.995	7	1.0022	16.665	21. *
AVERAGE		0.9908	0.007	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 286.761 7
ENERGY= 1.751356 + 0.9928549*CH + -1.333679E-06*CH**2
FWHM =SQRT(-0.9943 + 0.014320*ENERGY) (CO60= 4.253)

EFFICIENCIES FOR GEOMETRY JR 6 CALIBRATED 29.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.652300	100.0	5.512700	300.0	2.660400	0.0	0.000000
55.0	5.891700	110.0	5.268400	500.0	1.792700	0.0	0.000000
60.0	6.024200	130.0	4.801100	700.0	1.368100	0.0	0.000000
65.0	6.077200	150.0	4.388400	1000.0	1.012600	0.0	0.000000
70.0	6.072400	170.0	4.034000	1400.0	0.750900		
80.0	5.951400	190.0	3.731100	2000.0	0.541800		
90.0	5.748900	250.0	3.052100	3000.0	0.379700		

8808 3 GLS GSTOR 258

	PK	ENERGY	CPM	%ERR	COMMENT
	1	25.3	2.56	9.4	
	2	47.2	0.79	29.7	Pb210s
	4	74.4	12.58	4.1	
	5	85.0	4.50	8.7	Cs136
b	10	352.1	0.36	80.8	Ra226s Pb214s
	12	571.4	0.38	47.3	
			REJECTED PEAKS		
B	3	63.2	0.27	99.9	Th232s
B	6	92.7	-0.14	99.9	Th234s Th227s
B	7	186.0	0.17	99.9	Cs136 U 235s Ra226s
B	8	238.7	-0.05	99.9 Th228	Pb212s
B	9	295.4	0.12	99.9 Ra226	Ru103
B	11	511.2	-0.06	99.9 Th228	La140 Ru106 Na 22
B	13	583.1	-0.16	99.9 Th228	T1208s
B	14	608.8	-0.10	99.9	Ru103 Ra226s Bi214s
B	15	727.5	0.10	99.9 Ac228 Th228	Bi212s
B	16	909.9	0.24	88.5	Th232s Ac228s
B	17	968.7	0.11	99.9 Ac228	Sb124 Th232s
B	18	1119.3	0.08	99.9 Ra226	Co 60c Sc 46s
B	19	1461.5	0.01	99.9	K 40s
B	20	1764.5	0.05	99.9 Ra226	

8808 GLS 4 G-1 JR 290.865 7 219.25 MIN 177.28000 GR 640

LIBR=TTIH REF TIME= 261.924 7 100 mL in Parkway Jar

10-1807

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G			
1461 (1460.85)	0.110000	0.00644	1.926	2.717E+03 s	6.62%		6.904E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 7.871E-01 3G			
**** (889.26)	1.000000	0.00984	0.206	2.092E+01 s	<		6.755E-02
1121 (1120.52)	1.000000	0.00810	0.560	6.914E+01 s	19.13%		2.232E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.896E-01 4G			
**** (1173.21)	0.999200	0.00779	0.196	2.521E+01 s	<		6.473E-02
**** (1332.48)	1.000000	0.00698	0.143	2.051E+01 s	<		5.267E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 7.166E-01 16G			
969 (968.30)	0.017200	0.00917	0.238	1.512E+03	46.78%		5.360E+00
**** (1691.00)	0.457000	0.00566	0.127	4.897E+01 s	<		1.736E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.982E-01 3G			
662 (661.64)	0.851000	0.01252	0.474	4.448E+01 s	24.24%		1.132E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.958E-01 48G			
*** (121.78)	0.254000	0.04322	0.397	3.613E+01 s	<		9.220E-02
295 (295.97)	0.004000	0.02328	1.519	1.631E+04	14.14%		4.162E+01
**** (344.31)	0.245000	0.02075	0.295	5.797E+01 s	<		1.479E-01
768 (768.90)	0.000800	0.01109	0.233	2.622E+04	38.87%		6.691E+01
**** (963.36)	0.132000	0.00921	0.199	1.634E+02 s	<		4.168E-01
**** (1112.04)	0.124000	0.00815	0.178	1.762E+02 s	<		4.495E-01
**** (1408.02)	0.198000	0.00666	0.170	1.288E+02 s	<		3.285E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.936E-01 48G			
**** (123.07)	0.390000	0.04295	0.441	2.633E+01 s	<		6.733E-02
583 (582.03)	0.008000	0.01385	0.527	4.758E+03	23.74%		1.217E+01
**** (723.26)	0.202000	0.01166	0.217	9.213E+01 s	<		2.356E-01
**** (1004.75)	0.170000	0.00889	0.194	1.281E+02 s	<		3.276E-01
**** (1274.49)	0.336000	0.00725	0.147	6.016E+01 s	<		1.538E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 7.626E-01 22G			
295 (295.95)	0.290900	0.02328	1.520	2.244E+02	14.14%		7.478E-01
**** (316.50)	0.830700	0.02213	0.344	1.872E+01 s	<		6.236E-02
**** (468.06)	0.476000	0.01642	0.258	3.304E+01 s	<		1.101E-01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 19G			
583 (583.14)	0.860000	0.01383	0.527	4.433E+01 s	23.74%		1.126E-01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 1G			
47 (46.50)	0.040000	0.05556	1.749	7.871E+02 s	14.38%		2.000E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 22G			
295 (295.10)	0.000240	0.02333	1.519	2.713E+05	14.14%		6.893E+02
327 (327.96)	0.001400	0.02154	0.229	7.601E+03	54.11%		1.931E+01
583 (583.14)	0.310000	0.01383	0.527	1.230E+02	23.74%		3.125E-01
728 (727.17)	0.066500	0.01161	0.209	2.709E+02 s	39.48%		6.882E-01
Pb212 5.133E+12 DAYS		LAM		DECAY= 1.000E+00 4G			
239 (238.63)	0.431000	0.02731	1.240	1.096E+02 s	10.74%		2.786E-01

Bi214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
609	(609.30)	0.470000	0.01335	2.174	3.464E+02 s	7.44%	8.802E-01
768	(768.70)	0.050000	0.01109	0.233	4.195E+02	38.87%	1.066E+00
1121	(1120.40)	0.170000	0.00810	0.560	4.064E+02	19.13%	1.033E+00
1764	(1764.00)	0.170000	0.00546	0.437	4.708E+02	15.01%	1.196E+00
Pb214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 23G		
242	(241.90)	0.076000	0.02703	0.813	3.956E+02	20.38%	1.005E+00
295	(295.20)	0.190000	0.02332	1.519	3.427E+02	14.14%	8.709E-01
352	(352.00)	0.360000	0.02040	2.713	3.694E+02 s	7.18%	9.385E-01
768	(768.40)	0.000800	0.01109	0.233	2.621E+04	38.87%	6.659E+01
Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00 48G		
186	(186.10)	0.040000	0.03266	0.927	7.094E+02 s	23.99%	1.802E+00
242	(242.00)	0.078000	0.02703	0.813	3.856E+02	20.38%	9.797E-01
295	(295.20)	0.201000	0.02332	1.519	3.240E+02	14.14%	8.232E-01
352	(351.96)	0.393000	0.02040	2.713	3.383E+02 s	7.18%	8.597E-01
609	(609.32)	0.484000	0.01335	2.174	3.364E+02 s	7.44%	8.548E-01
768	(768.40)	0.053200	0.01109	0.233	3.941E+02	38.87%	1.001E+00
1121	(1120.30)	0.160000	0.00810	0.560	4.318E+02	19.13%	1.097E+00
1764	(1764.50)	0.166000	0.00546	0.437	4.823E+02	15.01%	1.226E+00
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 9.975E-01 48G		
****	(49.80)	0.087000	0.05556	0.435	8.992E+01 s	<	2.291E-01
****	(79.70)	0.018000	0.05314	0.561	5.863E+02 s	<	1.493E+00
****	(94.00)	0.013500	0.04967	0.628	9.362E+02 s	<	2.385E+00
****	(210.60)	0.012600	0.02990	0.385	1.023E+03 s	<	2.605E+00
****	(236.00)	0.115000	0.02753	0.452	1.427E+02 s	<	3.636E-01
****	(254.70)	0.009100	0.02603	0.349	1.472E+03 s	<	3.749E+00
****	(256.20)	0.063000	0.02591	0.336	2.060E+02 s	<	5.247E-01
****	(285.60)	0.016500	0.02391	0.331	8.383E+02 s	<	2.135E+00
295	(296.60)	0.003900	0.02324	1.519	1.676E+04	14.14%	4.268E+01
****	(300.00)	0.018900	0.02305	0.329	7.542E+02 s	<	1.921E+00
****	(304.40)	0.013500	0.02279	0.344	1.117E+03 s	<	2.846E+00
****	(329.90)	0.029000	0.02144	0.316	5.085E+02 s	<	1.295E+00
****	(334.40)	0.011500	0.02122	0.324	1.329E+03 s	<	3.385E+00
352	(350.50)	0.000800	0.02047	2.713	1.657E+05	7.18%	4.220E+02
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 41G		
****	(911.10)	0.250000	0.00964	0.283	1.175E+02 s	<	2.986E-01
Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00 8G		
****	(68.00)	0.005900	0.05550	0.624	1.907E+03 s	<	4.845E+00
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00 42G		
327	(328.00)	0.029000	0.02153	0.229	3.670E+02	54.11%	9.325E-01
339	(338.40)	0.104000	0.02103	0.352	1.609E+02	44.01%	4.089E-01
728	(727.00)	0.006900	0.01161	0.209	2.610E+03	39.48%	6.631E+00
911	(911.10)	0.250000	0.00964	0.363	1.505E+02 s	26.68%	3.823E-01
969	(968.90)	0.150000	0.00916	0.238	1.733E+02 s	46.78%	4.403E-01
****	(63.81)	0.010101	0.05607	0.593	1.047E+03 s	<T	2.661E+00
Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 10G		
****	(92.30)	0.999999	0.05009	0.662	1.321E+01 s	<	3.358E-02
Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
****	(1001.03)	0.006000	0.00892	0.210	3.929E+03 s	<	9.982E+00
U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00 34G		
****	(143.78)	0.132600	0.03894	0.440	8.529E+01 s	<	2.167E-01
186	(185.72)	0.540000	0.03271	0.927	5.247E+01 s	23.99%	1.333E-01
242	(240.93)	0.000700	0.02711	0.813	4.282E+04	20.38%	1.088E+02
Am241	1.582E+05 DAYS		LAM		DECAY= 9.999E-01 41G		
****	(59.54)	0.359000	0.05639	0.489	2.414E+01 s	<	6.136E-02

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*****************************************************************************
8808    GLS   4       G-1 JR 290.865  7  219.25 MIN   177.28000 GR       640
LIBR=TTIH  REF TIME= 261.924  7       100 mL in Parkway Jar
*****************************************************************************

*****************************************************************************
* Group.......................... 8808 * Time of count          290.865 2007 *
* Sample.......................... 4 * Reference GMT........ 261.924 2007 *
* Element.......................... * Elapsed Live Tm............ 219.25 *
* Type code...................... GLS * Dead Time Pct............ 0.022799 *
* ID.................. QC-DUP#1 62905 * Background GMT....... 286.979 2007 *
* Geometry, detector........... JR-1 * Standard GMT......... 286.721 2007 *
* Aliquot..................... 177.28 * Days since TO............ 28.94055 *
* Unit of Aliquot.............. GRAM * Time on.......... 13:45 PDT 17-OCT *
* Data Sheet Units........ PCI /GRAM * Time off......... 17:24 PDT 17-OCT *
* Library...................... TTIH * Calc Time......... 17:49 17-OCT-07 *
*****************************************************************************
* Slope...................... 1.00382 * Width slope.............. 0.005401 *
* Intercept................ 1.918432 * Width offset............. 1.146572 *
* X**2 TERM......... -0.15953368E-05 * Sensitivity..................... 4. *
  NP:[7,67]640.GSP                  26 PEAKS

*****************************************************************************
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN        CPM  ERR  EFF  K  FIT
  1  8   26.2   21 18    73 2.18    171   24.2  7.79E-01 18.80.145  0 23.40
  2  8   29.1   21 18   343 6.27    443   27.0  2.02E+00 12.30.196  0  0.00
  3  8   36.5   21 18   604 4.09    106   34.5  4.82E-01 43.00.390  0  0.00
  4  0   46.7   40  9   860 1.41    384   44.6  1.75E+00 14.40.816  0  0.00
  5  0   63.4   58  7   973 1.67    184   61.3  8.39E-01 28.9 5.61  0  0.00
  6  8   69.5   65 15   587 3.32    291   67.4  1.33E+00 12.0 5.52  0 41.50
  7  8   75.3   65 15  1357 3.32    834   73.1  3.80E+00  9.2 5.40  0  0.00
  8  0   92.4   87  7   792 1.89    374   90.2  1.70E+00 14.1 5.00  0  0.00
  9  0  186.2  179  9   590 2.00    312  183.6  1.42E+00 15.5 3.27  0  0.00
 10  3  238.5  231 13   228 1.47    395  235.8  1.80E+00  7.5 2.74  0  1.29
 11  3  241.7  231 13   343 1.95    178  239.0  8.13E-01 20.4 2.71  0  0.00
 12  0  295.1  287 11   502 1.83    354  292.2  1.61E+00 13.2 2.34  0  0.00
 13  0  327.3  323  7   230 2.07     50  324.4  2.29E-01 54.1 2.19  0  0.00
 14  0  338.6  331  9   331 1.88     90  335.6  4.09E-01 37.6 2.14  0  0.00
 15  0  351.7  344 10   308 1.54    644  348.6  2.94E+00  6.5 2.08  0  0.00
 16  0  511.1  503 12   241 2.54    316  507.7  1.44E+00 11.3 1.54  0  0.00
 17  0  583.1  575 10   160 2.06    150  579.5  6.86E-01 17.9 1.40  0  0.00
 18  0  609.2  601 11   185 2.08    514  605.6  2.35E+00  6.8 1.35  0  0.00
 19  0  662.5  654 11   145 2.03    111  658.7  5.08E-01 22.6 1.26  0  0.00
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN        CPM  ERR  EFF  K  FIT
 20  0  728.1  722  8    97 1.92     53  724.3  2.44E-01 33.8 1.17  0  0.00
 21  0  768.0  760  9    99 2.06     51  764.1  2.33E-01 38.9 1.12  0  0.00
 22  0  911.0  901 10    95 2.27     99  906.9  4.51E-01 21.20.974  0  0.00
 23  0  968.5  958 12   117 2.73     62  964.4  2.82E-01 39.00.921  0  0.00
 24  0 1120.7 1111 12    77 2.82    134 1116.6  6.09E-01 17.50.818  0  0.00
 25  0 1461.1 1450 14    59 3.19    438 1457.0  2.00E+00  6.30.648  0  0.00
 26  0 1764.3 1754 12    12 3.45    104 1760.6  4.74E-01 13.50.554  0  0.00
FWHM=SQRT( 7.46794E+00 + -7.81436E-04 *E)

*****************************************************************************
BACKGROUND INFO 8808    GLS   4       290.865  7 G- 1     BG DATE 286.979  7
*****************************************************************************

v---------PEAK----------v     v------BACKGROUND------v     v------NET----v
ENERGY       CPM  %ERROR       ENERGY       CPM  %ERROR          CPM  %ERROR

  63.44    0.8387 28.89         62.00   0.7373 17.75         0.1014271.72R
  92.42    1.7044 14.12                        3.50         0.5899 41.34
 186.17    1.4241 15.46        186.00   0.4973  6.21         0.9268 23.99
```

275.11	1.8137	13.17	275.20	0.0947	32.40	1.5187	14.14
338.63	0.4093	37.62	338.40	0.0574	28.40	0.3519	44.01
351.70	2.9371	6.55	351.90	0.2244	13.73	2.7127	7.18
511.13	1.4390	11.29	511.00	1.3547	4.94	0.0844	208.22R
583.11	0.6858	17.88	583.10	0.1588	15.81	0.5270	23.74
609.23	2.3460	6.83	609.30	0.1718	12.81	2.1742	7.44
662.46	0.5076	22.63	661.60	0.0338	0.00	0.4738	24.24
728.13	0.2439	33.76	727.20	0.0348	16.65	0.2091	39.48
910.95	0.4508	21.17	911.10	0.0882	18.03	0.3626	26.68
968.52	0.2824	39.03	968.90	0.0442	37.09	0.2382	46.78
1120.75	0.6090	17.47	1120.30	0.0494	24.71	0.5596	19.13
1461.14	1.9970	6.32	1461.00	0.0708	25.70	1.9261	6.62
1764.30	0.4743	13.50	1764.50	0.0375	37.87	0.4368	15.01

2 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 8808 GLS 4 290.865 7 G- 1

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8808 4 GLS RUN AT 290.865/2007

BACKGROUND FOR GELI DETECTOR 1 OF 286.979/2007 2391.6 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.7373	17.75	511.0	1.3547	4.94	1120.3	0.0494	24.71
92.0	1.1145	3.50	583.1	0.1588	15.81	1173.2	0.0272	0.00
143.0	0.0929	39.19	609.3	0.1718	12.81	1238.1	0.0296	5.06
186.0	0.4973	6.21	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0696	18.24	727.2	0.0348	16.65	1377.7	0.0319	0.00
238.6	0.5096	6.02	846.0	0.0720	46.82	1461.0	0.0708	25.70
279.0	0.0000	0.00	860.4	0.0438	0.00	1586.0	0.0000	0.00
295.2	0.0947	32.40	911.1	0.0882	18.03	1591.0	0.0620	0.00
338.4	0.0574	28.40	968.9	0.0442	37.09	1729.6	0.0061	0.00
351.9	0.2244	13.73	1001.0	0.0460	35.62	1764.5	0.0375	37.87

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 10/17/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
230.918	7	1.7347	13.890	35.
237.741	7	1.7237	13.528	28.
258.777	7	1.7442	14.353	29.
265.711	7	1.7599	15.213	22.
265.864	7	1.5439	11.619	38. NG
265.918	7	1.5464	12.253	26. NG
266.063	7	1.5169	11.690	20. NG
272.730	7	1.5111	11.869	23. NG
278.691	7	1.6797	13.907	20. NG
286.721	7	1.7356	13.726	26.
AVERAGE		1.7396	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.856	7	1.0713	7.228	30.
81.670	7	1.0534	5.600	25.
103.972	7	0.8203	15.248	21.
192.664	7	0.9760	34.750	25.
197.727	7	2.1369	18.219	45.
205.876	7	0.9740	30.810	21.
216.753	7	0.9677	15.266	24.
272.776	7	0.8535	10.320	20.
278.874	7	0.9541	14.321	20.
279.774	7	0.9550	14.786	35.
AVERAGE		0.9931	0.048	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 286.721 7
ENERGY= 1.918432 + 1.0038199*CH + -1.595337E-06*CH**2
FWHM =SQRT(1.1466 + 0.005402*ENERGY) (CO60= 2.889)

EFFICIENCIES FOR GEOMETRY JR 1 CALIBRATED 207.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.555600	100.0	4.819200	300.0	2.304700	0.0	0.000000
55.0	5.631600	110.0	4.582500	500.0	1.562100	0.0	0.000000
60.0	5.636600	130.0	4.152700	700.0	1.197600	0.0	0.000000
65.0	5.592800	150.0	3.787300	1000.0	0.892900	0.0	0.000000
70.0	5.516200	170.0	3.479400	1400.0	0.669100		
80.0	5.307100	190.0	3.218900	2000.0	0.489700		
90.0	5.065700	250.0	2.638800	3000.0	0.348600		

8808 4 GLS GSTOR 640

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	26.2	0.78	18.8	NO GEN.	
	2	29.1	2.02	12.3		
	3	36.5	0.48	43.0		
	4	46.7	1.75	14.4	NO GEN.	Pb210s
	6	69.5	1.33	12.0		
	7	75.3	3.80	9.2		
b	8	92.4	0.59	41.3		Th234s
b	9	186.2	0.93	24.0	Cs136 U 235s	Ra226s
b	10	238.5	1.29	10.7	Th228	Pb212s
	11	241.7	0.81	20.4	Ra226 Th228	La140
b	12	295.1	1.52	14.1	Ra226	Ru103
	13	327.3	0.23	54.1	Ac228 Th228	La140
b	14	338.6	0.35	44.0	Ac228	
b	15	351.7	2.71	7.2	Ra226s	Pb214s
b	17	583.1	0.53	23.7	Th228	Tl208s
b	18	609.2	2.17	7.4	Ru103 Ra226s	Bi214s
b	19	662.5	0.47	24.2		Cs137s
b	20	728.1	0.21	39.5	Ac228 Th228	Bi212s
	21	768.0	0.23	38.9	Ra226	
b	22	911.0	0.36	26.7	Th232s	Ac228s
b	23	968.5	0.24	46.8	Ac228	Sb124 Th232s
b	24	1120.7	0.56	19.1	Ra226	Sc 46s
b	25	1461.1	1.93	6.6		K 40s
b	26	1764.3	0.44	15.0	Ra226	
			REJECTED PEAKS			
	5	63.4	0.10	99.9		Th232s
B	16	511.1	0.08	99.9	Th228	La140 Ru106 Na 22

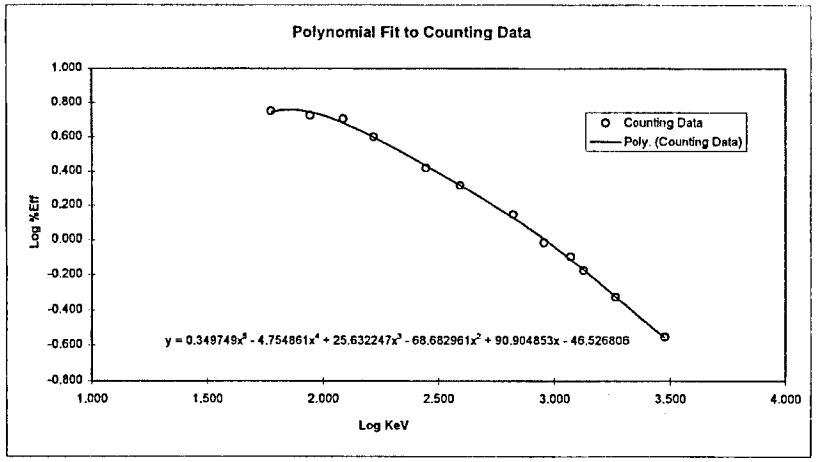
Section 7.0
Instrument Calibration

Gamma Spectrometer Efficiency Calculation

Detector	G7	100 mL Jar	
Geometry	JR	Shelf 0	EFF. DATE
Std I.D.	(GLY)1098-2		19-Feb-07
Filename	GELI07JR0.EFF		

Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	%Eff Avg	%SD of %Eff	LogKev	Log%Eff	%Dev from Spline
59.50	5.63861	5.54856	5.59369	1.14091	1.775	0.748	1
88.00	5.34271	5.21949	5.28109	1.64995	1.944	0.723	-5
122.10	5.09539	4.9894	5.04240	1.48615	2.087	0.703	5
165.90	3.99041	3.9326	3.96149	1.03264	2.220	0.598	0
279.20	2.62359	2.59658	2.61009	0.73179	2.446	0.417	-3
391.70	2.08794	2.04542	2.06668	1.45480	2.593	0.315	0
661.70	1.41278	1.37935	1.39605	1.69209	2.821	0.145	4
898.00	0.99661	0.92183	0.95922	5.51245	2.953	-0.018	-5
1173.20	0.82587	0.76850	0.79718	5.08882	3.069	-0.098	4
1332.50	0.71499	0.61418	0.66458	10.72671	3.125	-0.177	-1
1836.10	0.50611	0.43417	0.47014	10.81954	3.264	-0.328	-1
			#DIV/0!		#NUM!	#DIV/0!	#DIV/0!
3000	(artificial data)		0.28000		3.477	-0.553	0
				avg	#DIV/0!		

(shaded cells are manual entry, all others are calculated)

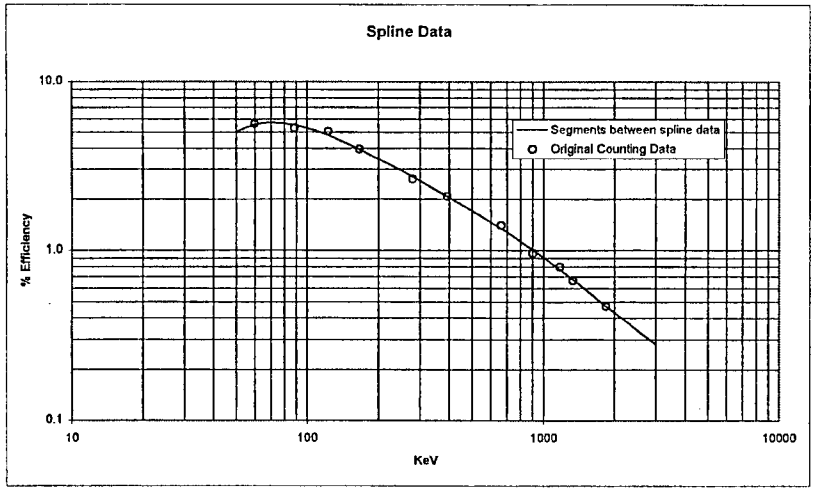


Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
50	5.02312	1.699	0.701		
55	5.34720	1.740	0.728		
60	5.55148	1.778	0.744		#DIV/0!
65	5.66344	1.813	0.753		
70	5.70619	1.845	0.756		
80	5.65344	1.903	0.752		
90	5.49462	1.954	0.740		
100	5.28718	2.000	0.723		#DIV/0!
110	5.06255	2.041	0.704		
130	4.62036	2.114	0.665		
150	4.22381	2.176	0.626		
170	3.88146	2.230	0.589		
190	3.58846	2.279	0.555		
250	2.93118	2.398	0.467		
300	2.55123	2.477	0.407		#DIV/0!
500	1.69916	2.699	0.230		
700	1.27081	2.845	0.104		
1000	0.90581	3.000	-0.043		#DIV/0!
1400	0.63765	3.146	-0.195		
2000	0.42991	3.301	-0.367		
3000	0.27964	3.477	-0.553		

Polynomial Coefficients

x5 =	0.349749
x4 =	-4.754861
x3 =	25.632247
x2 =	-68.682961
x1 =	90.904853
x0 =	-46.526806



Det ... GELI 7
Geo ... JR - 100-ml Jar
Shif ... 0
Def ... 100 mLs in Parkway Jar

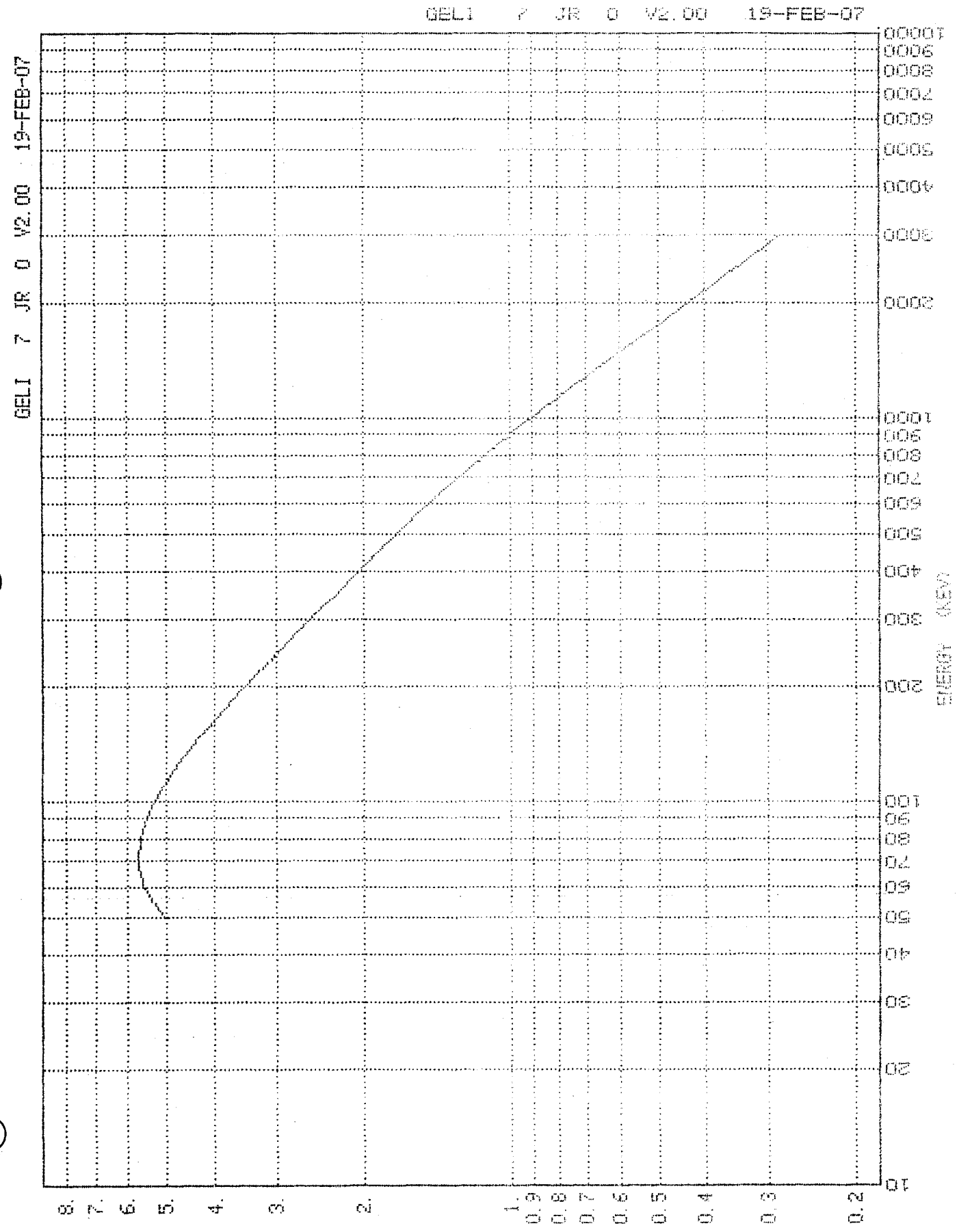
Date 19-FEB-07
Version ... 2.00
File ..... ND:[25,4]GELI07JRO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	5.02312	108	5.10504	216	3.26472	324	2.39969	432	1.90874
51	5.08880	110	5.06255	218	3.24261	326	2.38797	434	1.90174
52	5.15403	112	5.01289	220	3.22085	328	2.37638	436	1.89480
53	5.21884	114	4.96458	222	3.19943	330	2.36491	438	1.88791
54	5.28322	116	4.91756	224	3.17835	332	2.35357	440	1.88108
55	5.34720	118	4.87179	226	3.15759	334	2.34235	442	1.87430
56	5.38888	120	4.82719	228	3.13715	336	2.33125	444	1.86758
57	5.43013	122	4.79374	230	3.11701	338	2.32027	446	1.86092
58	5.47098	124	4.74137	232	3.09718	340	2.30940	448	1.85430
59	5.51142	126	4.70004	234	3.07764	342	2.29865	450	1.84774
60	5.55148	128	4.65972	236	3.05839	344	2.28801	452	1.84123
61	5.57442	130	4.62036	238	3.03943	346	2.27748	454	1.83478
62	5.59707	132	4.57634	240	3.02073	348	2.26706	456	1.82837
63	5.61946	134	4.53339	242	3.00231	350	2.25675	458	1.82202
64	5.64158	136	4.49147	244	2.98415	352	2.24654	460	1.81571
65	5.66344	138	4.45054	246	2.96624	354	2.23643	462	1.80945
66	5.67222	140	4.41056	248	2.94859	356	2.22643	464	1.80325
67	5.68088	142	4.37150	250	2.93118	358	2.21653	466	1.79709
68	5.68943	144	4.33333	252	2.91345	360	2.20673	468	1.79097
69	5.69787	146	4.29601	254	2.89597	362	2.19702	470	1.78491
70	5.70619	148	4.25951	256	2.87872	364	2.18741	472	1.77889
71	5.70056	150	4.22381	258	2.86171	366	2.17790	474	1.77291
72	5.69502	152	4.18620	260	2.84494	368	2.16847	476	1.76698
73	5.68956	154	4.14941	262	2.82838	370	2.15914	478	1.76110
74	5.68418	156	4.11340	264	2.81205	372	2.14990	480	1.75526
75	5.67887	158	4.07817	266	2.79594	374	2.14075	482	1.74946
76	5.67365	160	4.04367	268	2.78004	376	2.13168	484	1.74370
77	5.66849	162	4.00989	270	2.76434	378	2.12270	486	1.73799
78	5.66340	164	3.97680	272	2.74885	380	2.11381	488	1.73232
79	5.65839	166	3.94438	274	2.73356	382	2.10500	490	1.72669
80	5.65344	168	3.91261	276	2.71846	384	2.09627	492	1.72111
81	5.63648	170	3.88146	278	2.70356	386	2.08762	494	1.71556
82	5.61977	172	3.84956	280	2.68884	388	2.07906	496	1.71005
83	5.60331	174	3.81828	282	2.67431	390	2.07057	498	1.70459
84	5.58710	176	3.78761	284	2.65996	392	2.06216	500	1.69916
85	5.57113	178	3.75753	286	2.64578	394	2.05383	502	1.69330
86	5.55539	180	3.72802	288	2.63178	396	2.04557	504	1.68749
87	5.53987	182	3.69906	290	2.61795	398	2.03739	506	1.68172
88	5.52457	184	3.67064	292	2.60428	400	2.02928	508	1.67599
89	5.50949	186	3.64275	294	2.59078	402	2.02124	510	1.67031
90	5.49462	188	3.61536	296	2.57744	404	2.01327	512	1.66467
91	5.47249	190	3.58846	298	2.56426	406	2.00538	514	1.65906
92	5.45069	192	3.56207	300	2.55123	408	1.99755	516	1.65350
93	5.42920	194	3.53377	302	2.53778	410	1.98980	518	1.64798
94	5.40804	196	3.50715	304	2.52448	412	1.98211	520	1.64250
95	5.38717	198	3.48100	306	2.51135	414	1.97449	522	1.63705
96	5.36661	200	3.45530	308	2.49836	416	1.96693	524	1.63165
97	5.34633	202	3.43005	310	2.48553	418	1.95944	526	1.62628
98	5.32634	204	3.40522	312	2.47285	420	1.95201	528	1.62095
99	5.30662	206	3.38082	314	2.46031	422	1.94465	530	1.61566
100	5.28718	208	3.35682	316	2.44791	424	1.93734	532	1.61041
102	5.23970	210	3.33323	318	2.43565	426	1.93010	534	1.60519
104	5.19356	212	3.31002	320	2.42353	428	1.92292	536	1.60001
106	5.14869	214	3.28718	322	2.41155	430	1.91580	538	1.59486

Det ... GELI 7
Geo ... JR - 100-ml Jar
Shif ... 0
Ref ... 100 mLs in Parkway Jar

Date ... 19-FEB-07
Version . 2.00
File ... ND:[25,40]GELI07JRO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	1.58975	660	1.33648	930	0.96977	1260	0.71158	1800	0.48300
542	1.58468	665	1.32779	935	0.96485	1270	0.70575	1810	0.48006
544	1.57964	670	1.31922	940	0.95997	1280	0.70001	1820	0.47714
546	1.57464	675	1.31076	945	0.95515	1290	0.69436	1830	0.47426
548	1.56966	680	1.30242	950	0.95037	1300	0.68880	1840	0.47141
550	1.56473	685	1.29420	955	0.94564	1310	0.68333	1850	0.46860
552	1.55982	690	1.28608	960	0.94097	1320	0.67794	1860	0.46581
554	1.55495	695	1.27808	965	0.93634	1330	0.67263	1870	0.46306
556	1.55011	700	1.27018	970	0.93175	1340	0.66741	1880	0.46034
558	1.54531	705	1.26162	975	0.92721	1350	0.66226	1890	0.45765
560	1.54053	710	1.25318	980	0.92272	1360	0.65719	1900	0.45499
562	1.53579	715	1.24486	985	0.91827	1370	0.65220	1925	0.44846
564	1.53108	720	1.23664	990	0.91386	1380	0.64728	1950	0.44211
566	1.52640	725	1.22854	995	0.90950	1390	0.64243	1975	0.43593
568	1.52175	730	1.22055	1000	0.90518	1400	0.63765	2000	0.42991
570	1.51713	735	1.21266	1005	0.90049	1410	0.63265	2025	0.42428
572	1.51255	740	1.20488	1010	0.89585	1420	0.62773	2050	0.41880
574	1.50799	745	1.19719	1015	0.89126	1430	0.62288	2075	0.41345
576	1.50346	750	1.18961	1020	0.88671	1440	0.61810	2100	0.40823
578	1.49896	755	1.18213	1025	0.88220	1450	0.61339	2125	0.40314
580	1.49449	760	1.17474	1030	0.87775	1460	0.60875	2150	0.39816
582	1.49004	765	1.16745	1035	0.87333	1470	0.60418	2175	0.39331
584	1.48563	770	1.16024	1040	0.86896	1480	0.59967	2200	0.38857
586	1.48125	775	1.15313	1045	0.86463	1490	0.59522	2225	0.38394
588	1.47689	780	1.14611	1050	0.86034	1500	0.59083	2250	0.37942
590	1.47256	785	1.13918	1055	0.85610	1510	0.58651	2275	0.37500
592	1.46825	790	1.13233	1060	0.85189	1520	0.58225	2300	0.37068
594	1.46398	795	1.12556	1065	0.84773	1530	0.57804	2325	0.36645
596	1.45973	800	1.11888	1070	0.84361	1540	0.57390	2350	0.36232
598	1.45551	805	1.11228	1075	0.83952	1550	0.56981	2375	0.35827
600	1.45131	810	1.10575	1080	0.83547	1560	0.56577	2400	0.35432
602	1.44714	815	1.09931	1085	0.83147	1570	0.56179	2425	0.35044
604	1.44299	820	1.09294	1090	0.82749	1580	0.55786	2450	0.34665
606	1.43887	825	1.08665	1095	0.82356	1590	0.55398	2475	0.34294
608	1.43478	830	1.08043	1100	0.81966	1600	0.55016	2500	0.33930
610	1.43071	835	1.07428	1105	0.81580	1610	0.54638	2525	0.33574
612	1.42667	840	1.06821	1110	0.81198	1620	0.54266	2550	0.33225
614	1.42265	845	1.06221	1115	0.80819	1630	0.53898	2575	0.32883
616	1.41865	850	1.05627	1120	0.80443	1640	0.53535	2600	0.32548
618	1.41468	855	1.05040	1125	0.80071	1650	0.53176	2625	0.32219
620	1.41073	860	1.04460	1130	0.79702	1660	0.52822	2650	0.31897
622	1.40681	865	1.03886	1135	0.79336	1670	0.52473	2675	0.31581
624	1.40291	870	1.03319	1140	0.78974	1680	0.52128	2700	0.31270
626	1.39903	875	1.02758	1150	0.78259	1690	0.51787	2725	0.30966
628	1.39518	880	1.02204	1160	0.77557	1700	0.51450	2750	0.30668
630	1.39135	885	1.01655	1170	0.76867	1710	0.51118	2775	0.30375
632	1.38754	890	1.01113	1180	0.76188	1720	0.50789	2800	0.30087
634	1.38375	895	1.00576	1190	0.75522	1730	0.50465	2825	0.29805
636	1.37999	900	1.00045	1200	0.74867	1740	0.50145	2850	0.29528
638	1.37625	905	0.99520	1210	0.74223	1750	0.49828	2875	0.29255
640	1.37253	910	0.99001	1220	0.73589	1760	0.49515	2900	0.28988
645	1.36332	915	0.98487	1230	0.72966	1770	0.49206	2925	0.28725
650	1.35425	920	0.97978	1240	0.72354	1780	0.48901	2950	0.28467
655	1.34530	925	0.97475	1250	0.71751	1790	0.48599	2975	0.28213


GEL1 7 JR 0 V2.00 19-FEB-07
GEL1 7 JR 0 V2.00 19-FEB-07
ENERGY (KEV)

ANALYTICS
An Isotope Products Laboratories Company

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

Log 417 Recd 12/27/06 K Trenton

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

1098-2

LIBR A752

74159-207
100 mL Solid in Wide Mouth PPi Parkway Jar

Customer: Eberline Services / Richmond, CA
P.O. No.: 00003890, Item 1
Calibration Date: 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01515

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1990.0	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	189000	2863.9	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	94570	1433.0	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	133800	2027.5	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	295300	4475	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	185600	2812.4	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	116700	1768.4	0.70	1.20	2.78	HPGe
Y-88	898.0	106.60	455400	6901	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	226900	3438	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	227000	3440	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	481200	7292	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
This standard will expire one year after the calibration date.

Source Prepared by: M. Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate

DEAD TIME = 6.43% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-7 XX 3.803 7 113.73 MIN 1.00000 SM 146

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.996E-01 41G			
59 (59.54)	1.990000	1.00000	6730.228	3.382E+03 s		0.19%	1.524E+03
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.683E-01 2G			
87 (88.03)	0.039000	1.00000	8081.575	2.072E+05 s		0.12%	1.075E+05
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.867E-01 10G			
121 (122.06)	1.433000	1.00000	3526.350	2.461E+03 s		0.28%	1.409E+03
136 (136.47)	0.000001	1.00000	445.374	4.454E+08 s		1.49%	2.550E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 6.225E-01 3G			
165 (165.80)	0.800000	1.00000	3162.030	3.953E+03 s		0.27%	2.860E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.468E-01 2G			
278 (279.21)	0.815000	1.00000	1987.267	2.438E+03 s		0.34%	4.451E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.674E-01 5G			
390 (391.40)	0.642000	1.00000	2110.526	3.287E+03 s		0.32%	2.610E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.941E-01 3G			
**** (661.64)	1.768400	1.00000	17.016	9.622E+00 s		<	4.360E+00
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.424E-01 8G			
**** (898.00)	0.920000	1.00000	17.005	1.848E+01 s		<	1.535E+01
**** (1836.10)	1.000000	1.00000	8.854	8.854E+00 s		<	7.354E+00
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.666E-01 5G			
**** (1173.21)	0.999200	1.00000	12.855	1.287E+01 s		<	5.995E+00
**** (1332.48)	1.000000	1.00000	11.399	1.140E+01 s		<	5.312E+00
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 4.006E-01 4G			
811 (810.76)	0.990000	1.00000	40.199	4.060E+01		6.86%	4.566E+01

DEAD TIME = 6.43% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-7 XX 3.803 7 113.73 MIN 1.00000 SM 146

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

Group	1098	Time of count	3.803 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	113.7333
Type code	GLY	Dead Time Pct	6.430824
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-7	Standard GMT	356.823 2006
Aliquot	1.	Days since TO	94.09453
Unit of Aliquot	SMPL	Time on	11:16 PST 3-JAN
Data Sheet Units	PCI /SMPL	Time off	13:10 PST 3-JAN
Library	A982	Calc Time	13:22 03-JAN-07
Slope	0.991512	Width slope	0.006379
Intercept	0.848181	Width offset	0.925840
X**2 TERM	-0.15603343E-05	Sensitivity	4.

NP:[7,67]146.GSP 41 PEAKS

****

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	25.8	21	19	115852	2.71	886992	25.2	7.80E+03	0.1	0.104	0	******
2	5	32.8	21	19	356235	2.71	616862	32.2	5.42E+03	0.2	0.212	0	0.00
3	5	37.3	21	19	363399	2.71	136594	36.7	1.20E+03	0.7	0.311	0	0.00
4	0	42.5	40		5299494	2.67	55062	42.1	4.84E+02	1.6	0.463	0	0.00
5	0	49.4	47		5275031	2.00	15391	48.9	1.35E+02	5.2	0.723	0	0.00
6	0	58.9	54		9423136	1.65	765451	58.5	6.73E+03	0.2	100.	0	0.00
7	3	66.5	63	12	268802	3.48	44231	66.2	3.89E+02	2.0	100.	0	******
8	3	70.3	63	12	315316	2.68	76345	70.0	6.71E+02	1.4	100.	0	0.00
9	4	79.3	76	16	236319	1.96	13101	79.1	1.15E+02	5.7	100.	0	******
10	4	82.3	76	16	306297	2.76	36552	82.1	3.21E+02	2.6	100.	0	0.00
11	4	87.4	76	16	162939	1.51	919086	87.3	8.08E+03	0.1	100.	0	0.00
12	0	101.5	100		6146892	1.99	1591	101.6	1.40E+01	38.1	100.	0	0.00
13	0	108.7	107		5116932	1.67	4475	108.8	3.93E+01	11.6	100.	0	0.00
14	0	121.3	116	11	221077	1.92	401020	121.5	3.53E+03	0.3	100.	0	0.00
15	0	135.6	132		9161547	1.43	50648	135.9	4.45E+02	1.5	100.	0	0.00
16	0	142.8	141		6101054	2.48	2817	143.2	2.48E+01	17.9	100.	0	0.00
17	0	164.9	160	11	161720	1.94	359552	165.5	3.16E+03	0.3	100.	0	0.00
18	0	186.3	185		6 72423	2.81	2404	187.1	2.11E+01	17.8	100.	0	0.00
19	4	195.3	193	14	70625	2.10	2978	196.2	2.62E+01	14.4	100.	0	5.98
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	4	198.1	193	14	58791	1.80	15690	199.0	1.38E+02	2.5	100.	0	0.00
21	4	202.7	193	14	70388	2.05	4381	203.6	3.85E+01	9.7	100.	0	0.00
22	0	232.5	232		5 55002	2.35	1340	233.7	1.18E+01	26.4	100.	0	0.00
23	0	253.9	252		8 71133	2.01	9761	255.3	8.58E+01	4.8	100.	0	0.00
24	0	277.9	274	12	96362	2.09	225877	279.5	1.99E+03	0.3	100.	0	0.00
25	0	299.4	299		6 40511	1.92	1257	301.3	1.11E+01	25.5	100.	0	0.00
26	0	308.7	309		6 37099	2.19	1046	310.7	9.19E+00	29.3	100.	0	0.00
27	0	390.0	386	14	80842	2.27	239976	392.8	2.11E+03	0.3	100.	0	0.00
28	0	411.2	411		7 37288	2.53	1429	414.1	1.26E+01	22.5	100.	0	0.00
29	0	508.9	508	10	41969	3.79	5555	512.9	4.88E+01	7.0	100.	0	0.00
30	3	659.2	657	38	44277	3.15	169572	664.7	1.49E+03	0.3	100.	0	33.50
31	3	680.2	657	38	63738	4.57	2857	685.9	2.51E+01	18.7	100.	0	0.00
32	0	810.6	813	10	26736	3.90	4570	817.7	4.02E+01	6.9	100.	0	0.00
33	5	894.7	895	35	39366	4.21	269882	902.8	2.37E+03	0.2	100.	0	167.00

```
 34   5   908.7   895 35 55737 5.95    7103   916.9  6.25E+01   7.9 100.   0   0.00
 35   5   915.3   895 35 37274 5.34    3306   923.6  2.91E+01  11.8 100.   0   0.00
 36   0  1169.0  1172 21 36017 5.03  187907  1180.4  1.65E+03   0.3 100.   0   0.00
 37   0  1189.8  1197 10 14339 4.66    1571  1201.4  1.38E+01  14.6 100.   0   0.00
 38   0  1327.7  1333 17 29332 5.68  162774  1341.0  1.43E+03   0.3 100.   0   0.00
 39   3  1828.2  1839 23  6728 4.65  103088  1848.4  9.06E+02   0.4 100.   0265.00
 PK  IT    ENRG LEFT WD BKGND FWHM    AREA    CHAN       CPM   ERR   EFF   K   FIT
 40   3  1833.0  1839 23  7674 3.90   41731  1853.3  3.67E+02   0.9 100.   0   0.00
 41   0  1842.4  1861  8  5478 3.36     165  1862.8  1.45E+00  77.4 100.   0   0.00
FWHM=SQRT( 4.70167E+00 +  1.17078E-02 *E)

*************************************************************************************
BACKGROUND INFO 1098    GLY   2          3.803  7 G- 7     BG DATE   1.811  7
*************************************************************************************

v--------PEAK---------v      v------BACKGROUND------v      v------NET-----v
ENERGY       CPM  %ERROR      ENERGY       CPM  %ERROR          CPM  %ERROR

 142.84   24.7684 17.94       143.00  0.0670 20.30        24.7015 17.99
 186.31   21.1392 17.77       186.00  0.3104 11.02        20.8288 18.04
 198.07  137.9519  2.47       198.00  0.0516 28.12       137.9003  2.47
 277.90 1986.0198  0.34       279.00  0.0000  0.00      1986.0198  0.34
    0 PEAKS REJECTED BY BACKGROUND

*************************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY   2          3.803  7 G- 7
*************************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 3.803/2007

BACKGROUND FOR GELI DETECTOR 7 OF 1.811/2007 1109.9 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4061	14.31	511.0	1.0317	10.97	1120.3	0.0964	9.95
92.0	0.6932	8.24	583.1	0.1198	21.71	1173.2	0.0456	0.00
143.0	0.0670	20.30	609.3	0.2783	41.36	1238.1	0.0294	9.18
186.0	0.3104	11.02	661.6	0.0468	0.00	1332.5	0.0367	42.74
198.0	0.0516	28.12	727.2	0.0227	0.00	1377.7	0.0000	0.00
238.5	0.3591	18.29	846.0	0.0542	67.86	1461.0	0.0472	32.02
279.0	0.0000	0.00	860.4	0.0000	0.00	1586.0	0.0000	0.00
295.2	0.1706	41.84	911.1	0.0725	32.84	1591.0	0.0000	0.00
338.4	0.0785	27.52	968.9	0.0392	37.72	1729.6	0.0000	0.00
351.9	0.3282	38.52	1001.0	0.0285	0.00	1764.5	0.0388	66.47

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 7 ON 1/ 3/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
162.828	5	0.9029	10.177	23.
169.849	5	0.9205	10.183	22.
183.987	5	0.9095	10.702	26.
197.965	5	0.9078	9.941	23.
200.672	5	0.9031	10.264	29.
204.990	5	0.9034	10.175	27.
114.694	6	1.0727	13.035	31.
120.917	6	1.0739	12.608	21.
174.039	6	1.0089	14.185	11.
174.047	6	1.0130	14.270	13.
AVERAGE		0.9616	0.073	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
308.831	6	1.0108	9.106	32.
316.064	6	1.0011	9.753	21.
320.749	6	1.0520	12.685	42.
320.854	6	1.0496	10.625	61.
322.802	6	1.0135	9.347	25.
325.046	6	1.0085	7.842	42.
336.793	6	1.0304	10.592	25.
341.829	6	1.0122	8.732	12.
350.005	6	1.0063	8.133	24.
356.823	6	1.0105	9.296	16.
AVERAGE		1.0195	0.018	

CALIBRATION LINE FROM STANDARD FOR G- 7 OF 356.823 6
ENERGY= 0.848182 + 0.9915124*CH + -1.560334E-06*CH**2
FWHM =SQRT(0.9258 + 0.006380*ENERGY) (C060= 3.070)

EFFICIENCIES FOR GEOMETRY XX 7 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

1098 2 GLY GSTOR 146

	PK	ENERGY	CPM	%ERR	COMMENT
	1	25.8	7798.87	0.1	
	2	32.8	5423.76	0.2	
	3	37.3	1201.00	0.7	
	4	42.5	484.13	1.6	NO GEN.
	5	49.4	135.32	5.2	
	6	58.9	6730.23	0.2	Am241s
	7	66.5	388.90	2.0	NO GEN. 33S
	8	70.3	671.27	1.4	
	9	79.3	115.19	5.7	Ce144 I 131
	10	82.3	321.39	2.6	
	11	87.4	8081.06	0.1	Cs136 Cd109s
	12	101.5	13.99	38.1	
	13	108.7	39.35	11.6	La140 Cs136 Sb125
	14	121.3	3525.97	0.3	Ag110 Co 57s
	15	135.6	445.33	1.5	Co 57s
b	16	142.8	24.70	18.0	Fe 59
	17	164.9	3161.36	0.3	Cs136 Ce139s
b	18	186.3	20.83	18.0	Ra226 Cs136
	19	195.3	26.19	14.4	
b	20	198.1	137.90	2.5	Ac228
	21	202.7	38.52	9.7	
	22	232.5	11.78	26.4	Th228
	23	253.9	85.82	4.8	Th228 Sn113
b	24	277.9	1986.02	0.3	Ac228 Th228 Hg203s
	25	299.4	11.06	25.5	Th228
	26	308.7	9.19	29.3	
	27	390.0	2109.99	0.3	Sn113s
	28	411.2	12.57	22.5	
	29	508.9	48.84	7.0	Ac228 NO GEN.
	30	659.2	1490.96	0.3	NO GEN. Ag110
	31	680.2	25.12	18.7	
	32	810.6	40.18	6.9	NO GEN. Co 58
	33	894.7	2372.94	0.2	Th228
	34	908.7	62.45	7.9	NO GEN.
	35	915.3	29.07	11.8	NO GEN.
	36	1169.0	1652.17	0.3	Cs134
	37	1189.8	13.82	14.6	NO GEN.
	38	1327.7	1431.19	0.3	NO GEN.
	39	1828.2	906.40	0.4	NO GEN.
	40	1833.0	366.92	0.9	
	41	1842.4	1.45	77.4	

DEAD TIME = 6.26% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-7 XX 2.645 7 68.62 MIN 1.00000 SM 541

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.996E-01 41G		
59 (59.54)	1.990000	1.00000	6622.539	3.328E+03 s	0.22%	1.500E+03
103 (103.00)	0.000195	1.00000	31.468	1.614E+05	33.31%	7.272E+04
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.698E-01 2G		
88 (88.03)	0.039000	1.00000	7908.887	2.028E+05 s	0.16%	1.050E+05
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.890E-01 10G		
122 (122.06)	1.433000	1.00000	3463.219	2.417E+03 s	0.31%	1.380E+03
136 (136.47)	0.000001	1.00000	436.081	4.361E+08 s	1.80%	2.490E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 6.262E-01 3G		
165 (165.80)	0.800000	1.00000	3134.418	3.918E+03 s	0.34%	2.819E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.511E-01 2G		
278 (279.21)	0.815000	1.00000	2000.970	2.455E+03 s	0.44%	4.405E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.714E-01 5G		
391 (391.40)	0.642000	1.00000	2082.015	3.243E+03 s	0.39%	2.557E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.942E-01 3G		
660 (661.64)	1.768400	1.00000	1455.810	8.232E+02 s	0.53%	3.730E+02
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.465E-01 8G		
**** (898.00)	0.920000	1.00000	26.033	2.830E+01 s		< 2.333E+01
**** (1836.10)	1.000000	1.00000	16.499	1.650E+01 s		< 1.360E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.670E-01 5G		
**** (1173.21)	0.999200	1.00000	21.325	2.134E+01 s		< 9.941E+00
**** (1332.48)	1.000000	1.00000	19.748	1.975E+01 s		< 9.199E+00
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 4.052E-01 4G		
812 (810.76)	0.990000	1.00000	32.680	3.301E+01	9.99%	3.670E+01

DEAD TIME = 6.26% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-7 XX 2.645 7 68.62 MIN 1.00000 SM 541

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

Group	1098	Time of count	2.645 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	68.61667
Type code	GLY	Dead Time Pct	6.261384
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-7	Standard GMT	356.823 2006
Aliquot	1.	Days since TO	92.93659
Unit of Aliquot	SMPL	Time on	7:28 PST 2-JAN
Data Sheet Units	PCI /SMPL	Time off	8:37 PST 2-JAN
Library	A982	Calc Time	10:09 02-JAN-07
Slope	0.991512	Width slope	0.006379
Intercept	0.848181	Width offset	0.925840
X**2 TERM	-0.15603343E-05	Sensitivity	4.

NP:[7,67]541.GSP 34 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	26.0	21	19	76853	2.56	482795	25.4	7.04E+03	0.2	0.106	0	******
2	5	33.2	21	19	223558	2.56	409981	32.6	5.97E+03	0.2	0.220	0	0.00
3	5	37.5	21	19	215601	2.56	77217	37.0	1.13E+03	0.9	0.317	0	0.00
4	0	42.9	40	6	211254	2.37	36195	42.4	5.27E+02	2.1	0.474	0	0.00
5	0	59.3	55	7	207871	1.30	454416	58.9	6.62E+03	0.2	100.	0	0.00
6	6	66.6	64	13	116294	2.99	21893	66.4	3.19E+02	2.5	100.	0	392.00
7	6	70.5	64	13	214703	2.99	47044	70.3	6.86E+02	1.9	100.	0	0.00
8	8	80.6	76	17	209700	3.53	17492	80.4	2.55E+02	4.6	100.	0	920.00
9	8	87.8	76	17	76109	1.38	542661	87.7	7.91E+03	0.2	100.	0	0.00
10	0	102.6	97	10	145270	3.30	2159	102.7	3.15E+01	33.3	100.	0	0.00
11	0	109.1	107	6	83826	2.50	3835	109.2	5.59E+01	12.1	100.	0	0.00
12	0	121.7	118	8	100638	1.38	237619	121.9	3.46E+03	0.3	100.	0	0.00
13	0	136.1	133	8	86634	1.97	29921	136.4	4.36E+02	1.8	100.	0	0.00
14	0	143.0	141	6	61288	3.17	1776	143.4	2.59E+01	22.2	100.	0	0.00
15	0	165.4	161	10	89950	1.47	215046	166.0	3.13E+03	0.3	100.	0	0.00
16	0	186.7	185	6	43453	3.44	1674	187.5	2.44E+01	19.8	100.	0	0.00
17	0	198.1	195	8	59468	2.09	9104	199.0	1.33E+02	4.8	100.	0	0.00
18	0	203.1	203	6	43371	1.78	1510	204.0	2.20E+01	22.0	100.	0	0.00
19	0	254.4	253	7	37200	1.62	6223	255.9	9.07E+01	5.3	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	278.4	274	12	58162	1.90	137248	280.1	2.00E+03	0.4	100.	0	0.00
21	0	299.5	299	7	28398	2.38	748	301.3	1.09E+01	37.5	100.	0	0.00
22	0	390.7	387	12	43494	2.10	142839	393.4	2.08E+03	0.4	100.	0	0.00
23	0	411.6	412	6	19278	3.45	768	414.6	1.12E+01	28.8	100.	0	0.00
24	0	510.2	510	10	24954	3.10	3525	514.1	5.14E+01	8.6	100.	0	0.00
25	0	660.2	659	14	40136	2.47	99896	665.7	1.46E+03	0.5	100.	0	0.00
26	0	812.0	815	9	14886	3.08	2242	819.1	3.27E+01	10.0	100.	0	0.00
27	0	896.0	897	15	34340	2.78	151744	904.1	2.21E+03	0.4	100.	0	0.00
28	0	910.7	916	8	17721	1.74	1066	918.9	1.55E+01	22.0	100.	0	0.00
29	0	1170.6	1174	15	21432	3.28	105535	1182.0	1.54E+03	0.4	100.	0	0.00
30	0	1191.8	1200	8	7068	3.65	660	1203.4	9.62E+00	22.5	100.	0	0.00
31	0	1330.0	1337	14	24157	3.36	84392	1343.4	1.23E+03	0.5	100.	0	0.00
32	0	1832.2	1845	16	14566	4.27	75519	1852.5	1.10E+03	0.5	100.	0	0.00
33	0	1847.0	1864	8	2779	4	162	5	7.25E+00	19.1	100.	0	0.00

```
 34   0 1854.1 1871   9   1775 3.04     434 1874.6   6.33E+00 19.9 100.   0   0.00
FWHM=SQRT( 5.33777E+00 +   4.68597E-03 *E)

*****************************************************************************
BACKGROUND INFO 1098     GLY    2          2.645   7 G- 7      BG DATE    1.811   7
*****************************************************************************

v---------PEAK----------v      v------BACKGROUND------v      v------NET-----v
ENERGY        CPM   %ERROR      ENERGY        CPM   %ERROR          CPM   %ERROR

 143.00    25.8834 22.17        143.00   0.0670 20.30         25.8164 22.23
 186.66    24.3957 19.82        186.00   0.3104 11.02         24.0852 20.08
 198.11   132.6757  4.79        198.00   0.0516 28.12        132.6241  4.79
 278.44  2000.2137  0.44        279.00   0.0000  0.00       2000.2137  0.44
 510.22    51.3762  8.58        511.00   1.0317 10.97         50.3445  8.75
 660.16  1455.8542  0.53        661.60   0.0468  0.00       1455.8075  0.53
 910.67    15.5423 21.99        911.10   0.0725 32.84         15.4698 22.10
    0 PEAKS REJECTED BY BACKGROUND

*****************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098     GLY    2          2.645   7 G- 7
*****************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 2.645/2007

BACKGROUND FOR GELI DETECTOR 7 OF 1.811/2007 1109.9 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4061	14.31	511.0	1.0317	10.97	1120.3	0.0964	9.95
92.0	0.6932	8.24	583.1	0.1198	21.71	1173.2	0.0456	0.00
143.0	0.0670	20.30	609.3	0.2783	41.36	1238.1	0.0294	9.18
186.0	0.3104	11.02	661.6	0.0468	0.00	1332.5	0.0367	42.74
198.0	0.0516	28.12	727.2	0.0227	0.00	1377.7	0.0000	0.00
238.5	0.3591	18.29	846.0	0.0542	67.86	1461.0	0.0472	32.02
279.0	0.0000	0.00	860.4	0.0000	0.00	1586.0	0.0000	0.00
295.2	0.1706	41.84	911.1	0.0725	32.84	1591.0	0.0000	0.00
338.4	0.0785	27.52	968.9	0.0392	37.72	1729.6	0.0000	0.00
351.9	0.3282	38.52	1001.0	0.0285	0.00	1764.5	0.0388	66.47

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 7 ON 1/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
162.828	5	0.9029	10.177	23.
169.849	5	0.9205	10.183	22.
183.987	5	0.9095	10.702	26.
197.965	5	0.9078	9.941	23.
200.672	5	0.9031	10.264	29.
204.990	5	0.9034	10.175	27.
114.694	6	1.0727	13.035	31.
120.917	6	1.0739	12.608	21.
174.039	6	1.0089	14.185	11.
174.047	6	1.0130	14.270	13.
AVERAGE		0.9616	0.073	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH I' MINUTES
308.831	6	1.0108	9.106	32.
316.064	6	1.0011	9.753	21.
320.749	6	1.0520	12.685	42.
320.854	6	1.0496	10.625	61.
322.802	6	1.0135	9.347	25.
325.046	6	1.0085	7.842	42.
336.793	6	1.0304	10.592	25.
341.829	6	1.0122	8.732	12.
350.005	6	1.0063	8.133	24.
356.823	6	1.0105	9.296	16.
AVERAGE		1.0195	0.018	

CALIBRATION LINE FROM STANDARD FOR G- 7 OF 356.823 6
ENERGY= 0.848182 + 0.9915124*CH + -1.560334E-06*CH**2
FWHM =SQRT(0.9258 + 0.006380*ENERGY) (CO60= 3.070)

EFFICIENCIES FOR GEOMETRY XX 7 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

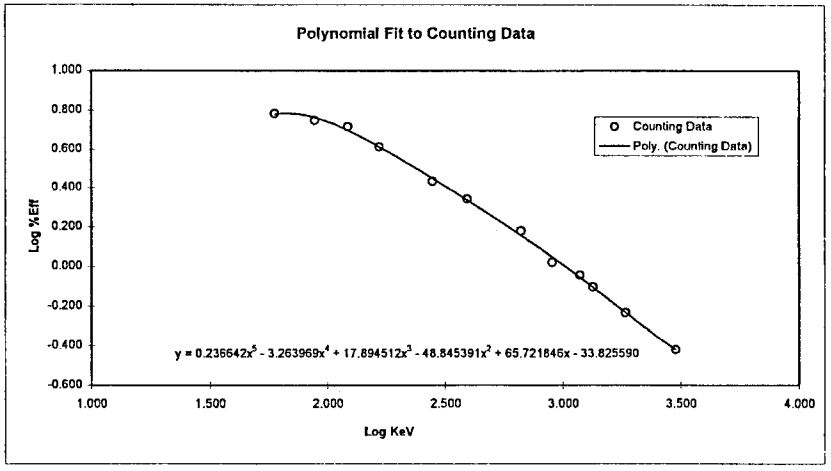
1098 2 GLY GSTOR 541

	PK	ENERGY	CPM	%ERR	COMMENT
	1	26.0	7036.11	0.2	
	2	33.2	5974.95	0.2	
	3	37.5	1125.34	0.9	
	4	42.9	527.50	2.1	
	5	59.3	6622.54	0.2	Am241s
	6	66.6	319.06	2.5	33S
	7	70.5	685.61	1.9	
	8	80.6	254.93	4.6	Ce144 I 131
	9	87.8	7908.59	0.2	Cs136 Cd109s
	10	102.6	31.47	33.3	
	11	109.1	55.89	12.1	La140 Cs136 Sb125
	12	121.7	3462.99	0.3	Co 57s
	13	136.1	436.05	1.8	Co 57s
b	14	143.0	25.82	22.2	Fe 59
	15	165.4	3134.02	0.3	Cs136 Cs136 Ce139s
b	16	186.7	24.09	20.1	Ra226 Cs136
b	17	198.1	132.62	4.8	Ac228
	18	203.1	22.01	22.0	Sb125
	19	254.4	90.70	5.3	Sn113
b	20	278.4	2000.21	0.4	Ac228 Th228 Hg203s
	21	299.5	10.90	37.5	Th228
	22	390.7	2081.70	0.4	Sn113s
	23	411.6	11.19	28.8	
b	24	510.2	50.34	8.8	Ac228 Th228 La140 Na 22
b	25	660.2	1455.81	0.5	Cs137s
	26	812.0	32.67	10.0	NO GEN. Co 58
	27	896.0	2211.48	0.4	
b	28	910.7	15.47	22.1	Ac228 NO GEN.
	29	1170.6	1538.04	0.4	NO GEN.
	30	1191.8	9.62	22.5	NO GEN.
	31	1330.0	1229.90	0.5	NO GEN.
	32	1832.2	1100.59	0.5	NO GEN.
	33	1847.0	7.25	19.1	Ra226
	34	1854.1	6.33	19.9	

Detector	G6	100 mL Jar	
Geometry	JR	Shelf 0	EFF. DATE
Std I.D.	(GLY)1098-2		29-Jan-07
Filename	GELI06JR0.EFF		

Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	%Eff Avg	%SD	LogKev	Log%Eff	%Dev from Spline
59.50	6.03306	6.09401	6.06354		1.775	0.783	1
88.00	5.69695	5.49539	5.59617		1.944	0.748	-3
122.10	5.21735	5.1909	5.20414		2.087	0.716	4
165.90	4.10436	4.1120	4.10817		2.220	0.614	0
279.20	2.70281	2.70990	2.70636		2.446	0.432	-4
391.70	2.20505	2.18339	2.19422		2.593	0.341	1
661.70	1.51034	1.50212	1.50623		2.821	0.178	5
898.00	1.04667	1.04005	1.04336		2.953	0.018	-6
1173.20	0.90227	0.90319	0.90273		3.069	-0.044	3
1332.50	0.78609	0.78862	0.78736		3.125	-0.104	0
1836.10	0.58281	0.58634	0.58458		3.264	-0.233	0
			#DIV/0!		#NUM!	#DIV/0!	#DIV/0!
3000	(artificial data)		0.38000		3.477	-0.420	0
				avg	#DIV/0!		

(shaded cells are manual entry, all others are calculated)

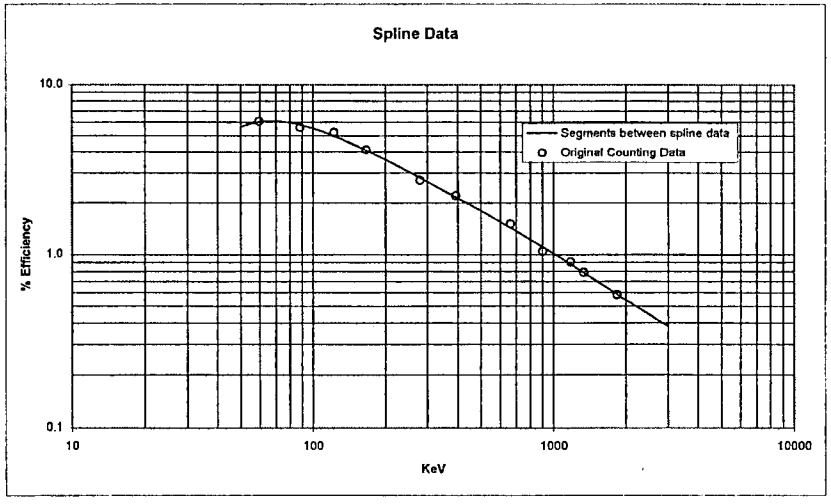


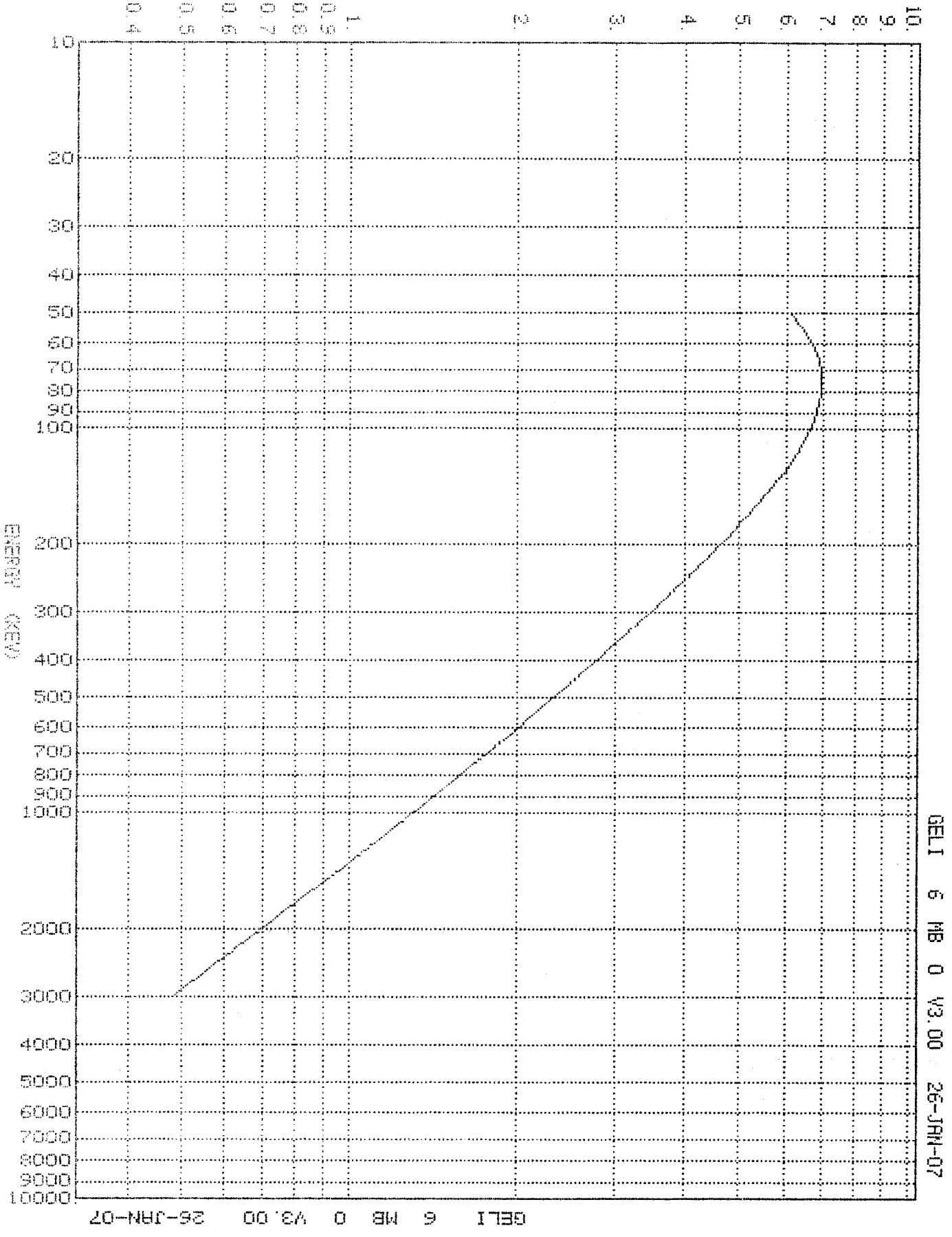
Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
50	5.65237	1.699	0.752		
55	5.89175	1.740	0.770		
60	6.02420	1.778	0.780		#DIV/0!
65	6.07724	1.813	0.784		
70	6.07249	1.845	0.783		
80	5.95146	1.903	0.775		
90	5.74892	1.954	0.760		
100	5.51275	2.000	0.741		#DIV/0!
110	5.26841	2.041	0.722		
130	4.80110	2.114	0.681		
150	4.38845	2.176	0.642		
170	4.03403	2.230	0.606		
190	3.73118	2.279	0.572		
250	3.05219	2.398	0.485		
300	2.66047	2.477	0.425		#DIV/0!
500	1.79279	2.699	0.254		
700	1.36814	2.845	0.136		
1000	1.01267	3.000	0.005		#DIV/0!
1400	0.75098	3.146	-0.124		
2000	0.54184	3.301	-0.266		
3000	0.37978	3.477	-0.420		

Polynomial Coefficients

x5 =	0.236642
x4 =	-3.263969
x3 =	17.894512
x2 =	-48.84539
x1 =	65.721846
x0 =	-33.8259




PERCENT EFFICIENCY
0.4 0.5 0.6 0.7 0.8 0.9 1 2 3 4 5 6 7 8 9 10
10 20 30 40 50 60 70 80 90 100 200 300 400 500 600 700 800 900 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
ENERGY (KEV)
GELI 6 MB 0 V3.00 26-JAN-07

Det ... GELI 6
Geo ... MB -- Marinelli beaker
Shf ... 0
Ref ...

Date 26-JAN-07
Version .. 3.00
File ..... ND:[25,4]GELI06MB0.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	6.10729	108	6.47079	216	4.37031	324	3.24970	432	2.59723
51	6.17999	110	6.42975	218	4.34241	326	3.23416	434	2.58790
52	6.25212	112	6.37963	220	4.31494	328	3.21879	436	2.57865
53	6.32369	114	6.33078	222	4.28789	330	3.20358	438	2.56947
54	6.39473	116	6.28314	224	4.26125	332	3.18853	440	2.56037
55	6.46523	118	6.23667	226	4.23500	334	3.17365	442	2.55134
56	6.51454	120	6.19131	228	4.20916	336	3.15892	444	2.54238
57	6.56334	122	6.14702	230	4.18369	338	3.14435	446	2.53349
58	6.61165	124	6.10377	232	4.15859	340	3.12993	448	2.52468
59	6.65949	126	6.06150	234	4.13386	342	3.11566	450	2.51593
60	6.70685	128	6.02018	236	4.10948	344	3.10154	452	2.50726
61	6.73756	130	5.97978	238	4.08545	346	3.08757	454	2.49865
62	6.76790	132	5.93017	240	4.06176	348	3.07373	456	2.49010
63	6.79789	134	5.88171	242	4.03841	350	3.06004	458	2.48163
64	6.82754	136	5.83436	244	4.01538	352	3.04649	460	2.47322
65	6.85686	138	5.78806	246	3.99266	354	3.03307	462	2.46487
66	6.87308	140	5.74280	248	3.97026	356	3.01979	464	2.45659
67	6.88910	142	5.69852	250	3.94816	358	3.00664	466	2.44838
68	6.90491	144	5.65520	252	3.92498	360	2.99362	468	2.44022
69	6.92053	146	5.61279	254	3.90212	362	2.98072	470	2.43213
70	6.93596	148	5.57128	256	3.87957	364	2.96796	472	2.42409
71	6.93690	150	5.53062	258	3.85732	366	2.95532	474	2.41612
72	6.93783	152	5.48694	260	3.83537	368	2.94280	476	2.40821
73	6.93875	154	5.44418	262	3.81372	370	2.93040	478	2.40036
74	6.93965	156	5.40229	264	3.79235	372	2.91811	480	2.39256
75	6.94054	158	5.36125	266	3.77125	374	2.90595	482	2.38482
76	6.94142	160	5.32103	268	3.75044	376	2.89390	484	2.37714
77	6.94229	162	5.28161	270	3.72989	378	2.88197	486	2.36952
78	6.94315	164	5.24296	272	3.70960	380	2.87014	488	2.36195
79	6.94399	166	5.20505	274	3.68957	382	2.85843	490	2.35444
80	6.94483	168	5.16787	276	3.66980	384	2.84682	492	2.34698
81	6.93251	170	5.13139	278	3.65027	386	2.83533	494	2.33957
82	6.92036	172	5.09300	280	3.63098	388	2.82393	496	2.33222
83	6.90838	174	5.05533	282	3.61193	390	2.81265	498	2.32492
84	6.89656	176	5.01837	284	3.59312	392	2.80146	500	2.31767
85	6.88491	178	4.98209	286	3.57453	394	2.79038	502	2.31012
86	6.87340	180	4.94648	288	3.55618	396	2.77939	504	2.30263
87	6.86205	182	4.91151	290	3.53804	398	2.76850	506	2.29519
88	6.85085	184	4.87716	292	3.52011	400	2.75771	508	2.28781
89	6.83980	186	4.84342	294	3.50240	402	2.74702	510	2.28048
90	6.82888	188	4.81027	296	3.48490	404	2.73642	512	2.27320
91	6.80944	190	4.77770	298	3.46760	406	2.72591	514	2.26597
92	6.79027	192	4.74306	300	3.45050	408	2.71550	516	2.25879
93	6.77136	194	4.70903	302	3.43268	410	2.70517	518	2.25166
94	6.75271	196	4.67558	304	3.41508	412	2.69494	520	2.24459
95	6.73430	198	4.64271	306	3.39768	414	2.68479	522	2.23756
96	6.71613	200	4.61040	308	3.38048	416	2.67473	524	2.23058
97	6.69820	202	4.57863	310	3.36347	418	2.66475	526	2.22365
98	6.68050	204	4.54739	312	3.34667	420	2.65486	528	2.21676
99	6.66303	206	4.51667	314	3.33005	422	2.64505	530	2.20993
100	6.64578	208	4.48644	316	3.31362	424	2.63533	532	2.20314
102	6.60031	210	4.45671	318	3.29737	426	2.62568	534	2.19639
104	6.55602	212	4.42745	320	3.28130	428	2.61612	536	2.18970
106	6.51286	214	4.39865	322	3.26542	430	2.60664	538	2.18305

Det ... GELI 6
Geo ... MB - Marinelli beaker
Shif .. 0
Ref ...

Date 26-JAN-07
Version .. 3.00
File ..... ND:[25,4]GELI06MB0.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	2.17644	660	1.84735	930	1.38279	1260	1.05907	1800	0.76598
542	2.16987	665	1.83600	935	1.37650	1270	1.05167	1810	0.76210
544	2.16335	670	1.82479	940	1.37027	1280	1.04437	1820	0.75826
546	2.15688	675	1.81374	945	1.36410	1290	1.03719	1830	0.75446
548	2.15045	680	1.80284	950	1.35800	1300	1.03011	1840	0.75069
550	2.14406	685	1.79208	955	1.35195	1310	1.02313	1850	0.74697
552	2.13771	690	1.78147	960	1.34596	1320	1.01625	1860	0.74329
554	2.13140	695	1.77099	965	1.34003	1330	1.00947	1870	0.73964
556	2.12513	700	1.76065	970	1.33415	1340	1.00279	1880	0.73603
558	2.11891	705	1.75003	975	1.32833	1350	0.99619	1890	0.73246
560	2.11273	710	1.73954	980	1.32257	1360	0.98969	1900	0.72892
562	2.10658	715	1.72919	985	1.31685	1370	0.98328	1925	0.72023
564	2.10048	720	1.71898	990	1.31120	1380	0.97696	1950	0.71176
566	2.09441	725	1.70889	995	1.30559	1390	0.97072	1975	0.70349
568	2.08838	730	1.69893	1000	1.30004	1400	0.96457	2000	0.69542
570	2.08240	735	1.68910	1005	1.29430	1410	0.95829	2025	0.68753
572	2.07645	740	1.67939	1010	1.28862	1420	0.95210	2050	0.67983
574	2.07053	745	1.66980	1015	1.28298	1430	0.94599	2075	0.67230
576	2.06466	750	1.66033	1020	1.27740	1440	0.93996	2100	0.66495
578	2.05882	755	1.65098	1025	1.27187	1450	0.93402	2125	0.65776
580	2.05302	760	1.64174	1030	1.26640	1460	0.92815	2150	0.65074
582	2.04725	765	1.63261	1035	1.26097	1470	0.92235	2175	0.64386
584	2.04152	770	1.62359	1040	1.25559	1480	0.91664	2200	0.63714
586	2.03583	775	1.61468	1045	1.25026	1490	0.91099	2225	0.63057
588	2.03017	780	1.60587	1050	1.24498	1500	0.90542	2250	0.62413
590	2.02455	785	1.59717	1055	1.23974	1510	0.89992	2275	0.61783
592	2.01896	790	1.58857	1060	1.23455	1520	0.89448	2300	0.61166
594	2.01340	795	1.58007	1065	1.22941	1530	0.88912	2325	0.60562
596	2.00788	800	1.57167	1070	1.22431	1540	0.88382	2350	0.59970
598	2.00239	805	1.56337	1075	1.21926	1550	0.87859	2375	0.59390
600	1.99694	810	1.55515	1080	1.21425	1560	0.87342	2400	0.58821
602	1.99152	815	1.54704	1085	1.20928	1570	0.86832	2425	0.58264
604	1.98613	820	1.53901	1090	1.20436	1580	0.86328	2450	0.57718
606	1.98077	825	1.53108	1095	1.19948	1590	0.85830	2475	0.57183
608	1.97545	830	1.52323	1100	1.19465	1600	0.85337	2500	0.56657
610	1.97016	835	1.51547	1105	1.18985	1610	0.84851	2525	0.56142
612	1.96489	840	1.50780	1110	1.18509	1620	0.84371	2550	0.55636
614	1.95966	845	1.50021	1115	1.18038	1630	0.83896	2575	0.55140
616	1.95446	850	1.49270	1120	1.17570	1640	0.83426	2600	0.54653
618	1.94930	855	1.48528	1125	1.17107	1650	0.82962	2625	0.54175
620	1.94416	860	1.47793	1130	1.16647	1660	0.82504	2650	0.53705
622	1.93905	865	1.47066	1135	1.16191	1670	0.82051	2675	0.53244
624	1.93397	870	1.46347	1140	1.15739	1680	0.81602	2700	0.52791
626	1.92892	875	1.45636	1150	1.14846	1690	0.81159	2725	0.52346
628	1.92390	880	1.44932	1160	1.13967	1700	0.80721	2750	0.51909
630	1.91891	885	1.44235	1170	1.13103	1710	0.80288	2775	0.51480
632	1.91395	890	1.43546	1180	1.12252	1720	0.79860	2800	0.51057
634	1.90901	895	1.42864	1190	1.11415	1730	0.79437	2825	0.50642
636	1.90411	900	1.42189	1200	1.10591	1740	0.79018	2850	0.50234
638	1.89923	905	1.41521	1210	1.09780	1750	0.78603	2875	0.49833
640	1.89438	910	1.40859	1220	1.08981	1760	0.78194	2900	0.49438
645	1.88237	915	1.40204	1230	1.08195	1770	0.77788	2925	0.49050
650	1.87054	920	1.39556	1240	1.07420	1780	0.77387	2950	0.48668
655	1.85886	925	1.38914	1250	1.06658	1790	0.76991	2975	0.48293

ANALYTICS
An Isotope Products Laboratories Company

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Tel 404-352-8677
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www.analyticsinc.com

Log 417 Recd 12/27/06 K Trenton

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

1098-2

LIBR A982

74159-207
100 mL Solid in Wide Mouth PPi Parkway Jar

Customer: Eberline Services / Richmond, CA
P.O. No.: 00003890, Item 1
Calibration Date: 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01515

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1990.0	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	189000	2863.9	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	94570	1433.0	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	133800	2027.5	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	295300	4475	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	185600	2812.4	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	116700	1768.4	0.70	1.20	2.78	HPGe
Y-88	898.0	106.60	455400	6901	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	226900	3438	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	227000	3440	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	481200	7292	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
This standard will expire one year after the calibration date.

Source Prepared by: M. Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate

DEAD TIME = 5.22% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-6 XX 15.865 7 68.35 MIN 1.00000 SM 215

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.995E-01	41G		
59 (59.54)	1.990000	1.00000	7200.399	3.618E+03	s	0.19%	1.631E+03
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.528E-01	2G		
87 (88.03)	0.039000	1.00000	8463.392	2.170E+05	s	0.19%	1.146E+05
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.628E-01	10G		
121 (122.06)	1.433000	1.00000	3501.593	2.444E+03	s	0.36%	1.443E+03
136 (136.47)	0.000001	1.00000	448.237	4.482E+08	s	1.89%	2.647E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 5.858E-01	3G		
165 (165.80)	0.800000	1.00000	3060.977	3.826E+03	s	0.36%	2.942E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.062E-01	2G		
**** (279.21)	0.815000	1.00000	23.729	2.912E+01	s	<	6.359E+01
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.277E-01	5G		
**** (391.40)	0.642000	1.00000	23.187	3.612E+01	s	<	3.083E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.933E-01	3G		
**** (661.64)	1.768400	1.00000	14.561	8.234E+00	s	<	3.734E+00
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.014E-01	8G		
**** (898.00)	0.920000	1.00000	13.884	1.509E+01	s	<	1.356E+01
**** (1836.10)	1.000000	1.00000	3.338	3.338E+00	s	<	2.999E+00
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.624E-01	5G		
**** (1173.21)	0.999200	1.00000	6.680	6.685E+00	s	<	3.129E+00
**** (1332.48)	1.000000	1.00000	5.328	5.328E+00	s	<	2.494E+00

DEAD TIME = 5.22% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

1098 GLY 2 G-6 XX 15.865 7 68.35 MIN 1.00000 SM 215

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

Group	1098	Time of count	15.865 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	68.35
Type code	GLY	Dead Time Pct	5.223018
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-6	Standard GMT	5.755 2007
Aliquot	1.	Days since TO	106.1565
Unit of Aliquot	SMPL	Time on	12:45 PST 15-JAN
Data Sheet Units	PCI /SMPL	Time off	13:53 PST 15-JAN
Library	A982	Calc Time	15:37 15-JAN-07
Slope	1.004323	Width slope	0.010382
Intercept	-.286814	Width offset	-.359554
X**2 TERM	-0.15486747E-05	Sensitivity	4.

NP:D7,671215.GSP 29 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	4	21.6	20	10401548	2.48	799985	21.8	1.17E+04	0.	10.	061	0	******
2	4	25.2	20	10400553	1.78	859771	25.4	1.26E+04	0.	20.	096	0	0.00
3	0	32.8	31	6223404	2.22	53630	32.9	7.85E+02	1.	50.	212	0	0.00
4	0	42.2	41	6124770	2.24	3796	42.3	5.55E+01	15.	20.	452	0	0.00
5	5	50.0	46	18167422	4.09	56883	50.1	8.32E+02	1.	30.	753	0	432.00
6	5	55.5	46	18241986	4.12	62095	55.6	9.08E+02	2.	0	100.	0	0.00
7	5	59.4	46	18133636	2.39	492147	59.4	7.20E+03	0.	2	100.	0	0.00
8	3	67.0	65	15	81524	4.02	24745	67.0	3.62E+02	1.	7	100.	0
9	3	73.2	65	15278621	4.93	107466	73.2	1.57E+03	1.	1	100.	0	0.00
10	0	87.5	83	10183951	2.42	578451	87.4	8.46E+03	0.	2	100.	0	0.00
11	0	104.7	100	12141013	8.18	4844	104.5	7.09E+01	15.	5	100.	0	0.00
12	0	121.3	116	12119215	2.50	239319	121.0	3.50E+03	0.	4	100.	0	0.00
13	0	135.6	131	10	87997	2.52	30635	135.3	4.48E+02	1.	9	100.	0
14	0	164.8	159	12	85823	2.46	209191	164.4	3.06E+03	0.	4	100.	0
15	0	186.4	183	6	37148	2.15	792	185.9	1.16E+01	38.	6	100.	0
16	0	197.3	193	8	53083	2.81	7994	196.7	1.17E+02	5.	1	100.	0
17	0	253.5	250	7	33971	2.45	6073	252.8	8.88E+01	5.	2	100.	0
18	0	277.4	271	12	50398	2.55	116970	276.6	1.71E+03	0.	5	100.	0
19	0	389.2	382	12	35785	2.74	141671	388.0	2.07E+03	0.	4	100.	0
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	507.7	501	11	25363	3.85	4397	506.2	6.43E+01	7.	2	100.	0
21	0	657.6	649	14	34785	2.98	108863	655.7	1.59E+03	0.	5	100.	0
22	0	808.9	803	9	14303	3.05	2140	806.8	3.13E+01	10.	2	100.	0
23	0	892.5	882	17	29665	3.35	157489	890.2	2.30E+03	0.	4	100.	0
24	0	906.7	900	10	18381	3.79	1941	904.4	2.84E+01	13.	2	100.	0
25	0	1166.1	1154	18	15534	3.73	122837	1163.5	1.80E+03	0.	4	100.	0
26	0	1324.6	1315	16	13901	3.86	107083	1321.8	1.57E+03	0.	4	100.	0
27	0	1451.8	1446	8	4279	4.88	374	1449.0	5.47E+00	30.	9	100.	0
28	0	1824.8	1811	22	3411	4.88	92662	1822.3	1.36E+03	0.	4	100.	0
29	0	1841.1	1832	17	1831	5.60	1282	1838.6	1.88E+01	8.	6	100.	0

FWHM=SQRT(1.04679E+01 + 6.26630E-03 *E)

BACKGROUND INFO 1098 GLY - -- -:- 7 G- 6 BG DATE 1.811 7

```
*****************************************************************************

v---------PEAK----------v     v-------BACKGROUND-------v     v-------NET----v
ENERGY       CPM   %ERROR       ENERGY       CPM   %ERROR          CPM   %ERROR

 186.39    11.5865 38.56        186.00   0.5077 15.50         11.0788 40.34
 197.25   116.9564  5.12        198.00   0.1287  0.00        116.8276  5.13
 277.37  1711.3406  0.48        279.00   0.2460  0.00       1711.0946  0.48
    0 PEAKS REJECTED BY BACKGROUND

*****************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY   2        15.865  7 G- 6
*****************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 15.865/2007

BACKGROUND FOR GELI DETECTOR 6 OF 1.811/2007 1375.0 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.6224	50.14	511.0	2.3106	3.31	1120.3	0.3595	13.96
92.0	0.7505	22.46	583.1	0.5662	19.50	1173.2	0.0430	0.00
143.0	0.1067	0.00	609.3	0.9957	5.07	1238.1	0.1603	14.78
186.0	0.5077	15.50	661.6	0.0853	28.48	1332.5	0.0532	28.93
198.0	0.1287	0.00	727.2	0.1281	17.80	1337.7	0.0000	0.00
238.6	1.1958	29.75	846.0	0.0625	0.00	1461.0	3.1055	9.84
279.0	0.2460	0.00	860.4	0.1053	19.95	1586.0	0.0773	0.00
295.2	0.4169	19.60	911.1	0.4260	15.85	1591.0	0.1130	31.59
338.4	0.2057	23.53	968.9	0.3063	28.89	1729.6	0.0661	22.69
351.9	0.8857	12.77	1001.0	0.0716	69.65	1764.5	0.3674	9.04

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 1/15/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
322.838	6	1.3358	12.317	78. NG
336.812	6	1.3293	13.679	22. NG
336.905	6	1.3338	12.583	73.
349.852	6	1.3218	11.981	63.
352.746	6	1.3080	12.674	24.
353.834	6	1.3114	12.373	30.
356.660	6	1.3386	13.451	111.
4.638	7	1.3913	12.530	18. NG
4.854	7	1.4380	11.424	46. NG
5.755	7	1.4354	12.275	24. NG
AVERAGE		1.3227	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
315.882	6	1.3541	14.648	20.
320.990	6	1.3895	15.941	50.
321.801	6	1.3496	13.162	25.
322.821	6	1.3393	13.918	22.
336.876	6	1.3866	16.427	40.
349.900	6	1.4000	17.996	30.
352.766	6	1.3902	16.717	35.
353.774	6	1.3305	13.970	27.
356.784	6	1.3369	13.477	23.
4.652	7	1.3440	13.744	26.
AVERAGE		1.3504	0.027	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 5.755 7
ENERGY= -0.286814 + 1.0043234*CH + -1.548675E-06*CH**2
FWHM =SQRT(-0.3596 + 0.010383*ENERGY) (CO60= 3.671)

EFFICIENCIES FOR GEOMETRY XX 6 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

1098 2 GLY GSTOR 215

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	21.6	11704.25	0.1		
	2	25.2	12578.95	0.2		
	3	32.8	784.64	1.5		
	4	42.2	55.54	15.2	NO GEN.	22S
	5	50.0	832.24	1.3		25S
	6	55.5	908.49	2.0		
	7	59.4	7200.40	0.2		Am241s
	8	67.0	362.03	1.7		
	9	73.2	1572.30	1.1		
	10	87.5	8463.07	0.2		Cs136 Cd109s
	11	104.7	70.87	15.5		
	12	121.3	3501.37	0.4		Ag110 Co 57s
	13	135.6	448.21	1.9		Co 57s
	14	164.8	3060.59	0.4		Cs136 Ce139s
b	15	186.4	11.08	40.3	Ra226 NO GEN.	Cs136
b	16	197.3	116.83	5.1		
	17	253.5	88.85	5.2	Th228	
b	18	277.4	1711.09	0.5	Th228 NO GEN.	
	19	389.2	2072.74	0.4	NO GEN.	
	20	507.7	64.33	7.2	NO GEN.	Cs136
	21	657.6	1592.74	0.5	NO GEN.	Ag110
	22	808.9	31.32	10.2	NO GEN.	
	23	892.5	2304.15	0.4	Th228 NO GEN.	La140
	24	906.7	28.40	13.2	NO GEN.	
	25	1166.1	1797.18	0.4	NO GEN.	
	26	1324.6	1566.69	0.4	NO GEN.	Sb124
	27	1451.8	5.47	30.9	NO GEN.	
	28	1824.8	1355.69	0.4		
	29	1841.1	18.76	8.6		

DEAD TIME = 5.16% LIVE TIME----v <---- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-6 XX 26.699 7 117.32 MIN 1.00000 SM 337

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMP(AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.995E-01	41G		
60 (59.54)	1.990000	1.00000	7272.792	3.655E+03 s		0.13%	1.647E+03
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.390E-01	2G		
88 (88.03)	0.039000	1.00000	8028.696	2.059E+05 s		0.12%	1.105E+05
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.420E-01	10G		
122 (122.06)	1.433000	1.00000	3386.192	2.363E+03 s		0.22%	1.434E+03
136 (136.47)	0.000001	1.00000	430.360	4.304E+08 s		1.35%	2.612E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 5.547E-01	3G		
166 (165.80)	0.800000	1.00000	2899.170	3.624E+03 s		0.27%	2.943E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 1.756E-01	2G		
279 (279.21)	0.815000	1.00000	1453.986	1.784E+03 s		0.37%	4.578E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 4.943E-01	5G		
392 (391.40)	0.642000	1.00000	1919.381	2.990E+03 s		0.29%	2.724E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.927E-01	3G		
662 (661.64)	1.768400	1.00000	1582.950	8.951E+02 s		0.35%	4.062E+02
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 4.673E-01	8G		
898 (898.00)	0.920000	1.00000	2129.789	2.315E+03 s		0.28%	2.231E+03
1835 (1836.10)	1.000000	1.00000	1268.734	1.269E+03 s		0.29%	1.223E+03
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.587E-01	5G		
1173 (1173.21)	0.999200	1.00000	1791.814	1.793E+03 s		0.28%	8.426E+02
1333 (1332.48)	1.000000	1.00000	1565.447	1.565E+03 s		0.30%	7.356E+02

DEAD TIME = 5.16% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-6 XX 26.699 7 117.32 MIN 1.00000 SM 337

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

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Group	1098	Time of count	26.699 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	117.3167
Type code	GLY	Dead Time Pct	5.160334
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-6	Standard GMT	26.607 2007
Aliquot	1.	Days since TO	116.9906
Unit of Aliquot	SMPL	Time on	8:46 PST 26-JAN
Data Sheet Units	PCI /SMPL	Time off	10:43 PST 26-JAN
Library	A982	Calc Time	15:24 26-JAN-07
Slope	1.003945	Width slope	0.010932
Intercept	-.248056	Width offset	0.0
X**2 TERM	-0.15754654E-05	Sensitivity	4.

NP:[7,67]337.GSP 38 PEAKS

****

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	21.6	18	12196278		2.14	1954463	21.8	1.67E+04	0.1	0.061	0	******
2	5	25.4	18	12327187		1.62	1896731	25.5	1.62E+04	0.1	0.098	0	0.00
3	0	32.9	32	4290842		1.43	50326	33.0	4.29E+02	1.6	0.214	0	0.00
4	0	43.2	41	6203969		2.34	15016	43.3	1.28E+02	5.0	0.484	0	0.00
5	5	50.2	46	18278217		3.38	87732	50.3	7.48E+02	1.1	0.762	0	******
6	5	59.9	46	18149876		1.58	853220	59.9	7.27E+03	0.1	100.	0	0.00
7	4	67.4	66	14106504		2.32	21325	67.4	1.82E+02	2.1	100.	0	******
8	4	71.6	66	14394565		3.54	65151	71.6	5.55E+02	1.9	100.	0	0.00
9	4	75.0	66	14217309		2.13	92856	75.0	7.92E+02	0.9	100.	0	0.00
10	2	85.1	84	9	89685	1.45	24466	85.1	2.09E+02	1.5	100.	0	94.10
11	2	88.2	84	9129682		1.46	941839	88.2	8.03E+03	0.1	100.	0	0.00
12	0	105.3	101	10192962		8.08	6844	105.1	5.83E+01	12.0	100.	0	0.00
13	0	122.1	118	8130959		1.40	397213	121.9	3.39E+03	0.2	100.	0	0.00
14	0	136.4	132	9126581		1.73	50483	136.2	4.30E+02	1.3	100.	0	0.00
15	0	143.0	141	6	81565	2.11	1238	142.7	1.06E+01	36.6	100.	0	0.00
16	0	165.9	160	11128039		1.97	340047	165.5	2.90E+03	0.3	100.	0	0.00
17	0	188.1	185	6	60713	2.28	1077	187.7	9.18E+00	36.2	100.	0	0.00
18	6	196.1	194	8	31354	2.27	1847	195.6	1.57E+01	12.9	100.	0	15.90
19	6	199.0	194	8	63708	1.89	13324	198.5	1.14E+02	3.1	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	203.7	202	5	51540	1.81	2269	203.2	1.93E+01	15.3	100.	0	0.00
21	0	255.1	251	8	62861	2.04	10500	254.4	8.95E+01	4.2	100.	0	0.00
22	0	279.2	274	10	67411	2.05	170497	278.4	1.45E+03	0.4	100.	0	0.00
23	0	310.9	308	6	34301	1.71	744	310.0	6.34E+00	39.5	100.	0	0.00
24	0	391.6	385	11	55014	2.09	225117	390.6	1.92E+03	0.3	100.	0	0.00
25	0	511.0	506	8	31795	2.92	5690	509.7	4.85E+01	5.6	100.	0	0.00
26	0	639.7	636	5	18961	2.60	430	638.1	3.67E+00	48.3	100.	0	0.00
27	0	661.6	654	13	52971	2.45	185716	659.9	1.58E+03	0.3	100.	0	0.00
28	0	690.8	687	7	28520	2.96	568	689.0	4.84E+00	49.4	100.	0	0.00
29	0	813.6	808	10	25698	3.09	3949	811.7	3.37E+01	7.8	100.	0	0.00
30	0	820.3	817	7	18067	3.13	372	818.4	3.17E+00	60.2	100.	0	0.00
31	0	898.0	888	16	47530	2.88	249790	895.9	2.13E+03	0.3	100.	0	0.00
32	0	912.2	907	9	27771	2.61	2656	910.1	2.26E+01	11.5	100.	0	0.00
33	0	1173.2	1162	17	24954	3.34	210211	1171.0	1.79E+03	0.3	100.	0	0.00

```
 34   0 1332.5 1323 16 22821 3.66 183656 1330.3  1.57E+03  0.3 100.   0  0.00
 35   0 1609.0 1603 10 11454 3.29    323 1607.0  2.75E+00 62.8 100.   0  0.00
 36   0 1710.9 1704 10  3921 3.14    242 1709.0  2.06E+00 49.0 100.   0  0.00
 37   0 1835.4 1822 22  5256 4.72 148802 1833.8  1.27E+03  0.3 100.   0  0.00
 38   0 1850.0 1843 11  2689 4.58   1428 1848.3  1.22E+01  7.6 100.   0  0.00
FWHM=SQRT( 6.01953E+00 +  4.84391E-03 *E)

*************************************************************************************
BACKGROUND INFO 1098    GLY   2          26.699  7 G- 6     BG DATE   1.811  7
*************************************************************************************

v--------PEAK---------v      v------BACKGROUND------v      v------NET-----v
ENERGY       CPM  %ERROR      ENERGY       CPM  %ERROR          CPM  %ERROR

 142.99   10.5545 36.63       143.00  0.1067  0.00        10.4478 37.01
 196.11   15.7465 12.93       198.00  0.1287  0.00        15.6178 13.03
 199.00  113.5738  3.13       198.00  0.1287  0.00       113.4450  3.14
 279.15 1453.3032  0.37       279.00  0.2460  0.00      1453.0573  0.37
 511.03   48.5016  5.58       511.00  2.3106  3.31        46.1910  5.87
 661.60 1583.0308  0.35       661.60  0.0853 28.48      1582.9454  0.35
 912.17   22.6436 11.51       911.10  0.4260 15.85        22.2176 11.74
1173.17 1791.8297  0.28      1173.20  0.0430  0.00      1791.7867  0.28
1332.53 1565.4762  0.30      1332.50  0.0532 28.93      1565.4230  0.30
    0 PEAKS REJECTED BY BACKGROUND

*************************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY   2          26.699  7 G- 6
*************************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 26.699/2007

BACKGROUND FOR GELI DETECTOR 6 OF 1.811/2007 1375.0 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.6224	50.14	511.0	2.3106	3.31	1120.3	0.3595	13.96
92.0	0.7505	22.46	583.1	0.5662	19.50	1173.2	0.0430	0.00
143.0	0.1067	0.00	609.3	0.9957	5.07	1238.1	0.1603	14.78
186.0	0.5077	15.50	661.6	0.0853	28.48	1332.5	0.0532	28.93
198.0	0.1287	0.00	727.2	0.1281	17.80	1337.7	0.0000	0.00
238.6	1.1958	29.75	846.0	0.0625	0.00	1461.0	3.1055	9.84
279.0	0.2460	0.00	860.4	0.1053	19.95	1586.0	0.0773	0.00
295.2	0.4169	19.60	911.1	0.4260	15.85	1591.0	0.1130	31.59
338.4	0.2057	23.53	968.9	0.3063	28.89	1729.6	0.0661	22.69
351.9	0.8857	12.77	1001.0	0.0716	69.65	1764.5	0.3674	9.04

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 1/26/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
336.905	6	1.3338	12.583	73.
349.852	6	1.3218	11.981	63.
352.746	6	1.3080	12.674	24.
353.834	6	1.3114	12.373	30.
356.660	6	1.3386	13.451	111.
4.638	7	1.3913	12.530	18. NG
4.854	7	1.4380	11.424	46. NG
5.755	7	1.4354	12.275	24. NG
20.762	7	1.4106	11.030	21. NG
26.607	7	1.4487	13.714	22. NG
AVERAGE		1.3227	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
320.990	6	1.3895	15.941	50.
321.801	6	1.3496	13.162	25.
322.821	6	1.3393	13.918	22.
336.876	6	1.3866	16.427	40.
349.900	6	1.4000	17.996	30.
352.766	6	1.3902	16.717	35.
353.774	6	1.3305	13.970	27.
356.784	6	1.3369	13.477	23.
4.652	7	1.3440	13.744	26.
20.778	7	1.3707	13.413	21. NG
AVERAGE		1.3545	0.025	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 26.607 7
ENERGY= -0.248056 + 1.0039451*CH + -1.575465E-06*CH**2
FWHM =SQRT(-0.6836 + 0.010933*ENERGY) (C060= 3.726)

EFFICIENCIES FOR GEOMETRY XX 6 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

DEAD TIME = 5.16% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

1098 GLY 2 G-6 XX 26.699 7 117.32 MIN 1.00000 SM 337

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

* Group	1098	* Time of count	26.699 2007 *
* Sample	2	* Reference GMT	274.708 2006 *
* Element		* Elapsed Live Tm	117.3167 *
* Type code	GLY	* Dead Time Pct	5.160334 *
* ID	74159-207 (JR)	* Background GMT	1.811 2007 *
* Geometry, detector	XX-6	* Standard GMT	26.607 2007 *
* Aliquot	1.	* Days since TO	116.9906 *
* Unit of Aliquot	SMPL	* Time on	8:46 PST 26-JAN *
* Data Sheet Units	PCI /SMPL	* Time off	10:43 PST 26-JAN *
* Library	A982	* Calc Time	10:52 26-JAN-07 *
* Slope	1.003945	* Width slope	0.010932 *
* Intercept	-.248056	* Width offset	-.683575 *
* X**2 TERM	-0.15754654E-05	* Sensitivity	4. *

NP:[7,67]337.GSP 38 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	21.6	18	12196278	2.14	1954463	21.8	1.67E+04	0.1	0.061	0	******	
2	5	25.4	18	12327187	1.62	1896731	25.5	1.62E+04	0.1	0.098	0	0.00	
3	0	32.9	32	4290842	1.43	50326	33.0	4.29E+02	1.6	0.214	0	0.00	
4	0	43.2	41	6203969	2.34	15016	43.3	1.28E+02	5.0	0.484	0	0.00	
5	5	50.2	46	18278217	3.38	87732	50.3	7.48E+02	1.1	0.762	0	******	
6	5	59.9	46	18149876	1.58	853220	59.9	7.27E+03	0.1	100.	0	0.00	
7	4	67.4	66	14106504	2.32	21325	67.4	1.82E+02	2.1	100.	0	******	
8	4	71.6	66	14394565	3.54	65151	71.6	5.55E+02	1.9	100.	0	0.00	
9	4	75.0	66	14217309	2.13	92856	75.0	7.92E+02	0.9	100.	0	0.00	
10	2	85.1	84	9	89685	1.45	24466	85.1	2.09E+02	1.5	100.	0	94.10
11	2	88.2	84	9129682	1.46	941839	88.2	8.03E+03	0.1	100.	0	0.00	
12	0	105.3	101	10192962	8.08	6844	105.1	5.83E+01	12.0	100.	0	0.00	
13	0	122.1	118	8130959	1.40	397213	121.9	3.39E+03	0.2	100.	0	0.00	
14	0	136.4	132	9126581	1.73	50483	136.2	4.30E+02	1.3	100.	0	0.00	
15	0	143.0	141	6	81565	2.11	1238	142.7	1.06E+01	36.6	100.	0	0.00
16	0	165.9	160	11128039	1.97	340047	165.5	2.90E+03	0.3	100.	0	0.00	
17	0	188.1	185	6	60713	2.28	1077	187.7	9.18E+00	36.2	100.	0	0.00
18	6	196.1	194	8	31354	2.27	1847	195.6	1.57E+01	12.9	100.	0	15.90
19	6	199.0	194	8	63708	1.89	13324	198.5	1.14E+02	3.1	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	203.7	202	5	51540	1.81	2269	203.2	1.93E+01	15.3	100.	0	0.00
21	0	255.1	251	8	62861	2.04	10500	254.4	8.95E+01	4.2	100.	0	0.00
22	0	279.2	274	10	67411	2.05	170497	278.4	1.45E+03	0.4	100.	0	0.00
23	0	310.9	308	6	34301	1.71	744	310.0	6.34E+00	39.5	100.	0	0.00
24	0	391.6	385	11	55014	2.09	225117	390.6	1.92E+03	0.3	100.	0	0.00
25	0	511.0	506	8	31795	2.92	5690	509.7	4.85E+01	5.6	100.	0	0.00
26	0	639.7	636	5	18961	2.60	430	638.1	3.67E+00	48.3	100.	0	0.00
27	0	661.6	654	13	52971	2.45	185716	659.9	1.58E+03	0.3	100.	0	0.00
28	0	690.8	687	7	28520	2.96	568	689.0	4.84E+00	49.4	100.	0	0.00
29	0	813.6	808	10	25698	3.09	3949	811.7	3.37E+01	7.8	100.	0	0.00
30	0	820.3	817	7	18067	3.13	372	818.4	3.17E+00	60.2	100.	0	0.00
31	0	898.0	888	16	47530	2.88	249790	895.9	2.13E+03	0.3	100.	0	0.00
32	0	912.2	907	9	27771	2.61	2656	910.1	2.26E+01	11.5	100.	0	0.00
33	0	1173.2	1162	17	24954	3.24	210211	1171.0	1.79E+03	0.3	100.	0	0.00

```
 34   0 1332.5 1323 16 22821 3.66 183656 1330.3  1.57E+03  0.3 100.   0  0.00
 35   0 1609.0 1603 10 11454 3.29    323 1607.0  2.75E+00 62.8 100.   0  0.00
 36   0 1710.9 1704 10  3921 3.14    242 1709.0  2.06E+00 49.0 100.   0  0.00
 37   0 1835.4 1822 22  5256 4.72 148802 1833.8  1.27E+03  0.3 100.   0  0.00
 38   0 1850.0 1843 11  2689 4.58   1428 1848.3  1.22E+01  7.6 100.   0  0.00
FWHM=SQRT( 6.01953E+00 +  4.84391E-03 *E)

*************************************************************************************
BACKGROUND INFO 1098    GLY   2         26.699  7 G- 6     BG DATE   1.811  7
*************************************************************************************

v---------PEAK----------v      v------BACKGROUND-------v      v-------NET-----v
ENERGY       CPM   %ERROR      ENERGY       CPM   %ERROR          CPM   %ERROR

 142.99   10.5545 36.63        143.00  0.1067   0.00         10.4478 37.01
 196.11   15.7465 12.93        198.00  0.1287   0.00         15.6178 13.03
 199.00  113.5738  3.13        198.00  0.1287   0.00        113.4450  3.14
 279.15 1453.3032  0.37        279.00  0.2460   0.00       1453.0573  0.37
 511.03   48.5016  5.58        511.00  2.3106   3.31         46.1910  5.87
 661.60 1583.0308  0.35        661.60  0.0853  28.48       1582.9454  0.35
 912.17   22.6436 11.51        911.10  0.4260  15.85         22.2176 11.74
1173.17 1791.8297  0.28       1173.20  0.0430   0.00       1791.7867  0.28
1332.53 1565.4762  0.30       1332.50  0.0532  28.93       1565.4230  0.30
    0 PEAKS REJECTED BY BACKGROUND

*************************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY   2         26.699  7 G- 6
*************************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 26.699/2007

BACKGROUND FOR GELI DETECTOR 6 OF 1.811/2007 1375.0 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.6224	50.14	511.0	2.3106	3.31	1120.3	0.3595	13.96
92.0	0.7505	22.46	583.1	0.5662	19.50	1173.2	0.0430	0.00
143.0	0.1067	0.00	609.3	0.9957	5.07	1238.1	0.1603	14.78
186.0	0.5077	15.50	661.6	0.0853	28.48	1332.5	0.0532	28.93
198.0	0.1287	0.00	727.2	0.1281	17.80	1337.7	0.0000	0.00
238.6	1.1958	29.75	846.0	0.0625	0.00	1461.0	3.1055	9.84
279.0	0.2460	0.00	860.4	0.1053	19.95	1586.0	0.0773	0.00
295.2	0.4169	19.60	911.1	0.4260	15.85	1591.0	0.1130	31.59
338.4	0.2057	23.53	968.9	0.3063	28.89	1729.6	0.0661	22.69
351.9	0.8857	12.77	1001.0	0.0716	69.65	1764.5	0.3674	9.04

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 1/26/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
336.905	6	1.3338	12.583	73.
349.852	6	1.3218	11.981	63.
352.746	6	1.3080	12.674	24.
353.834	6	1.3114	12.373	30.
356.660	6	1.3386	13.451	111.
4.638	7	1.3913	12.530	18. NG
4.854	7	1.4380	11.424	46. NG
5.755	7	1.4354	12.275	24. NG
20.762	7	1.4106	11.030	21. NG
26.607	7	1.4487	13.714	22. NG
AVERAGE		1.3227	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
320.990	6	1.3895	15.941	50.
321.801	6	1.3496	13.162	25.
322.821	6	1.3393	13.918	22.
336.876	6	1.3866	16.427	40.
349.900	6	1.4000	17.996	30.
352.766	6	1.3902	16.717	35.
353.774	6	1.3305	13.970	27.
356.784	6	1.3369	13.477	23.
4.652	7	1.3440	13.744	26.
20.778	7	1.3707	13.413	21. NG
AVERAGE		1.3545	0.025	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 26.607 7
ENERGY= -0.248056 + 1.0039451*CH + -1.575465E-06*CH**2
FWHM =SQRT(-0.6836 + 0.010933*ENERGY) (CO60= 3.726)

EFFICIENCIES FOR GEOMETRY XX 6 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

	PK	ENERGY	CPM	%ERR	COMMENT
	1	21.61	6659.72	0.1	
	2	25.41	6167.62	0.1	
	3	32.9	428.97	1.6	
	4	43.2	127.99	5.0	22S
	5	50.2	747.82	1.1	25S
	6	59.9	7272.79	0.1	Am241s
	7	67.4	181.78	2.1	
	8	71.6	555.34	1.9	
	9	75.0	791.50	0.9	
	10	85.1	208.55	1.5	Cs136
	11	88.2	8028.18	0.1	Cd109s
	12	105.3	58.33	12.0	
	13	122.1	3385.82	0.2	Co 57s
	14	136.4	430.31	1.3	Co 57s
b	15	143.0	10.45	37.0	Fe 59
	16	165.9	2898.54	0.3	Cs136 Ce139s
	17	188.1	9.18	36.2	Cs136
b	18	196.1	15.62	13.0	
b	19	199.0	113.45	3.1	Ac228
	20	203.7	19.34	15.3	Sb125
	21	255.1	89.50	4.2	Sn113
b	22	279.2	1453.06	0.4	Ac228 Hg203s
	23	310.9	6.34	39.5	Co 60p
	24	391.6	1918.88	0.3	Sn113s
b	25	511.0	46.19	5.9	Ac228 Th228 La140 Ru106 Na 22
	26	639.7	3.67	48.3	
b	27	661.6	1582.95	0.3	Cs137
	28	690.8	4.84	49.4	
	29	813.6	33.66	7.8	
	30	820.3	3.17	60.2	Co 60p
	31	898.0	2129.19	0.3	La140 Y 88s
b	32	912.2	22.22	11.7	Ac228
b	33	1173.2	1791.79	0.3	Cs134+ Co 60s
b	34	1332.5	1565.42	0.3	Co 60s
	35	1609.0	2.75	62.8	
	36	1710.9	2.06	49.0	
	37	1835.4	1268.38	0.3	Y 88s
	38	1850.0	12.17	7.6	

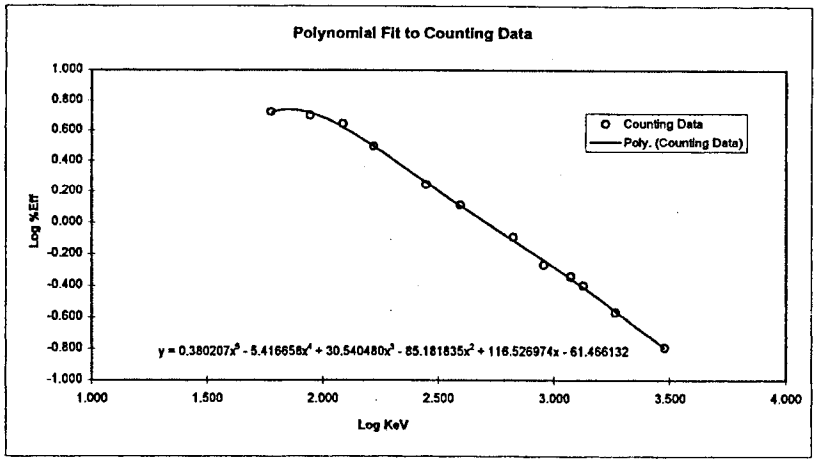
1098 2 GLY GSTOR 337

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	21.6	16659.72	0.1		
	2	25.4	16167.62	0.1		
	3	32.9	428.97	1.6		
	4	43.2	127.99	5.0	NO GEN.	228
	5	50.2	747.82	1.1		258
	6	59.9	7272.79	0.1		Am241s
	7	67.4	181.78	2.1		
	8	71.6	555.34	1.9		
	9	75.0	791.50	0.9		
	10	85.1	208.55	1.5		Cs136
	11	88.2	8028.18	0.1		Cd109s
	12	105.3	58.33	12.0		
	13	122.1	3385.82	0.2		Co 57s
	14	136.4	430.31	1.3		Co 57s
b	15	143.0	10.45	37.0		Fe 59
	16	165.9	2898.54	0.3		Cs136 Ce139s
	17	188.1	9.18	36.2		Cs136
b	18	196.1	15.62	13.0		
b	19	199.0	113.45	3.1	Ac228	
	20	203.7	19.34	15.3		Sb125
	21	255.1	89.50	4.2		Sn113
b	22	279.2	1453.06	0.4	Ac228	Hg203s
	23	310.9	6.34	39.5		Co 60p
	24	391.6	1918.88	0.3		Sn113s
b	25	511.0	46.19	5.9	Ac228 Th228 NO GEN.	La140 Ru106 Na 22
	26	639.7	3.67	48.3		
b	27	661.6	1582.95	0.3	NO GEN.	Cs137
	28	690.8	4.84	49.4	NO GEN.	
	29	813.6	33.66	7.8		
	30	820.3	3.17	60.2		Co 60p
	31	898.0	2129.19	0.3		La140 Y 88s
b	32	912.2	22.22	11.7	Ac228	
b	33	1173.2	1791.79	0.3		Cs134+ Co 60s
b	34	1332.5	1565.42	0.3		Co 60s
	35	1609.0	2.75	62.8	NO GEN.	
	36	1710.9	2.06	49.0		
	37	1835.4	1268.38	0.3		Y 88s
	38	1850.0	12.17	7.6		

Detector	G1	100 mL Jar	
Geometry	JR	Shelf 0	EFF. DATE
Std I.D.	(GLY)1098-2		13-Feb-07
Filename	GELI01JR0.EFF		

Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	%Eff Avg	%SD of %Eff	LogKev	Log%Eff	%Dev from Spline
59.50	[redacted]	[redacted]	5.26277	2.08009	1.775	0.721	1
88.00	[redacted]	[redacted]	4.96587	1.00931	1.944	0.696	-4
122.10	[redacted]	[redacted]	4.38276	0.11444	2.087	0.642	5
165.90	[redacted]	[redacted]	3.11318	0.41218	2.220	0.493	0
279.20	[redacted]	[redacted]	1.74771	0.67692	2.446	0.242	-3
391.70	[redacted]	[redacted]	1.29184	0.36942	2.593	0.111	1
661.70	[redacted]	[redacted]	0.80214	1.77639	2.821	-0.096	4
898.00	[redacted]	[redacted]	0.53442	0.52998	2.953	-0.272	-7
1173.20	[redacted]	[redacted]	0.45116	2.08065	3.069	-0.346	3
1332.50	[redacted]	[redacted]	0.39547	2.64735	3.125	-0.403	3
1836.10	[redacted]	[redacted]	0.26869	1.87047	3.264	-0.571	-2
			#DIV/0!		#NUM!	#DIV/0!	#DIV/0!
3000	(artificial data)		[redacted]		3.477	-0.796	0
				avg		#DIV/0!	

(shaded cells are manual entry, all others are calculated)

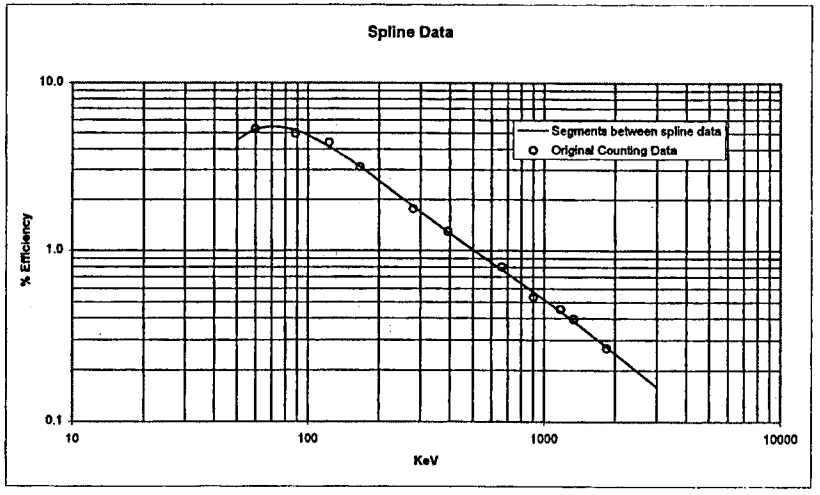


Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
50	4.53269	1.699	0.656		
55	4.96120	1.740	0.696		
60	5.23609	1.778	0.719	[redacted]	#DIV/0!
65	5.38659	1.813	0.731		
70	5.44124	1.845	0.736		
80	5.35704	1.903	0.729		
90	5.12692	1.954	0.710		
100	4.83508	2.000	0.684	[redacted]	#DIV/0!
110	4.52730	2.041	0.656		
130	3.94493	2.114	0.596		
150	3.44963	2.176	0.538		
170	3.04357	2.230	0.483		
190	2.71277	2.279	0.433		
250	2.03112	2.398	0.308		
300	1.67826	2.477	0.225	[redacted]	#DIV/0!
500	1.00580	2.699	0.003		
700	0.72806	2.845	-0.138		
1000	0.51550	3.000	-0.288	[redacted]	#DIV/0!
1400	0.36649	3.146	-0.436		
2000	0.24971	3.301	-0.603		
3000	0.15960	3.477	-0.797		

Polynomial Coefficients

x5 =	[redacted]
x4 =	[redacted]
x3 =	[redacted]
x2 =	[redacted]
x1 =	[redacted]
x0 =	[redacted]



Det ... GELI 1
Geo ... JR - 100 ml Jar
Unif ... 0
Ref ... 100 mL in Parkway Jar

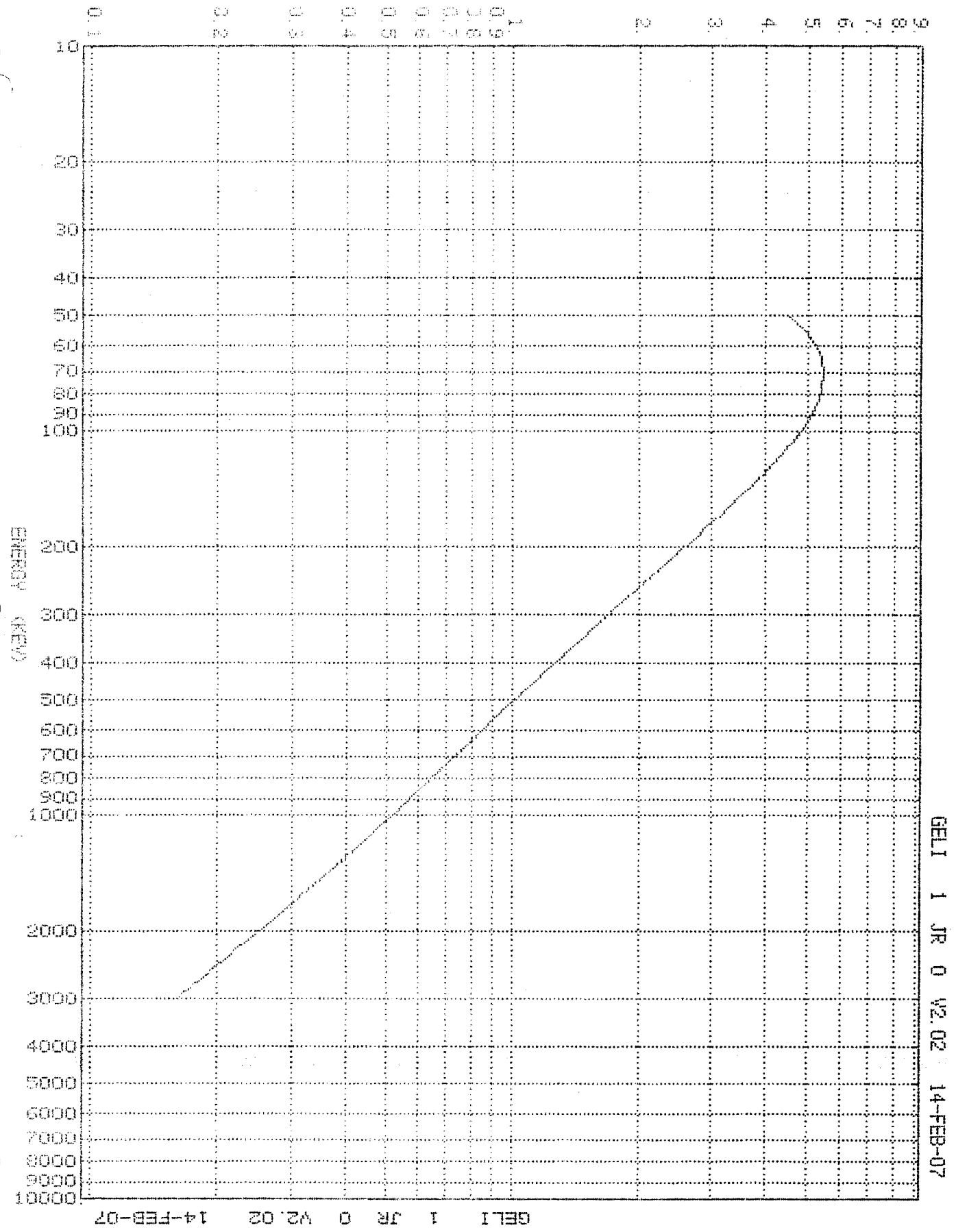
Date 14-FEB-07
Version .. 2.02
File ..... ND:[25,4]GELI01JRO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	4.53269	108	4.58499	216	2.36962	324	1.55368	432	1.16450
51	4.61856	110	4.52730	218	2.34671	326	1.54412	434	1.15912
52	4.70435	112	4.46056	220	2.32422	328	1.53469	436	1.15380
53	4.79005	114	4.39596	222	2.30214	330	1.52536	438	1.14852
54	4.87567	116	4.33339	224	2.28047	332	1.51615	440	1.14328
55	4.96120	118	4.27276	226	2.25920	334	1.50706	442	1.13810
56	5.01691	120	4.21398	228	2.23831	336	1.49806	444	1.13296
57	5.07225	122	4.15696	230	2.21779	338	1.48918	446	1.12787
58	5.12722	124	4.10161	232	2.19763	340	1.48040	448	1.12282
59	5.18183	126	4.04787	234	2.17783	342	1.47172	450	1.11782
60	5.23609	128	3.99567	236	2.15837	344	1.46315	452	1.11286
61	5.26682	130	3.94493	238	2.13925	346	1.45467	454	1.10795
62	5.29723	132	3.88887	240	2.12046	348	1.44629	456	1.10308
63	5.32732	134	3.83442	242	2.10198	350	1.43801	458	1.09825
64	5.35710	136	3.78153	244	2.08382	352	1.42982	460	1.09347
65	5.38659	138	3.73012	246	2.06596	354	1.42173	462	1.08872
66	5.39780	140	3.68014	248	2.04840	356	1.41372	464	1.08402
67	5.40887	142	3.63153	250	2.03112	358	1.40580	466	1.07936
68	5.41980	144	3.58422	252	2.01425	360	1.39798	468	1.07473
69	5.43059	146	3.53816	254	1.99765	362	1.39024	470	1.07015
70	5.44124	148	3.49332	256	1.98132	364	1.38258	472	1.06560
71	5.43223	150	3.44963	258	1.96525	366	1.37501	474	1.06110
72	5.42337	152	3.40422	260	1.94943	368	1.36752	476	1.05663
73	5.41464	154	3.35998	262	1.93386	370	1.36011	478	1.05220
74	5.40604	156	3.31688	264	1.91853	372	1.35278	480	1.04780
75	5.39757	158	3.27487	266	1.90343	374	1.34553	482	1.04345
76	5.38923	160	3.23391	268	1.88856	376	1.33836	484	1.03913
77	5.38101	162	3.19396	270	1.87392	378	1.33126	486	1.03484
78	5.37290	164	3.15499	272	1.85951	380	1.32424	488	1.03059
79	5.36492	166	3.11695	274	1.84530	382	1.31729	490	1.02637
80	5.35704	168	3.07982	276	1.83131	384	1.31041	492	1.02219
81	5.33229	170	3.04357	278	1.81752	386	1.30361	494	1.01804
82	5.30796	172	3.00697	280	1.80393	388	1.29687	496	1.01393
83	5.28403	174	2.97122	282	1.79055	390	1.29021	498	1.00985
84	5.26049	176	2.93630	284	1.77735	392	1.28361	500	1.00580
85	5.23733	178	2.90218	286	1.76434	394	1.27708	502	1.00195
86	5.21455	180	2.86882	288	1.75152	396	1.27062	504	0.99813
87	5.19212	182	2.83622	290	1.73888	398	1.26422	506	0.99434
88	5.17005	184	2.80433	292	1.72642	400	1.25788	508	0.99058
89	5.14832	186	2.77314	294	1.71413	402	1.25161	510	0.98685
90	5.12692	188	2.74263	296	1.70201	404	1.24540	512	0.98315
91	5.09550	190	2.71277	298	1.69005	406	1.23925	514	0.97947
92	5.06462	192	2.68298	300	1.67826	408	1.23316	516	0.97583
93	5.03426	194	2.65383	302	1.66712	410	1.22713	518	0.97221
94	5.00439	196	2.62528	304	1.65613	412	1.22116	520	0.96862
95	4.97502	198	2.59732	306	1.64528	414	1.21525	522	0.96505
96	4.94613	200	2.56994	308	1.63457	416	1.20939	524	0.96152
97	4.91770	202	2.54312	310	1.62400	418	1.20360	526	0.95800
98	4.88972	204	2.51684	312	1.61357	420	1.19785	528	0.95452
99	4.86219	206	2.49108	314	1.60327	422	1.19216	530	0.95106
100	4.83508	208	2.46583	316	1.59310	424	1.18652	532	0.94762
102	4.76946	210	2.44107	318	1.58306	426	1.18094	534	0.94422
104	4.70597	212	2.41679	320	1.57314	428	1.17541	536	0.94083
106	4.64452	214	2.39298	322	1.56335	430	1.16993	538	0.93747

Det ... GELI 1
Geo ... JR - 100-ml Jar
Shlf .. 0
Ref ... 100 mL in Parkway Jar

Date 14-FEB-07
Version .. 2.02
File ..... ND:[25,4]GELI01JR0.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	0.93414	660	0.77039	930	0.55301	1260	0.40781	1800	0.27968
542	0.93083	665	0.76482	935	0.55015	1270	0.40455	1810	0.27802
544	0.92754	670	0.75934	940	0.54732	1280	0.40135	1820	0.27637
546	0.92428	675	0.75394	945	0.54451	1290	0.39820	1830	0.27475
548	0.92104	680	0.74861	950	0.54174	1300	0.39509	1840	0.27314
550	0.91782	685	0.74337	955	0.53899	1310	0.39203	1850	0.27155
552	0.91463	690	0.73819	960	0.53628	1320	0.38902	1860	0.26998
554	0.91145	695	0.73309	965	0.53359	1330	0.38606	1870	0.26843
556	0.90830	700	0.72806	970	0.53092	1340	0.38313	1880	0.26690
558	0.90518	705	0.72306	975	0.52829	1350	0.38026	1890	0.26538
560	0.90207	710	0.71813	980	0.52568	1360	0.37742	1900	0.26388
562	0.89899	715	0.71327	985	0.52310	1370	0.37463	1925	0.26019
564	0.89593	720	0.70847	990	0.52054	1380	0.37188	1950	0.25660
566	0.89289	725	0.70375	995	0.51801	1390	0.36916	1975	0.25311
568	0.88987	730	0.69908	1000	0.51550	1400	0.36649	2000	0.24971
570	0.88687	735	0.69448	1005	0.51290	1410	0.36369	2025	0.24631
572	0.88389	740	0.68993	1010	0.51033	1420	0.36094	2050	0.24299
574	0.88093	745	0.68545	1015	0.50778	1430	0.35823	2075	0.23976
576	0.87799	750	0.68103	1020	0.50525	1440	0.35555	2100	0.23662
578	0.87508	755	0.67666	1025	0.50275	1450	0.35291	2125	0.23354
580	0.87218	760	0.67235	1030	0.50028	1460	0.35031	2150	0.23055
582	0.86930	765	0.66810	1035	0.49783	1470	0.34775	2175	0.22762
584	0.86644	770	0.66390	1040	0.49540	1480	0.34522	2200	0.22477
586	0.86360	775	0.65975	1045	0.49300	1490	0.34273	2225	0.22198
588	0.86078	780	0.65566	1050	0.49062	1500	0.34028	2250	0.21926
590	0.85797	785	0.65161	1055	0.48826	1510	0.33785	2275	0.21660
592	0.85519	790	0.64762	1060	0.48593	1520	0.33546	2300	0.21401
594	0.85243	795	0.64368	1065	0.48361	1530	0.33310	2325	0.21147
596	0.84968	800	0.63978	1070	0.48132	1540	0.33078	2350	0.20898
598	0.84695	805	0.63594	1075	0.47905	1550	0.32848	2375	0.20656
600	0.84424	810	0.63214	1080	0.47680	1560	0.32622	2400	0.20418
602	0.84154	815	0.62838	1085	0.47457	1570	0.32398	2425	0.20186
604	0.83887	820	0.62467	1090	0.47237	1580	0.32178	2450	0.19959
606	0.83621	825	0.62101	1095	0.47018	1590	0.31960	2475	0.19736
608	0.83357	830	0.61739	1100	0.46801	1600	0.31745	2500	0.19519
610	0.83094	835	0.61381	1105	0.46587	1610	0.31533	2525	0.19305
612	0.82833	840	0.61027	1110	0.46374	1620	0.31324	2550	0.19096
614	0.82574	845	0.60678	1115	0.46163	1630	0.31117	2575	0.18892
616	0.82317	850	0.60332	1120	0.45954	1640	0.30913	2600	0.18691
618	0.82061	855	0.59990	1125	0.45747	1650	0.30712	2625	0.18495
620	0.81806	860	0.59653	1130	0.45542	1660	0.30513	2650	0.18303
622	0.81554	865	0.59319	1135	0.45338	1670	0.30316	2675	0.18114
624	0.81303	870	0.58989	1140	0.45137	1680	0.30122	2700	0.17929
626	0.81053	875	0.58663	1150	0.44739	1690	0.29931	2725	0.17747
628	0.80805	880	0.58340	1160	0.44348	1700	0.29741	2750	0.17569
630	0.80559	885	0.58021	1170	0.43963	1710	0.29554	2775	0.17395
632	0.80314	890	0.57705	1180	0.43586	1720	0.29369	2800	0.17223
634	0.80071	895	0.57393	1190	0.43214	1730	0.29187	2825	0.17055
636	0.79629	900	0.57085	1200	0.42849	1740	0.29006	2850	0.16890
638	0.79588	905	0.56779	1210	0.42490	1750	0.28828	2875	0.16728
640	0.79350	910	0.56477	1220	0.42137	1760	0.28652	2900	0.16569
645	0.78759	915	0.56179	1230	0.41790	1770	0.28478	2925	0.16412
650	0.78177	920	0.55883	1240	0.41448	1780	0.28306	2950	0.16259
655	0.77604	925	0.55591	1250	0.41112	1790	0.28136	2975	0.16108


PERCENT EFFICIENCY
ENERGY (KEV)
GELI 1 JR 0 V2.02 14-FEB-07

ANALYTICS
Isotope Products Laboratories Company

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

Log 417 Recd 12/27/06 K Trenton

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

1098-2

LIBR= A782

74159-207
100 mL Solid in Wide Mouth PPi Parkway Jar

Customer: Eberline Services / Richmond, CA
P.O. No.: 00003890, Item 1
Calibration Date: 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01515

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1990.0	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	189000	2863.9	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	94570	1433.0	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	133800	2027.5	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	295300	4475	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	185600	2812.4	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	116700	1768.4	0.70	1.20	2.78	HPGe
Y-88	898.0	106.60	455400	6901	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	226900	3438	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	227000	3440	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	481200	7292	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
This standard will expire one year after the calibration date.

Source Prepared by: M. Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate

DEAD TIME = 6.56% LIVE TIME----v <---- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-1 XX 33.682 7 121.50 MIN 1.00000 SM 781

LIBR=A962 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.995E-01 41G			
59 (59.54)	1.990000	1.00000	6188.197	3.110E+03 s		0.22%	1.402E+03
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.303E-01 2G			
88 (88.03)	0.039000	1.00000	7233.947	1.855E+05 s		0.14%	1.006E+05
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.289E-01 10G			
122 (122.06)	1.433000	1.00000	2808.347	1.960E+03 s		0.33%	1.211E+03
136 (136.47)	0.000001	1.00000	334.789	3.348E+08 s		1.96%	2.069E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 5.355E-01 3G			
166 (165.80)	0.800000	1.00000	2128.383	2.660E+03 s		0.37%	2.238E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 1.582E-01 2G			
279 (279.21)	0.815000	1.00000	852.962	1.047E+03 s		0.69%	2.979E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 4.740E-01 5G			
392 (391.40)	0.642000	1.00000	1087.926	1.695E+03 s		0.50%	1.610E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.922E-01 3G			
662 (661.64)	1.768400	1.00000	834.341	4.718E+02 s		0.49%	2.142E+02
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 4.466E-01 8G			
898 (898.00)	0.920000	1.00000	1043.850	1.135E+03 s		0.52%	1.144E+03
1835 (1836.10)	1.000000	1.00000	549.271	5.493E+02 s		0.50%	5.540E+02
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.563E-01 5G			
1173 (1173.21)	0.999200	1.00000	879.756	8.805E+02 s		0.49%	4.147E+02
1332 (1332.48)	1.000000	1.00000	768.477	7.685E+02 s		0.48%	3.620E+02

DEAD TIME = 6.56% LIVE TIME-----> <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 Q-1 XX 33.682 7 121.50 MIN 1.00000 SM 781

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

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Group	1098	Time of count	33.682 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	121.5
Type code	GLY	Dead Time Pct	6.56242
ID	74159-207 (JR)	Background GMT	27.044 2007
Geometry, detector	XX-1	Standard GMT	20.891 2007
Aliquot	1.	Days since TO	123.9744
Unit of Aliquot	SMPL	Time on	8:22 PST 2-FEB
Data Sheet Units	PCI /SMPL	Time off	10:23 PST 2-FEB
Library	A982	Calc Time	14:22 02-FEB-07
Slope	1.001289	Width slope	0.005351
Intercept	-.114029	Width offset	5.175049
X**2 TERM	-0.17979892E-05	Sensitivity	4.

NP:[7,67]781.GSP 40 PEAKS

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PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	7	26.1	21	33	78000	1.94	1829320	26.2	1.51E+04	0.1	0.107	0	*******
2	7	32.9	21	33	423137	3.92	671002	33.0	5.52E+03	0.3	0.214	0	0.00
3	7	38.0	21	33	437701	3.21	173444	38.1	1.43E+03	0.8	0.331	0	0.00
4	7	42.9	21	33	698543	4.65	229655	43.0	1.89E+03	0.7	0.475	0	0.00
5	7	49.7	21	33	457265	2.77	22234	49.8	1.83E+02	4.5	0.739	0	0.00
6	0	59.4	53	11	567717	2.41	751866	59.5	6.19E+03	0.2	100.	0	0.00
7	4	67.1	65	12	197304	2.96	25596	67.2	2.11E+02	2.7	100.	0	16.10
8	4	71.0	65	12	442136	4.47	84272	71.0	6.94E+02	1.6	100.	0	0.00
9	4	81.3	77	20	351662	4.40	44520	81.3	3.66E+02	2.3	100.	0	406.00
10	4	88.1	77	20	225819	2.44	878865	88.1	7.23E+03	0.1	100.	0	0.00
11	0	101.6	99	7	170928	3.58	2127	101.6	1.75E+01	32.3	100.	0	0.00
12	0	109.7	107	7	159708	2.99	8603	109.7	7.08E+01	7.8	100.	0	0.00
13	0	122.0	116	12	228243	2.50	341175	122.0	2.81E+03	0.3	100.	0	0.00
14	0	136.4	132	10	169569	2.49	40672	136.4	3.35E+02	2.0	100.	0	0.00
15	0	143.8	141	7	110088	4.33	3706	143.7	3.05E+01	15.0	100.	0	0.00
16	0	157.5	150	10	144865	3.24	1192	157.5	9.81E+00	60.1	100.	0	0.00
17	0	165.8	160	12	161631	2.56	258540	165.8	2.13E+03	0.4	100.	0	0.00
18	0	187.2	185	6	70320	2.95	1739	187.1	1.43E+01	24.2	100.	0	0.00
19	0	198.7	195	8	93617	2.68	9115	198.6	7.50E+01	5.9	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	255.2	252	8	67385	2.58	5941	255.1	4.89E+01	7.7	100.	0	0.00
21	0	279.1	273	13	95340	2.69	103565	279.0	8.52E+02	0.7	100.	0	0.00
22	0	300.4	297	8	51514	3.79	1274	300.3	1.05E+01	31.0	100.	0	0.00
23	0	310.6	308	8	48559	2.06	564	310.5	4.64E+00	67.8	100.	0	0.00
24	0	391.6	385	13	70319	2.73	132147	391.5	1.09E+03	0.5	100.	0	0.00
25	0	413.0	410	7	35755	4.13	1276	412.9	1.05E+01	24.6	100.	0	0.00
26	0	510.9	507	9	36423	[illegible]		8	2.73E+01	10.5	100.	0	0.00
[illegible]		661.8	653	34	40413	[illegible]	[illegible]	661.8	8.34E+02	0.5	100.	0	48.00

29	0	738.3	736	7	20771	2.53	803	738.4	4.78E+00	40.0	100.	0	0.00
30	0	813.9	809	11	29165	3.90	3516	814.1	2.89E+01	9.6	100.	0	0.00
31	0	897.9	889	18	57084	3.33	126791	898.3	1.04E+03	0.5	100.	0	0.00
32	0	911.6	909	9	30445	2.62	642	912.1	5.28E+00	49.1	100.	0	0.00
33	0	919.4	917	9	25429	3.19	972	919.8	8.17E+00	28.0	100.	0	0.00
34	0	1173.1	1165	18	31401	3.68	106892	1174.2	8.80E+02	0.5	100.	0	0.00
35	0	1194.3	1190	11	15081	5.00	1602	1195.4	1.32E+01	15.2	100.	0	0.00
36	0	1310.2	1309	7	5740	2.34	279	1311.7	2.29E+00	46.1	100.	0	0.00
37	0	1332.3	1325	17	22202	3.75	93372	1333.9	7.68E+02	0.5	100.	0	0.00
38	0	1352.6	1347	14	12889	6.08	1415	1354.2	1.16E+01	17.2	100.	0	0.00
39	0	1835.3	1830	18	8900	4.35	66717	1839.2	5.49E+02	0.5	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
40	0	1849.7	1850	9	3604	3.32	487	1853.6	4.00E+00	22.5	100.	0	0.00

FWHM=SQRT(1.01733E+01 + 4.56594E-03 *E)

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BACKGROUND INFO 1098 GLY 2 33.682 7 G- 1 BG DATE 27.044 7

****

PEAK			BACKGROUND			NET	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
143.77	30.5057	15.00	143.00	0.0931	34.71	30.4126	15.05
187.16	14.3148	24.18	186.00	0.3656	9.57	13.9493	24.81
198.68	75.0189	5.90	198.00	0.0518	27.78	74.9671	5.90
279.14	852.3890	0.69	279.00	0.0000	0.00	852.3890	0.69
510.85	27.3274	10.48	511.00	0.8929	4.60	26.4346	10.83
661.78	834.3720	0.49	661.60	0.0338	0.00	834.3383	0.49
911.63	5.2846	49.14	911.10	0.0514	49.98	5.2332	49.63
1173.09	879.7686	0.49	1173.20	0.0272	0.00	879.7415	0.49
1332.32	768.4932	0.48	1332.50	0.0288	0.00	768.4644	0.48

0 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 1098 GLY 2 33.682 7 G- 1

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 33.682/2007

BACKGROUND FOR GELI DETECTOR 1 OF 27.044/2007 3667.7 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.7847	18.25	511.0	0.8929	4.60	1120.3	0.0313	9.89
92.0	0.8600	4.40	583.1	0.1094	27.34	1173.2	0.0272	0.00
143.0	0.0931	34.71	609.3	0.1309	30.86	1238.1	0.0000	0.00
186.0	0.3656	9.57	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0518	27.78	727.2	0.0443	0.00	1377.7	0.0075	0.00
238.6	0.4981	8.05	846.0	0.0291	26.45	1461.0	0.0474	39.01
279.0	0.0000	0.00	860.4	0.0410	0.00	1586.0	0.0000	0.00
295.2	0.1010	34.14	911.1	0.0514	49.98	1591.0	0.0620	0.00
338.4	0.0575	21.55	968.9	0.0269	0.00	1729.6	0.0061	0.00
351.9	0.1766	21.85	1001.0	0.0394	0.00	1764.5	0.0384	27.35

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 2/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
295.001	6	1.0519	3.532	22.
301.975	6	1.0622	4.270	36.
309.042	6	1.0675	2.249	22.
316.064	6	1.0692	4.219	20.
322.821	6	1.0844	2.233	20.
336.853	6	1.0756	2.800	23.
350.006	6	1.0721	3.790	21.
356.822	6	1.0885	3.272	13.
5.705	7	1.0875	3.007	20.
20.868	7	1.0580	4.663	29.
AVERAGE		1.0717	0.012	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
302.004	6	1.0626	4.563	27.
306.609	6	1.0640	5.601	22. NG
309.022	6	1.0609	4.908	26.
316.042	6	1.0737	5.494	30.
322.838	6	1.0726	4.175	83.
336.812	6	1.0804	3.118	24.
349.983	6	1.0623	5.691	29.
356.803	6	1.0920	3.791	25.
5.722	7	1.0735	5.147	24.
20.891	7	1.0901	7.076	25.
AVERAGE		1.0732	0.011	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 20.891 7
ENERGY= -0.114029 + 1.0012885*CH + -1.797989E-06*CH**2
FWHM =SQRT(5.1750 + 0.005352*ENERGY) (CO60= 3.508)

EFFICIENCIES FOR GEOMETRY XX 1 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

1098 2 GLY GSTOR 781

	PK	ENERGY	CPM	%ERR	COMMENT
	1	26.1	15056.13	0.1	
	2	32.9	5522.65	0.3	
	3	38.0	1427.52	0.8	
	4	42.9	1890.16	0.7	
	5	49.7	182.99	4.5	
	6	59.4	6188.20	0.2	Am241s
	7	67.1	210.66	2.7	NO GEN. 33S
	8	71.0	693.60	1.6	
	9	81.3	366.42	2.3	Ce144 I 131
	10	88.1	7233.46	0.1	Cd109s
	11	101.6	17.51	32.3	
	12	109.7	70.80	7.8	La140 Cs136 Sb125
	13	122.0	2808.02	0.3	Co 57s
	14	136.4	334.75	2.0	Co 57s
b	15	143.8	30.41	15.0	Fe 59
	16	157.5	9.81	60.1	
	17	165.8	2127.90	0.4	Cs136 Ce139s
b	18	187.2	13.95	24.8	Ra226 Cs136
b	19	198.7	74.97	5.9	Ac228
	20	255.2	48.90	7.7	Sn11
b	21	279.1	852.39	0.7	Ac228 Hg203s
	22	300.4	10.49	31.0	Th228
	23	310.6	4.64	67.8	Co 60p
	24	391.6	1087.63	0.5	Sn113s
	25	413.0	10.51	24.6	
b	26	510.9	26.43	10.8	Ac228 Th228 La140 Ru106 Na 22
b	27	661.8	834.34	0.5	Cs137s
	28	681.4	22.14	21.3	
	29	738.3	4.96	40.0	NO GEN.
	30	813.9	28.94	9.6	
	31	897.9	1043.54	0.5	La140 Y 88s
b	32	911.6	5.23	49.6	Ac228 NO GEN.
	33	919.4	8.17	28.0	La140
b	34	1173.1	879.74	0.5	Cs134+ Co 60s
	35	1194.3	13.19	15.2	NO GEN.
	36	1310.2	2.29	46.1	
b	37	1332.3	768.46	0.5	NO GEN. Co 60s
	38	1352.6	11.64	17.2	
	39	1835.3	549.11	0.5	Y 88s
	40	1849.7	4.00	22.5	

DEAD TIME = 7.39% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-1 XX 3.892 7 78.58 MIN 1.00000 SM 149

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMP(AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.996E-01 41G		
59 (59.54)	1.990000	1.00000	6373.786	3.203E+03 s	0.28%	1.443E+03
102 (103.00)	0.000195	1.00000	16.765	8.598E+04	39.46%	3.874E+04
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.682E-01 2G		
88 (88.03)	0.039000	1.00000	7456.956	1.912E+05 s	0.18%	9.920E+04
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.865E-01 10G		
122 (122.06)	1.433000	1.00000	3034.929	2.118E+03 s	0.40%	1.213E+03
136 (136.47)	0.000001	1.00000	385.206	3.852E+08 s	2.47%	2.206E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 6.222E-01 3G		
166 (165.80)	0.800000	1.00000	2458.614	3.073E+03 s	0.43%	2.225E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.464E-01 2G		
279 (279.21)	0.815000	1.00000	1315.741	1.614E+03 s	0.62%	2.951E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.671E-01 5G		
392 (391.40)	0.642000	1.00000	1308.520	2.038E+03 s	0.57%	1.619E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.941E-01 3G		
662 (661.64)	1.768400	1.00000	857.178	4.847E+02 s	0.87%	2.196E+02
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.420E-01 8G		
898 (898.00)	0.920000	1.00000	1276.491	1.387E+03 s	0.56%	1.153E+03
1836 (1836.10)	1.000000	1.00000	684.542	6.845E+02 s	0.61%	5.689E+02
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.666E-01 5G		
1173 (1173.21)	0.999200	1.00000	915.805	9.165E+02 s	0.63%	4.271E+02
1333 (1332.48)	1.000000	1.00000	806.405	8.064E+02 s	0.60%	3.758E+02

DEAD TIME = 7.39% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-1 XX 3.892 7 78.58 MIN 1.00000 SM 149

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

Group	1098	Time of count	3.892 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	78.58334
Type code	GLY	Dead Time Pct	7.385582
ID	74159-207 (JR)	Background GMT	1.810 2007
Geometry, detector	XX-1	Standard GMT	356.822 2006
Aliquot	1.	Days since TO	94.18388
Unit of Aliquot	SMPL	Time on	13:24 PST 3-JAN
Data Sheet Units	PCI /SMPL	Time off	14:43 PST 3-JAN
Library	A982	Calc Time	15:08 03-JAN-07
Slope	1.001241	Width slope	0.007769
Intercept	0.126842	Width offset	4.628612
X**2 TERM	-0.18197669E-05	Sensitivity	4.

NP:[7,67]149.GSP 36 PEAKS

****

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	25.9	21	32	62993	1.99	1317557	25.8	1.68E+04	0.1	0.105	0	******
2	5	33.0	21	32	302862	3.92	496944	32.8	6.32E+03	0.3	0.216	0	0.00
3	5	38.0	21	32	274588	2.90	117457	37.8	1.49E+03	0.9	0.330	0	0.00
4	5	42.9	21	32	518382	5.03	179992	42.7	2.29E+03	0.8	0.474	0	0.00
5	5	49.7	21	32	238197	2.59	13164	49.5	1.68E+02	5.1	0.739	0	0.00
6	0	59.4	53	11	371775	2.43	500873	59.2	6.37E+03	0.3	100.	0	0.00
7	3	67.2	65	12	114513	2.04	16199	67.0	2.06E+02	3.1	100.	0	50.60
8	3	70.3	65	12	259361	3.10	43438	70.1	5.53E+02	2.2	100.	0	0.00
9	3	72.8	65	12	261319	2.85	23558	72.6	3.00E+02	4.0	100.	0	0.00
10	4	83.1	77	21	317820	3.85	34866	82.9	4.44E+02	3.7	100.	0	167.00
11	4	88.1	77	21	160088	2.39	585967	87.8	7.46E+03	0.2	100.	0	0.00
12	0	102.3	99	6	107812	2.75	1317	102.0	1.68E+01	39.5	100.	0	0.00
13	0	109.0	106	7	119390	3.49	6170	108.8	7.85E+01	9.4	100.	0	0.00
14	0	122.0	116	12	168873	2.46	238477	121.8	3.03E+03	0.4	100.	0	0.00
15	0	136.4	131	11	141238	2.54	30269	136.1	3.85E+02	2.5	100.	0	0.00
16	0	143.9	141	7	84857	2.44	2300	143.6	2.93E+01	21.1	100.	0	0.00
17	0	165.8	160	12	122080	2.51	193177	165.5	2.46E+03	0.4	100.	0	0.00
18	0	187.0	184	7	60662	2.58	2082	186.7	2.65E+01	19.7	100.	0	0.00
19	0	198.7	195	8	69418	2.50	6771	198.4	8.62E+01	6.8	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	255.0	251	9	55729	2.69	5053	254.7	6.43E+01	8.5	100.	0	0.00
21	0	279.2	272	13	71591	2.67	103350	278.8	1.32E+03	0.6	100.	0	0.00
22	0	300.3	297	8	37748	3.85	1067	300.0	1.36E+01	31.8	100.	0	0.00
23	0	391.7	384	14	54118	2.70	102810	391.4	1.31E+03	0.6	100.	0	0.00
24	0	412.8	410	8	29155	3.30	752	412.4	9.57E+00	39.4	100.	0	0.00
25	0	511.0	507	9	25867	3.26	2351	510.7	2.99E+01	12.5	100.	0	0.00
26	0	661.8	654	17	51660	3.09	67362	661.6	8.57E+02	0.9	100.	0	0.00
27	0	813.7	808	12	22013	3.94	3140	813.8	4.00E+01	9.6	100.	0	0.00
28	0	898.2	889	18	39680	3.31	100292	898.4	1.28E+03	0.6	100.	0	0.00
29	0	912.4	909	9	21257	2.23	673	912.6	8.57E+00	39.3	100.	0	0.00
30	0	1173.4	1164	20	22999	3.54	71968	1174.3	9.16E+02	0.6	100.	0	0.00
31	0	1194.1	1190	11	10885	5.35	1103	1195.0	1.40E+01	18.6	100.	0	0.00
32	0	1332.6	1324	18	15872	3.78	63371	1334.0	8.06E+02	0.6	100.	0	0.00
33	0	1559.3	1560	6	4685	1.52	227	1561.7	2.83E+00	49.6	100.	0	0.00

```
 34   0 1836.2 1829 23   7779 4.28   53783 1839.9   6.84E+02   0.6 100.   0   0.00
 35   0 1851.0 1851  9   2932 5.27     402 1854.9   5.12E+00  24.9 100.   0   0.00
 36   0 1858.5 1859  9   1727 4.41     416 1862.4   5.29E+00  20.1 100.   0   0.00
FWHM=SQRT( 7.98383E+00 +  5.56538E-03 *E)

*************************************************************************************
BACKGROUND INFO 1098    GLY   2          3.892  7 G- 1     BG DATE   1.810  7
*************************************************************************************

v---------PEAK----------v      v------BACKGROUND-------v      v-------NET-----v
ENERGY       CPM   %ERROR      ENERGY       CPM   %ERROR          CPM   %ERROR

 143.89    29.2720 21.13        143.00  0.0892 34.87         29.1828 21.20
 186.96    26.4918 19.68        186.00  0.3670  9.35         26.1248 19.95
 198.73    86.1654  6.83        198.00  0.0621  0.00         86.1033  6.84
 279.17  1315.1650  0.62        279.00  0.0000  0.00       1315.1650  0.62
 511.00    29.9177 12.51        511.00  0.8900  3.38         29.0278 12.89
 661.78   857.2103  0.87        661.60  0.0338  0.00        857.1766  0.87
 912.38     8.5693 39.26        911.10  0.0725 24.29          8.4968 39.60
1173.41   915.8226  0.63       1173.20  0.0272  0.00        915.7955  0.63
1332.56   806.4213  0.60       1332.50  0.0251  0.00        806.3962  0.60
    0 PEAKS REJECTED BY BACKGROUND

*************************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY   2          3.892  7 G- 1
*************************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 3.892/2007

BACKGROUND FOR GELI DETECTOR 1 OF 1.810/2007 1109.5 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.8253	20.99	511.0	0.8900	3.38	1120.3	0.0473	0.00
92.0	0.8400	4.94	583.1	0.1098	27.51	1173.2	0.0272	0.00
143.0	0.0892	34.87	609.3	0.1211	30.56	1238.1	0.0000	0.00
186.0	0.3670	9.35	661.6	0.0338	0.00	1332.5	0.0251	0.00
198.0	0.0621	0.00	727.2	0.0443	0.00	1377.7	0.0075	0.00
238.6	0.4796	11.53	846.0	0.0474	72.96	1461.0	0.0483	40.59
279.0	0.0000	0.00	860.4	0.0410	0.00	1586.0	0.0000	0.00
295.2	0.1010	41.67	911.1	0.0725	24.29	1591.0	0.0620	0.00
338.4	0.0575	21.55	968.9	0.0433	0.00	1729.6	0.0061	0.00
351.9	0.1621	23.82	1001.0	0.0394	0.00	1764.5	0.0332	6.63

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 1/ 3/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
280.781	6	1.0202	3.827	23.
287.818	6	1.0257	4.019	22.
295.001	6	1.0519	3.532	22.
301.975	6	1.0622	4.270	36.
309.042	6	1.0675	2.249	22.
316.064	6	1.0692	4.219	20.
322.821	6	1.0844	2.233	20.
336.853	6	1.0756	2.800	23.
350.006	6	1.0721	3.790	21.
356.822	6	1.0885	3.272	13.
AVERAGE		1.0617	0.023	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
287.797	6	1.0180	7.644	28.
294.983	6	1.0504	5.738	23.
302.004	6	1.0626	4.563	27.
306.609	6	1.0640	5.601	22. NG
309.022	6	1.0609	4.908	26.
316.042	6	1.0737	5.494	30.
322.838	6	1.0726	4.175	83.
336.812	6	1.0804	3.118	24.
349.983	6	1.0623	5.691	29.
356.803	6	1.0920	3.791	25.
AVERAGE		1.0637	0.020	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 356.822 6
ENERGY= 0.126843 + 1.0012411*CH + -1.819767E-06*CH**2
FWHM =SQRT(4.6286 + 0.007770*ENERGY) (CO60= 3.871)

EFFICIENCIES FOR GEOMETRY XX 1 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

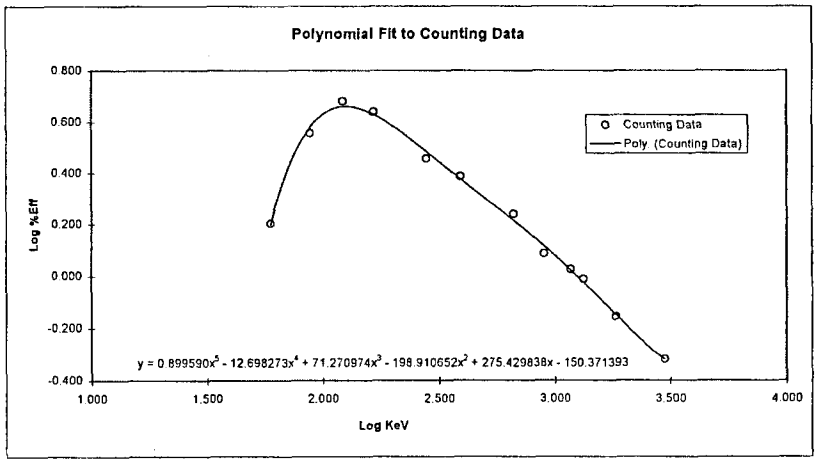
1098 2 GLY GSTOR 149

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	25.9	16766.37	0.1		
	2	33.0	6323.78	0.3		
	3	38.0	1494.68	0.9		
	4	42.9	2290.46	0.8		
	5	49.7	167.52	5.1		
	6	59.4	6373.79	0.3		Am241s
	7	67.2	206.13	3.1		33S
	8	70.3	552.76	2.2		
	9	72.8	299.78	4.0		
	10	83.1	443.69	3.7		
	11	88.1	7456.63	0.2		Cd109s
	12	102.3	16.77	39.5		
	13	109.0	78.51	9.4		La140 Cs136 Sb125
	14	122.0	3034.70	0.4		Co 57s
	15	136.4	385.18	2.5		Co 57s
b	16	143.9	29.18	21.2		Fe 59
	17	165.8	2458.25	0.4		Cs136 Ce139s
b	18	187.0	26.12	20.0	Ra226	Cs136
b	19	198.7	86.10	6.8	Ac228	
	20	255.0	64.30	8.5		Sn113
b	21	279.2	1315.17	0.6	Ac228	Hg203s
	22	300.3	13.58	31.8	Th228	
	23	391.7	1308.29	0.6		Sn113s
	24	412.8	9.57	39.4		
b	25	511.0	29.03	12.9	Ac228 Th228	La140 Ru106 Na 22
b	26	661.8	857.18	0.9	NO GEN.	Cs137s
	27	813.7	39.95	9.6		
	28	898.2	1276.25	0.6		La140 Y 88s
b	29	912.4	8.50	39.6	Ac228	
b	30	1173.4	915.80	0.6		Cs134+ Co 60s
	31	1194.1	14.04	18.6		
b	32	1332.6	806.40	0.6	NO GEN.	Co 60s
	33	1559.3	2.83	49.6		
	34	1836.2	684.41	0.6	NO GEN.	Y 88s
	35	1851.0	5.12	24.9		
	36	1858.5	5.29	20.1		

Detector	G8	100 mL Jar	
Geometry	JR	Shelf 0	EFF. DATE
Std I.D.	(GLY)1098-2		4-Jun-07
Filename	GELI08JR0.EFF		

Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	%Eff Avg	%SD of %Eff	LogKev	Log%Eff	%Dev from Spline
59.50	1.58768	1.59342	1.59055	0.25539	1.775	0.202	1
88.00	3.62048	3.57248	3.59648	0.94370	1.944	0.556	-5
122.10	4.69231	4.8641	4.77819	2.54175	2.087	0.679	5
165.90	4.32424	4.3607	4.34247	0.59385	2.220	0.638	2
279.20	2.88267	2.83392	2.85829	1.20584	2.446	0.456	-6
391.70	2.43446	2.43238	2.43342	0.06026	2.593	0.386	2
661.70	1.72497	1.73185	1.72841	0.28131	2.821	0.238	6
898.00	1.21952	1.21942	1.21947	0.00565	2.953	0.086	-7
1173.20	1.06143	1.06183	1.06163	0.02640	3.069	0.026	1
1332.50	0.97061	0.97429	0.97245	0.26746	3.125	-0.012	3
1836.10	0.69239	0.70337	0.69788	1.11189	3.264	-0.156	-2
			#DIV/0!		#NUM!	#DIV/0!	#DIV/0!
3000	(artificial data)		0.48000		3.477	-0.319	0
				avg	#DIV/0!		

(shaded cells are manual entry, all others are calculated)

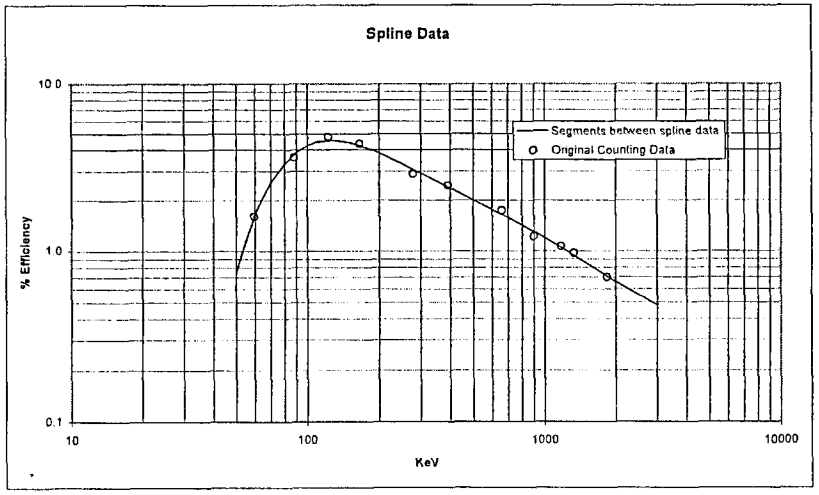


Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
50	0.74516	1.699	-0.128		
55	1.15980	1.740	0.064		
60	1.61917	1.778	0.209		#DIV/0!
65	2.08791	1.813	0.320		
70	2.53772	1.845	0.404		
80	3.31215	1.903	0.520		
90	3.87813	1.954	0.589		
100	4.24599	2.000	0.628		#DIV/0!
110	4.45413	2.041	0.649		
130	4.55194	2.114	0.658		
150	4.42173	2.176	0.646		
170	4.20182	2.230	0.623		
190	3.95865	2.279	0.598		
250	3.30384	2.398	0.519		
300	2.89513	2.477	0.462		#DIV/0!
500	1.99928	2.699	0.301		
700	1.57140	2.845	0.196		
1000	1.19897	3.000	0.079		#DIV/0!
1400	0.90384	3.146	-0.044		
2000	0.65671	3.301	-0.183		
3000	0.47888	3.477	-0.320		

Polynomial Coefficients

x5 =	0.89959
x4 =	-12.698273
x3 =	71.270974
x2 =	-198.910652
x1 =	275.429838
x0 =	-150.371393



Det ... GELI 8
Geo ... JR - 100-ml Jar
Shlf .. 0
Ref ... 100ML IN PARKWAY JAR

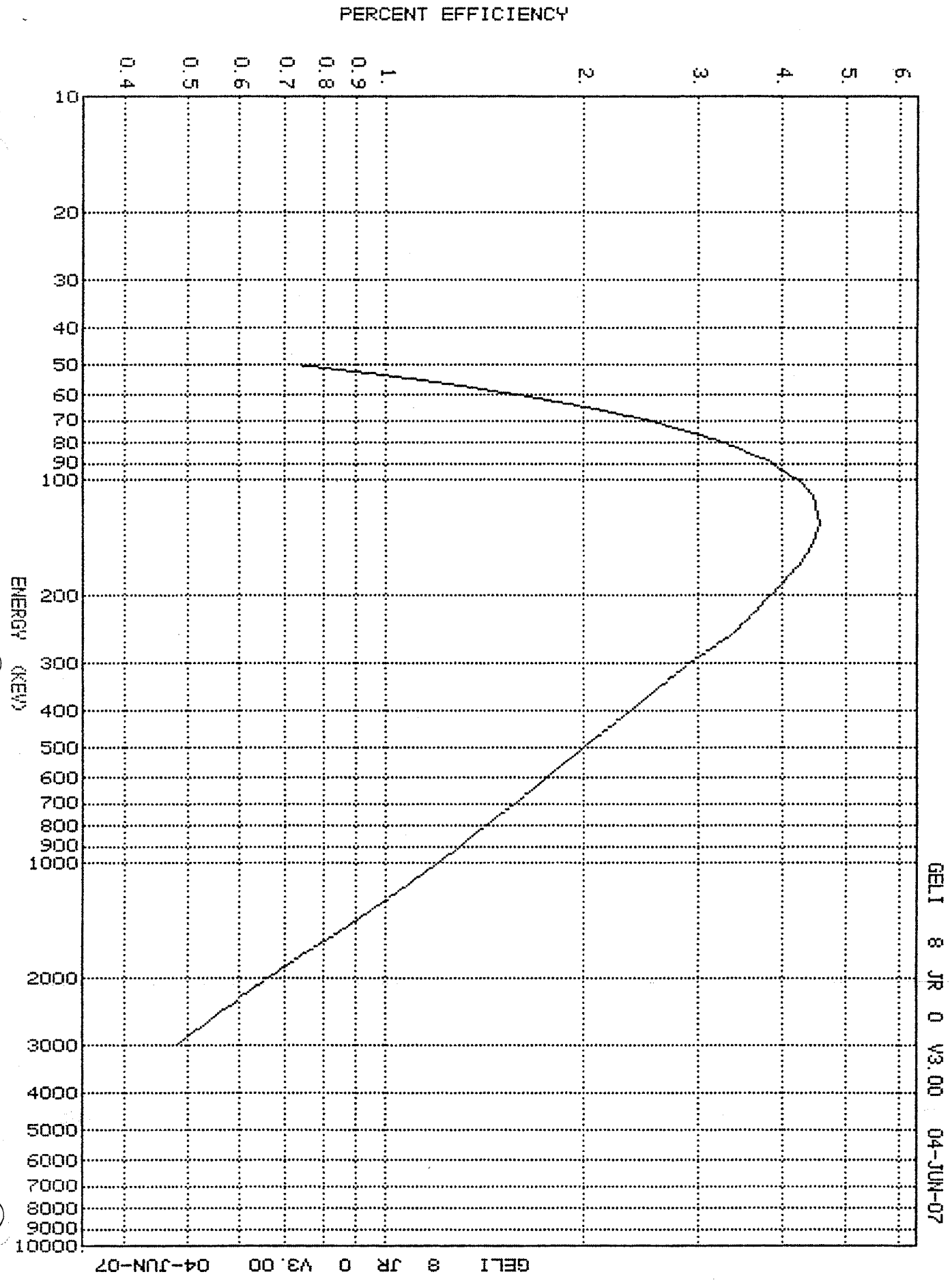
Date ..... 04-JUN-07 Page 1
Version .. 3.00
File ..... ND:[25,4]GELI08JR0.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.74516	108	4.41328	216	3.68386	324	2.73806	432	2.22274
51	0.81690	110	4.45413	218	3.66486	326	2.72587	434	2.21531
52	0.89395	112	4.46482	220	3.64614	328	2.71382	436	2.20794
53	0.97659	114	4.47534	222	3.62768	330	2.70188	438	2.20063
54	1.06511	116	4.48570	224	3.60947	332	2.69008	440	2.19337
55	1.15980	118	4.49591	226	3.59152	334	2.67839	442	2.18617
56	1.24277	120	4.50597	228	3.57381	336	2.66683	444	2.17903
57	1.33005	122	4.51589	230	3.55635	338	2.65538	446	2.17195
58	1.42178	124	4.52566	232	3.53912	340	2.64405	448	2.16491
59	1.51811	126	4.53530	234	3.52212	342	2.63284	450	2.15794
60	1.61917	128	4.54481	236	3.50534	344	2.62173	452	2.15101
61	1.70645	130	4.55419	238	3.48879	346	2.61074	454	2.14414
62	1.79691	132	4.53987	240	3.47245	348	2.59986	456	2.13732
63	1.89059	134	4.52581	242	3.45632	350	2.58908	458	2.13055
64	1.98757	136	4.51200	244	3.44040	352	2.57841	460	2.12383
65	2.08791	138	4.49844	246	3.42469	354	2.56784	462	2.11716
66	2.17354	140	4.48511	248	3.40917	356	2.55738	464	2.11055
67	2.26132	142	4.47200	250	3.39384	358	2.54702	466	2.10398
68	2.35126	144	4.45912	252	3.37035	360	2.53675	468	2.09746
69	2.44339	146	4.44645	254	3.34720	362	2.52659	470	2.09098
70	2.53772	148	4.43399	256	3.32440	364	2.51652	472	2.08456
71	2.61054	150	4.42173	258	3.30192	366	2.50654	474	2.07818
72	2.68439	152	4.39792	260	3.27977	368	2.49666	476	2.07185
73	2.75927	154	4.37456	262	3.25793	370	2.48687	478	2.06556
74	2.83517	156	4.35161	264	3.23641	372	2.47717	480	2.05932
75	2.91210	158	4.32907	266	3.21519	374	2.46757	482	2.05312
76	2.99006	160	4.30694	268	3.19426	376	2.45805	484	2.04697
77	3.06904	162	4.28518	270	3.17362	378	2.44861	486	2.04086
78	3.14905	164	4.26381	272	3.15327	380	2.43927	488	2.03479
79	3.23009	166	4.24280	274	3.13320	382	2.43000	490	2.02877
80	3.31215	168	4.22214	276	3.11340	384	2.42082	492	2.02279
81	3.36772	170	4.20182	278	3.09386	386	2.41173	494	2.01685
82	3.42352	172	4.17556	280	3.07459	388	2.40271	496	2.01095
83	3.47956	174	4.14977	282	3.05557	390	2.39377	498	2.00510
84	3.53582	176	4.12443	284	3.03681	392	2.38491	500	1.99928
85	3.59231	178	4.09952	286	3.01829	394	2.37613	502	1.99358
86	3.64903	180	4.07505	288	3.00001	396	2.36743	504	1.98791
87	3.70597	182	4.05098	290	2.98197	398	2.35880	506	1.98228
88	3.76314	184	4.02732	292	2.96415	400	2.35025	508	1.97669
89	3.82052	186	4.00406	294	2.94657	402	2.34177	510	1.97114
90	3.87813	188	3.98117	296	2.92921	404	2.33336	512	1.96563
91	3.91516	190	3.95865	298	2.91206	406	2.32502	514	1.96015
92	3.95214	192	3.93547	300	2.89513	408	2.31675	516	1.95471
93	3.98906	194	3.91266	302	2.88122	410	2.30856	518	1.94931
94	4.02593	196	3.89021	304	2.86747	412	2.30043	520	1.94394
95	4.06274	198	3.86812	306	2.85387	414	2.29237	522	1.93861
96	4.09949	200	3.84637	308	2.84043	416	2.28438	524	1.93331
97	4.13620	202	3.82497	310	2.82714	418	2.27645	526	1.92804
98	4.17285	204	3.80389	312	2.81399	420	2.26859	528	1.92281
99	4.20944	206	3.78313	314	2.80099	422	2.26079	530	1.91762
100	4.24599	208	3.76268	316	2.78813	424	2.25305	532	1.91245
102	4.28842	210	3.74253	318	2.77541	426	2.24538	534	1.90732
104	4.33044	212	3.72269	320	2.76282	428	2.23777	536	1.90223
106	4.37205	214	3.70313	322	2.75037	430	2.23023	538	1.89716

Det ... GELI 8
Geo ... JR - 100-ml Jar
Shlf .. 0
Ref ... 100ML IN PARKWAY JAR

Date ..... 04-JUN-07 Page 2
Version .. 3.00
File ..... ND:[25,4]GELI08JR0.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	1.89213	660	1.63899	930	1.26681	1260	0.98746	1800	0.72169
542	1.88713	665	1.63016	935	1.26167	1270	0.98092	1810	0.71812
544	1.88216	670	1.62144	940	1.25657	1280	0.97448	1820	0.71458
546	1.87723	675	1.61284	945	1.25153	1290	0.96814	1830	0.71109
548	1.87232	680	1.60434	950	1.24653	1300	0.96188	1840	0.70762
550	1.86745	685	1.59595	955	1.24158	1310	0.95571	1850	0.70420
552	1.86260	690	1.58767	960	1.23667	1320	0.94962	1860	0.70081
554	1.85779	695	1.57948	965	1.23181	1330	0.94362	1870	0.69745
556	1.85300	700	1.57140	970	1.22699	1340	0.93771	1880	0.69413
558	1.84824	705	1.56294	975	1.22221	1350	0.93187	1890	0.69084
560	1.84352	710	1.55459	980	1.21748	1360	0.92611	1900	0.68758
562	1.83882	715	1.54633	985	1.21279	1370	0.92043	1925	0.67958
564	1.83415	720	1.53818	990	1.20814	1380	0.91483	1950	0.67177
566	1.82951	725	1.53013	995	1.20354	1390	0.90930	1975	0.66415
568	1.82490	730	1.52218	1000	1.19897	1400	0.90384	2000	0.65671
570	1.82031	735	1.51432	1005	1.19396	1410	0.89810	2025	0.65039
572	1.81575	740	1.50655	1010	1.18899	1420	0.89243	2050	0.64420
574	1.81122	745	1.49888	1015	1.18407	1430	0.88684	2075	0.63815
576	1.80672	750	1.49129	1020	1.17920	1440	0.88132	2100	0.63222
578	1.80224	755	1.48380	1025	1.17436	1450	0.87588	2125	0.62642
580	1.79779	760	1.47639	1030	1.16957	1460	0.87050	2150	0.62074
582	1.79337	765	1.46906	1035	1.16483	1470	0.86520	2175	0.61518
584	1.78897	770	1.46182	1040	1.16012	1480	0.85996	2200	0.60973
586	1.78460	775	1.45466	1045	1.15546	1490	0.85479	2225	0.60438
588	1.78025	780	1.44759	1050	1.15084	1500	0.84969	2250	0.59915
590	1.77593	785	1.44059	1055	1.14625	1510	0.84465	2275	0.59401
592	1.77163	790	1.43367	1060	1.14171	1520	0.83967	2300	0.58898
594	1.76736	795	1.42682	1065	1.13721	1530	0.83475	2325	0.58404
596	1.76312	800	1.42006	1070	1.13274	1540	0.82990	2350	0.57920
598	1.75889	805	1.41336	1075	1.12832	1550	0.82510	2375	0.57444
600	1.75470	810	1.40674	1080	1.12393	1560	0.82036	2400	0.56978
602	1.75052	815	1.40019	1085	1.11958	1570	0.81568	2425	0.56520
604	1.74637	820	1.39371	1090	1.11526	1580	0.81106	2450	0.56070
606	1.74224	825	1.38730	1095	1.11099	1590	0.80649	2475	0.55628
608	1.73814	830	1.38096	1100	1.10674	1600	0.80197	2500	0.55195
610	1.73406	835	1.37468	1105	1.10254	1610	0.79751	2525	0.54768
612	1.73000	840	1.36847	1110	1.09836	1620	0.79310	2550	0.54350
614	1.72597	845	1.36232	1115	1.09423	1630	0.78874	2575	0.53938
616	1.72195	850	1.35624	1120	1.09012	1640	0.78443	2600	0.53534
618	1.71796	855	1.35022	1125	1.08605	1650	0.78017	2625	0.53137
620	1.71400	860	1.34427	1130	1.08202	1660	0.77596	2650	0.52746
622	1.71005	865	1.33837	1135	1.07801	1670	0.77180	2675	0.52361
624	1.70612	870	1.33253	1140	1.07404	1680	0.76769	2700	0.51983
626	1.70222	875	1.32675	1150	1.06619	1690	0.76362	2725	0.51612
628	1.69834	880	1.32103	1160	1.05847	1700	0.75959	2750	0.51246
630	1.69448	885	1.31537	1170	1.05086	1710	0.75561	2775	0.50886
632	1.69064	890	1.30976	1180	1.04338	1720	0.75168	2800	0.50532
634	1.68682	895	1.30420	1190	1.03601	1730	0.74779	2825	0.50183
636	1.68302	900	1.29871	1200	1.02876	1740	0.74394	2850	0.49840
638	1.67924	905	1.29326	1210	1.02161	1750	0.74013	2875	0.49502
640	1.67549	910	1.28787	1220	1.01458	1760	0.73636	2900	0.49169
645	1.66618	915	1.28253	1230	1.00764	1770	0.73263	2925	0.48842
650	1.65700	920	1.27724	1240	1.00082	1780	0.72895	2950	0.48519
655	1.64793	925	1.27200	1250	0.99409	1790	0.72530	2975	0.48201


PERCENT EFFICIENCY
0.4
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700
800
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1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
ENERGY (KEV)
GELI 8 JR 0 V3.00 04-JUN-07
GELI 8 JR 0 V3.00 04-JUN-07

```
*****************************************************************************
1098    GLY   2       G-8 XX 152.742  7  112.00 MIN     1.00000 SM       464
LIBR=A982  REF TIME= 274.708  6
*****************************************************************************

*****************************************************************************
* Group.......................... 1098 * Time of count          152.742 2007 *
* Sample.......................... 2 * Reference GMT........ 274.708 2006 *
* Element.......................... * Elapsed Live Tm.............. 112. *
* Type code...................... GLY * Dead Time Pct............ 2.665122 *
* ID................ 74159-207 (JR) * Background GMT....... 148.779 2007 *
* Geometry, detector........... XX-8 * Standard GMT......... 146.689 2007 *
* Aliquot.......................... 1. * Days since TO............ 243.0337 *
* Unit of Aliquot.............. SMPL * Time on.......... 10:48 PDT  1-JUN *
* Data Sheet Units........ PCI /SMPL * Time off......... 12:40 PDT  1-JUN *
* Library...................... A982 * Calc Time......... 08:25 04-JUN-07 *
*****************************************************************************
* Slope.................... 1.008624 * Width slope.............. 0.042773 *
* Intercept................ -2.19831 * Width offset.................. 0.0 *
* X**2 TERM......... -0.22302215E-05 * Sensitivity.................... 4. *
  NP:[7,67]464.GSP                 25 PEAKS

*****************************************************************************
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN       CPM  ERR  EFF  K  FIT
  1  7   24.3   24  8 30307 1.83  33089   26.2  2.95E+02  1.20.000  0101.65
  2  7   26.2   24  8 67630 2.50  29508   28.2  2.63E+02  1.80.000  0101.65
  3  2   34.4   31 11181573 2.62    375   36.3  3.35E+00197.30.000  0  2.89
  4  2   37.6   31 11 85725 2.62   1387   39.5  1.24E+01 30.40.000  0  2.89
  5  0   59.1   56  9182772 1.65 212099   60.8  1.89E+03  0.40.000  0  2.89
  6 10   67.4   66 29 83085 5.17  21991   69.0  1.96E+02  2.00.000  0405.43
  7 10   74.2   66 29299654 6.28  91870   75.7  8.20E+02  1.40.000  0405.43
  8 10   85.0   66 29177866 4.42  94487   86.4  8.44E+02  1.20.000  0405.43
  9 10   87.9   66 29 63206 1.70 490681   89.4  4.38E+03  0.20.000  0405.43
 10  0  121.9  117 11119251 1.84 248765  123.1  2.22E+03  0.30.000  0405.43
 11  0  136.4  133  9 77392 2.10  30913  137.5  2.76E+02  1.70.000  0405.43
 12  0  165.8  161 10 79500 2.04 181234  166.6  1.62E+03  0.40.000  0405.43
 13  0  186.2  184  9 61148 2.95   1034  186.9  9.23E+00 43.30.000  0405.43
 14  0  255.2  252  9 53746 2.40   5337  255.4  4.77E+01  8.00.000  0405.43
 15  0  279.2  274 11 58258 2.45  26710  279.2  2.38E+02  1.80.000  0405.43
 16  0  391.7  383 14 57890 3.06 112398  390.9  1.00E+03  0.50.000  0405.43
 17  0  511.6  506 10 31764 3.92   3539  510.0  3.16E+01  9.60.000  0405.43
 18  0  661.6  647 21 62678 4.44 202025  659.1  1.80E+03  0.40.000  0405.43
 19  0  691.4  684 10 27673 5.41    723  688.7  6.45E+00 43.30.000  0405.43
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN       CPM  ERR  EFF  K  FIT
 20  0  812.9  806 11 25993 5.13   1030  809.6  9.20E+00 30.60.000  0405.43
 21  0  897.9  880 26 69330 5.67 123474  894.1  1.10E+03  0.60.000  0405.43
 22  0 1173.0 1152 29 37581 6.94 225409 1168.2  2.01E+03  0.30.000  0405.43
 23  0 1332.0 1309 30 19725 7.68 206243 1326.7  1.84E+03  0.30.000  0405.43
 24  4 1831.1 1808 33  3240 5.97  26277 1825.0  2.35E+02  1.10.000  0216.52
 25  4 1837.3 1808 33  1665 4.18  47798 1831.2  4.27E+02  0.50.000  0216.52
FWHM=SQRT( 9.01826E+00 +  1.81703E-02 *E)

*****************************************************************************
BACKGROUND INFO 1098    GLY   2       152.742  7 G- 8     BG DATE 148.779  7
*****************************************************************************

 --------PEAK---------v      v------BACKGROUND------v      v------NET----v
ENERGY       CPM  %ERROR       ENERGY       CPM  %ERROR          CPM  %ERROR

 186.24    9.2337 43.34        186.00  0.4940 10.61          8.7397 45.79
 279.22  238.4799  1.85        279.00  0.1166  0.00        238.3632  1.85
 511.58   31.5971  9.56        511.00  2.7627  5.61         28.8344 10.49
```

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  661.64 1803.7959  0.38        661.60  0.3624 16.72       1803.4335  0.38
 1173.03 2012.5823  0.29       1173.20  0.0927  0.00       2012.4896  0.29
 1332.04 1841.4550  0.27       1332.50  0.0965  7.15       1841.3584  0.27
     0 PEAKS REJECTED BY BACKGROUND

**********************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY    2        152.742  7 G- 8
**********************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 152.742/2007

BACKGROUND FOR GELI DETECTOR 8 OF 148.779/2007 1265.7 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.2261	62.01	511.0	2.7627	5.61	1173.2	0.0927	0.00
92.0	0.6445	8.46	583.1	0.5399	24.89	1238.1	0.1478	28.08
143.0	0.0943	29.91	609.3	0.9053	22.58	1332.5	0.0965	7.15
186.0	0.4940	10.61	661.6	0.3624	16.72	1377.7	0.1743	0.00
198.0	0.1733	59.43	727.2	0.1320	42.49	1460.8	3.2905	20.88
238.5	1.0416	18.53	860.0	0.0834	0.00	1586.0	0.1235	36.03
279.0	0.1166	0.00	911.1	0.5059	25.20	1591.0	0.0777	55.70
295.2	0.3167	35.68	968.9	0.4218	25.53	1729.6	0.0424	0.00
338.4	0.2046	28.35	1001.0	0.1562	0.00	1764.5	0.3128	24.87
351.9	0.6750	20.59	1120.3	0.3533	26.10	0.0	0.0000	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 8 ON 6/ 4/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.719	3	0.9279	15.753	61.*
322.765	5	0.8833	18.759	31.*
322.789	5	0.8727	17.160	43.*
322.825	5	0.8755	17.370	41.*
352.103	5	0.8703	18.548	21.*
355.939	5	0.8663	19.048	20.*
58.691	6	0.9079	17.307	83.*
312.732	6	0.8798	18.209	22.*
146.689	7	0.9437	22.807	27.
153.871	7	0.9404	23.280	21.
AVERAGE		0.9421	0.002	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
55.907	7	0.8497	13.966	22. NG
61.951	7	0.8381	12.615	42. NG
69.881	7	0.8217	10.936	33.
76.788	7	0.8444	12.015	30.
81.924	7	0.8275	10.834	33. NG
92.670	7	0.8012	11.271	24.
96.949	7	1.2243	10.113	32. NG
103.953	7	0.8129	11.386	25. NG
133.873	7	0.8257	11.864	28. NG
140.052	7	0.8416	13.026	21.
AVERAGE		0.0000	0.016	

CALIBRATION LINE FROM STANDARD FOR G- 8 OF 146.689 7
ENERGY= -2.198306 + 1.0086241*CH + -2.230222E-06*CH**2
FWHM =SQRT(-6.9307 + 0.042773*ENERGY) (CO60= 7.076)

EFFICIENCIES FOR GEOMETRY XX 8 CALIBRATED 0.000 2000

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000		
0.0	0.000000	0.0	0.000000	0.0	0.000000		
0.0	0.000000	0.0	0.000000	0.0	0.000000		

1098 2 GLY GSTOR 464

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	24.3	295.44	1.2		
	2	26.2	263.46	1.8		
	3	34.4	3.35	99.9		
	4	37.6	12.38	30.4		
	5	59.1	1893.74	0.4		Am241s
	6	67.4	196.35	2.0		
	7	74.2	820.27	1.4		
	8	85.0	843.64	1.2		Cs136
	9	87.9	4381.08	0.2		Cd109s
	10	121.9	2221.12	0.3		Co 57s
	11	136.4	276.01	1.7		Co 57s
	12	165.8	1618.16	0.4		Cs136 Ce139s
b	13	186.2	8.74	45.8	Ra226	Cs136
	14	255.2	47.66	8.0		Sn113
b	15	279.2	238.36	1.9	Ac228	Hg203s
	16	391.7	1003.56	0.5		Sn113s
b	17	511.6	28.83	10.5	Th228	La140 Ru106 Na 22
b	18	661.6	1803.43	0.4		Cs137s
	19	691.4	6.45	43.3		Co 57
	20	812.9	9.20	30.6		
	21	897.9	1102.45	0.6		La140 Y 88s
b	22	1173.0	2012.49	0.3		Cs134+ Co 60s
b	23	1332.0	1841.36	0.3		Co 60s
	24	1831.1	234.62	1.1		
	25	1837.3	426.77	0.5	Ra226	Y 88s

```
1098   GLY  2      G-8 XX 115.846  7  202.63 MIN     1.00000 SM      198
LIBR=A982  REF TIME= 274.708  6
```

Group	1098	Time of count	115.846 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm.	202.6333
Type code	GLY	Dead Time Pct.	2.875859
ID	74159-207 (JR)	Background GMT	110.963 2007
Geometry, detector	XX-8	Standard GMT	110.881 2007
Aliquot	1.	Days since TO	206.1383
Unit of Aliquot	SMPL	Time on	13:18 PDT 25-APR
Data Sheet Units	PCI /SMPL	Time off	16:41 PDT 25-APR
Library	A982	Calc Time	17:56 25-APR-07
Slope	1.008353	Width slope	0.040798
Intercept	-2.12583	Width offset	-5.47015
X**2 TERM	-0.20896141E-05	Sensitivity	4.

NP: [7,67]198.GSP 24 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	3	24.4	24	8	33044	1.93	71045	26.3	3.51E+02	0.60.	000	0358.	26
2	3	26.4	24	8	176412	2.83	58056	28.3	2.87E+02	1.40.	000	0358.	26
3	0	59.2	56	9	354435	1.64	385185	60.8	1.90E+03	0.30.	000	0358.	26
4	10	67.3	66	29	164118	4.50	38646	68.9	1.91E+02	1.60.	000	0606.	03
5	10	74.1	66	29	621818	6.57	189162	75.6	9.34E+02	1.00.	000	0606.	03
6	10	85.1	66	29	407537	5.06	204313	86.5	1.01E+03	0.90.	000	0606.	03
7	10	88.0	66	29	126638	1.70	925775	89.3	4.57E+03	0.10.	000	0606.	03
8	4	113.8	97	30	186183	2.87	17045	115.0	8.41E+01	4.70.	000	0668.	28
9	4	122.0	97	30	114494	1.89	512579	123.1	2.53E+03	0.20.	000	0668.	28
10	0	136.4	133	9	158798	2.10	61601	137.4	3.04E+02	1.20.	000	0668.	28
11	0	165.8	161	10	159517	2.07	398196	166.6	1.97E+03	0.20.	000	0668.	28
12	0	255.1	252	9	106740	2.42	11246	255.2	5.55E+01	5.30.	000	0668.	28
13	0	279.2	274	10	105612	2.45	82215	279.1	4.06E+02	0.80.	000	0668.	28
14	0	309.8	306	8	74193	1.41	722	309.5	3.56E+00	65.60.	000	0668.	28
15	0	391.6	383	14	113593	3.02	253735	390.8	1.25E+03	0.30.	000	0668.	28
16	0	511.0	505	11	68579	4.28	7547	509.4	3.72E+01	6.80.	000	0668.	28
17	0	661.4	647	19	113402	4.35	367815	658.9	1.82E+03	0.30.	000	0668.	28
18	0	813.7	805	12	53511	5.22	2892	810.4	1.43E+01	16.10.	000	0668.	28
19	0	897.6	879	23	117103	5.54	283939	893.9	1.40E+03	0.30.	000	0668.	28
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1113.7	1101	17	597681	0.06	3964	1109.1	1.96E+01	12.20.	000	0668.	28
21	0	1172.6	1151	29	72845	6.79	413435	1167.9	2.04E+03	0.20.	000	0668.	28
22	0	1331.7	1310	29	39588	7.52	379574	1326.4	1.87E+03	0.20.	000	0668.	28
23	4	1830.6	1809	34	6518	5.25	63076	1824.4	3.11E+02	0.60.	000	0733.	49
24	4	1837.0	1809	34	3377	3.83	109982	1830.8	5.43E+02	0.40.	000	0733.	49

FWHM=SQRT(9.63069E+00 + 2.10185E-02 *E)

BACKGROUND INFO 1098 GLY 2 115.846 7 G- 8 BG DATE 110.963 7

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
279.16	405.7323	0.82	279.00	0.1166	0.00	405.6157	0.82
510.97	37.2464	6.83	511.00	2.7764	7.75	34.4700	7.40
661.42	1815.1771	0.27	661.60	0.3418	15.07	1814.8353	0.27
1172.64	2040.3099	0.22	1172.70	0.1297	11.18	2040.1802	0.22

1381.69 1873.2065 0.20 1332.50 0.1415 0.00 1873.0651 0.20
0 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 1098 GLY 2 115.846 7 G- 8

****

PANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 115.846/2007

BACKGROUND FOR GELI DETECTOR 8 OF 110.963/2007 3732.9 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.2421	58.91	511.0	2.7764	7.75	1173.2	0.1297	11.18
92.0	0.6458	6.19	583.1	0.5464	24.29	1238.1	0.1378	34.75
143.0	0.1143	0.00	609.3	0.8816	16.31	1332.5	0.1415	0.00
186.0	0.4844	14.37	661.6	0.3418	15.07	1377.7	0.0989	66.92
198.0	0.1386	21.21	727.2	0.1264	45.17	1460.8	3.2983	16.96
238.5	1.0015	16.92	860.0	0.0834	0.00	1586.0	0.1242	50.66
279.0	0.1166	0.00	911.1	0.5001	17.56	1591.0	0.1211	76.58
295.2	0.3080	27.85	968.9	0.4081	21.47	1729.6	0.0424	0.00
338.4	0.2416	34.19	1001.0	0.1562	0.00	1764.5	0.3079	29.82
351.9	0.6914	18.95	1120.3	0.3610	20.58	0.0	0.0000	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 8 ON 4/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.719	3	0.9279	15.753	61.
322.765	5	0.8833	18.759	31.
322.789	5	0.8727	17.160	43.
322.825	5	0.8755	17.370	41.
352.103	5	0.8703	18.548	21.
355.939	5	0.8663	19.048	20.
58.691	6	0.9079	17.307	83.
312.732	6	0.8798	18.209	22.
4.921	7	0.8151	17.364	39.
10.881	7	0.7126	23.100	22. NG
AVERAGE		0.8776	0.031	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
50.959	7	0.8133	14.108	22.
53.696	7	0.8334	12.601	46.
55.907	7	0.8497	13.966	22. NG
61.951	7	0.8381	12.615	42. NG
69.881	7	0.8217	10.936	33.
76.788	7	0.8444	12.015	30.
81.924	7	0.8275	10.834	33. NG
92.670	7	0.8012	11.271	24.
96.949	7	1.2243	10.113	32. NG
103.953	7	0.8129	11.386	25. NG
AVERAGE		0.8286	0.016	

CALIBRATION LINE FROM STANDARD FOR G- 8 OF 110.881 7
ENERGY= -2.125832 + 1.0083526*CH + -2.089614E-06*CH**2
FWHM =SQRT(-5.4702 + 0.040799*ENERGY) (CO60= 6.992)

EFFICIENCIES FOR GEOMETRY XX 8 CALIBRATED 0.000 2000

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000		
0.0	0.000000	0.0	0.000000	0.0	0.000000		
0.0	0.000000	0.0	0.000000	0.0	0.000000		

1098 2 GLY GSTOR 198

	PK	ENERGY	CPM	%ERR	COMMENT				
	1	24.4	350.61	0.6					
	2	26.4	286.51	1.4					
	3	59.2	1900.90	0.3					Am241s
	4	67.3	190.72	1.6					
	5	74.1	933.52	1.0					
	6	85.1	1008.29	0.9					Cs136
	7	88.0	4568.72	0.1					Cd109s
	8	113.8	84.12	4.7	Th228				
	9	122.0	2529.59	0.2					Co 57s
	10	136.4	304.00	1.2					Co 57s
	11	165.8	1965.11	0.2				Cs136	Ce139s
	12	255.1	55.50	5.3					Sn113
b	13	279.2	405.62	0.8	Ac228				Hg203s
	14	309.8	3.56	65.6					Co 60p
	15	391.6	1252.19	0.3					Sn113s
b	16	511.0	34.47	7.4	Ac228	Th228		La140	Ru106 Na 22
b	17	661.4	1814.84	0.3					Cs137s
	18	813.7	14.27	16.1					
	19	897.6	1401.25	0.3				La140	Y 88s
	20	1113.7	19.56	12.2					
b	21	1172.6	2040.18	0.2				Cs134+	Co 60s
b	22	1331.7	1873.07	0.2					Co 60s
	23	1830.6	311.28	0.6					
	24	1837.0	542.76	0.4	Ra226				Y 88s

ANALYTICS
An Isotope Products Laboratories Company

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

Log 417 Recd 12/27/06 K Trenton

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

1098-2

LIBR= A782

74159-207

100 mL Solid in Wide Mouth PPi Parkway Jar

Customer: Eberline Services / Richmond, CA
P.O. No.: 00003890, Item 1
Calibration Date: 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01515

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1990.0	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	189000	2863.9	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	94570	1433.0	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	133800	2027.5	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	295300	4475	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	185600	2812.4	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	116700	1768.4	0.70	1.20	2.78	HPGe
Y-88	898.0	106.60	455400	6901	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	226900	3438	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	227000	3440	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	481200	7292	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
This standard will expire one year after the calibration date.

Source Prepared by: M. Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate

N60028_001568
TREASURE ISLAND
SSIC NO. 5090.3

SDG # R709160-8811

Eberline Services – Richmond

039

Chain of Custody

CLIENT: TETRATECH EC

ADDRESS: 1230 COLUMBIA STREET, SUITE 750
SAN DIEGO, CA 92101

PROJECT: CTO 021 TREASURE ISLAND

CONTACT: SABINA SUDIKO 949-756-7545

SAMPLERS SIGNATURE: J. Dennett

PURCHASE ORDER NO. 101711 2

DATE 9/26/07 PAGE 1 OF 1

TAT (IN DAYS) (5) AND (21)

SAMPLE NO.	DATE	TIME	LOCATION *	EPA 901.1M (RADIONUCLIDES by GAMMA SPEC) 5/21 day TAT	PARAMETERS	SAMPLE TYPE OR MATRIX	# CONTAINERS	OBSERVATIONS, COMMENTS, VOLUMES, SPECIAL OR ADDITIONAL TEST
								R709160-8811
✓ 021-124-ST-001	9-24-07	10:15	~~BLDG 233, ROOM 124~~ B233 R124 SINK TRAP	X		SOIL/DEBRIS	1	REPORT RESULTS DOWN TO MDL & "J" FLAG
✓ 021-233-SL-002S	9-25-07	14:22	~~BLDG 233, OUTSIDE~~ B233 SL SOUTH	X		SOIL/DEBRIS	1	ANY RESULTS BETWEEN
✓ 021-233-SL-003N	9-25-07	14:30	~~BLDG 233, OUTSIDE~~ B233 SL NORTH	X		SOIL/DEBRIS	1	RL AND MDL FOR
✓ 021-121-SL-005	9-26-07	08:35	~~BLDG 233, ROOM 121~~ B233 R121 WESTERLY	X		SOIL/DEBRIS	1	ALL SAMPLES.
✓ 021-121-SL-006	9-26-07	08:45	BLDG 233, ROOM 121 B233 R121 EASTERLY	X		SOIL/DEBRIS	1	LEVEL III QC.
								* CHECK PEL
								BRIAN MAIDRAND
								3-13-08 Sudiko

1) RELINQUISHED BY / DATE: J. Dennett 9/27/07
COMPANY:

2) RECEIVED BY / DATE: Melissa Mann 9/27/07
COMPANY: Eberline Services

3) RELINQUISHED BY / DATE:
COMPANY:

4) RECEIVED BY / DATE:
COMPANY:

5) RELINQUISHED BY / DATE:
COMPANY:

6) RECEIVED BY / DATE:
COMPANY:

7) RELINQUISHED BY / DATE:
COMPANY:

8) RECEIVED BY / DATE:
COMPANY:

TOTAL NO. OF CONTAINERS: 5

METHOD OF SHIPMENT:

SPECIAL SHIPMENT-HANDLING, STORAGE REQUIREMENTS, OR POSSIBLE HAZARDS

2030 Wright Avenue P.O. Box 4040 Richmond, CA 94804-0040 (510) 235-2633 FAx No. (510) 235-0438

Eberline Services – Richmond 040 Chain of Custody

CLIENT: TETRATECH EC

ADDRESS: 1230 COLUMBIA STREET, SUITE 1100
SAN DIEGO, CA 92101

PROJECT: CTO 021 TREASURE ISLANDS

CONTACT: SABINA SUDOKO 949-756 7545

SAMPLERS SIGNATURE:

PURCHASE ORDER NO. 1017112

DATE 9/27/07 PAGE 1 OF 1

TAT (IN DAYS) (5) AND (21)

SAMPLE NO.	DATE	TIME	LOCATION	EPA 901.1 M GRADIONUCLIDES BY GAMMA SPEC 5/21 days CT	SAMPLE TYPE OR MATRIX	# CONTAINERS	OBSERVATIONS, COMMENTS, VOLUMES, SPECIAL OR ADDITIONAL TEST
021-344-CL-001	9-26-07	15:35	BLDG 344, CEILING	X	SOLID (CONCRETE)	1	REPORT RESULTS DOWN TO MDL AND "J" FLAG ANY RESULTS BETWEEN RL AND MDL FOR ALL SAMPLES. LEVEL III QC

R709160-8811

1) RELINQUISHED BY / DATE:	2) RECEIVED BY / DATE:	3) RELINQUISHED BY / DATE:	4) RECEIVED BY / DATE:	TOTAL NO. OF CONTAINERS: 1
COMPANY: 9/27/07	Melissa Manor Eberline Services 9/27/07	COMPANY:	COMPANY:	METHOD OF SHIPMENT:
5) RELINQUISHED BY / DATE:	6) RECEIVED BY / DATE:	7) RELINQUISHED BY / DATE:	8) RECEIVED BY / DATE:	SPECIAL SHIPMENT-HANDLING, STORAGE REQUIREMENTS, OR POSSIBLE HAZARDS
COMPANY:	COMPANY:	COMPANY:	COMPANY:	

2030 Wright Avenue P.O. Box 4040 Richmond, CA 94804-0040 (510) 235-2633 FAx No. (510) 235-0438

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Tetra Tech EC, Inc.
1940 E. Deere Avenue, Suite 200
Santa Ana, CA 92705
ATTN: Ms. Sabina Sudoko

November 20, 2007

SUBJECT: Treasure Island, CTO 021, Data Validation

Dear Ms. Sudoko,

Enclosed is the final validation report for the fraction listed below. This SDG was received on November 19, 2007. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 17854:

SDG #	Fraction
R709160-8811	Gamma Spectroscopy

The data validation was performed under EPA Level III guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998

Please feel free to contact us if you have any questions.

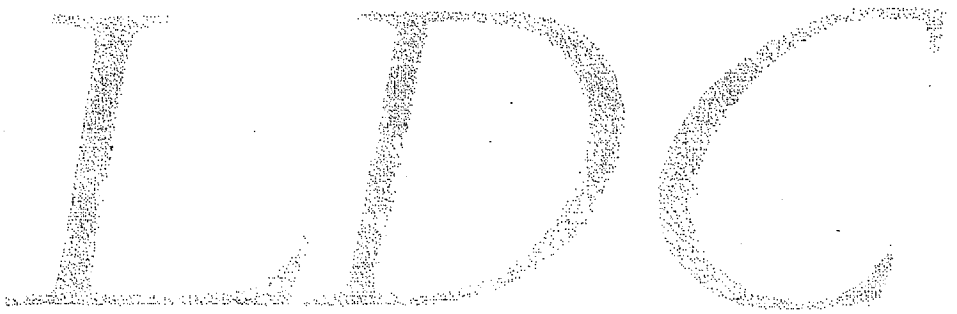
Sincerely,

ERauto

Erlinda T. Rauto
Operations Manager/Senior Chemist

Treasure Island, CTO 021
Data Validation Reports
LDC# 17854

Gamma Spectroscopy



Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Treasure Island, CTO 021

Collection Date: September 24 through September 26, 2007

LDC Report Date: November 19, 2007

Matrix: Soil

Parameters: Gamma Spectroscopy

Validation Level: EPA Level III

Laboratory: Eberline Services

Sample Delivery Group (SDG): R709160-8811

Sample Identification

021-124-ST-001
021-233-SL-002S
021-233-SL-001N
021-121-SL-005
021-121-SL-006
021-344-CL-001
021-233-SL-001NDUP

Introduction

This data review covers 7 soil samples listed on the cover sheet. The analyses were per EPA Method 901.1 for Gamma Spectroscopy.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the isotope was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the isotope was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination was performed at the required frequencies.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicates

A matrix spike (MS) analysis was not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Relative percent differences (RPD) were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been summarized.

VIII. Field Duplicates

No field duplicates were identified in this SDG.

IX. Field Blanks

No field blanks were identified in this SDG.

Treasure Island, CTO 021
Gamma Spectroscopy - Data Qualification Summary - SDG R709160-8811

No Sample Data Qualified in this SDG

Treasure Island, CTO 021
Gamma Spectroscopy - Laboratory Blank Data Qualification Summary - SDG R709160-8811

No Sample Data Qualified in this SDG

LDC #: 17854A35 **VALIDATION COMPLETENESS WORKSHEET** Date: 11-19-07

SDG #: R709160-8811 Level III Page: 1 of 1

Laboratory : Eberline Services Reviewer: MG

2nd Reviewer:

METHOD: Gamma Spectroscopy (EPA Method 901.1)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 9-24-07 through 9-26-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVb.	Laboratory control samples	A	LCS
V.	Minimum dectectable activity (MDA)	A	
VI.	Sample result verification	N	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	N	
IX	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: all soil

1	021-124-ST-001	11		21		31	
2	021-233-SL-002S	12		22		32	
3	021-233-SL-001N	13		23		33	
4	021-121-SL-005	14		24		34	
5	021-121-SL-006	15		25		35	
6	021-344-CL-001	16		26		36	
7	021-233-SL-001NDUP	17		27		37	
8	PBS	18		28		38	
9		19		29		39	
10		20		30		40	

Notes: 21 day set validated

EBERLINE SERVICES

ORIGINAL

November 14, 2007

Ms. Sabina Sudoko
Chemist
Tetra Tech EC, Inc.
1940 E. Deere Avenue, Suite 200
Santa Ana, CA 92705

Reference: **Treasure Island, San Francisco CA**
Treasure Island, Contract Task Order No. 21
TtECI Subcontract No.: 1017112
Eberline Services W.O. No. R709160-8811
Sample Delivery Group R709160-8811

Dear Ms. Sudoko,

Enclosed is a Level IV CLP-like data package for six soil samples received on September 27, 2007.

Please call if you have any questions concerning the attached report.

Sincerely,

Melissa Mannion
Senior Program Manager

MCM/njv

Enclosure: Level IV CLP-like Data Package (1 original and 1 copy)
Electronic Data Deliverable (e-mail)

Analytical Services
2030 Wright Avenue
P.O. Box 4040
Richmond, California 94804-0040
(510) 235-2633 Fax (510) 235-0438
Toll Free (800) 841-5487
www.eberlineservices.com

SAMPLE DELIVERY GROUP
R709160-8811

Analysis:
Gamma Spectroscopy

Section 1.0	**Case Narrative**
Section 2.0	**Chain-of-Custody and Sample Receipt Information**
Section 3.0	**CLP-Like Summary Report**
Section 4.0	**Aliquot Information**
Section 5.0	**Preparation Log For Quality Control Samples, Standards and Tracer/Carrier Certification**
Section 6.0	**Sample Analysis Raw Data**
Section 7.0	**Instrument Calibration**

Section 1.0
Case Narrative

1.0 General Comments

Sample Delivery Group 8811 is a CLP-like Level IV data package that consists of the analytical results and supporting documentation for six soil samples. The analysis performed was gamma scan. The sample ID's and reference dates/times are given in the Sample Summary section of the Summary Data report.

The samples were received as stated on the chains-of-custody. Any discrepancies are noted on the Eberline Services Sample Receipt Checklist. No holding times were exceeded.

2.0 Quality Control Summary

Quality Control Samples consisted of a laboratory controlled spike (LCS), a method blank, and a duplicate analysis. Quality control samples apply to all samples in the preparation batch. The QC sample results reported on the "Batch QC Summary Sheet" form of the report have not been divided by the method specific aliquot. The QC sample data sheets indicate Eberline Services standard QC aliquot of 1.0 sample.

All QC sample results were within control limits.

3.0 Method Errors

The error for each result is an estimate of the significant random uncertainties incurred in the measurement process. These are propagated to each final result. They include the counting (Poisson) uncertainty, as well as those intrinsic errors due to carrier or tracer standardization, aliquoting, counter efficiencies, weights, or volumes. The following method errors were propagated to the count error to calculate the 2σ ERR(Total):

Analysis	Method Error
Gamma Spectroscopy	15%

4.0 Analysis Notes

4.1 Gamma Spectroscopy Analyses

The samples were analyzed for gamma activity per Eberline Services Hazardous Waste Procedure "HWP-100, Sample Preparation for Gamma Spectroscopy", Rev. 02, dated 01/28/04. References: EPA 901.1.

Aliquots of the samples were put into standard (calibrated) counting geometries and counted for gamma activity. The samples were counted within 5 days of receipt at Eberline Services. After the initial count the samples were allowed to stand for 21 days and then were recounted. Both sets of data, 5-day and 21-day counts, are reported herein. No problems were encountered during the course of the analyses.

5.0 Case Narrative Certification Statement

"I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data obtained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature."

Melissa C. Mannion
Senior Program Manager

11/14/7
Date

Section 2.0
Chain-of-Custody and Sample Receipt Information

EBERLINE SERVICES

RICHMOND, CA LABORATORY

SAMPLE RECEIPT CHECKLIST

Client: TETRA TECH TREASURE ISL. City SAN DIEGO State CA

Date/Time received 9/27/07 10:30 CoC No. 1017112

Container I.D. No. BOX Requested TAT (Days) 5/21 P.O. Received Yes [ ] No [ ]

INSPECTION

1. Custody seals on shipping container intact? Yes [ ] No [ ] N/A [✓]
2. Custody seals on shipping container dated & signed? Yes [ ] No [ ] N/A [✓]
3. Custody seals on sample containers intact? Yes [✓] No [ ] N/A [ ]
4. Custody seals on sample containers dated & signed? Yes [✓] No [ ] N/A [ ]
5. Packing material is: Wet [ ] Dry [ ] N/A ✓
6. Number of samples in shipping container: 6 Sample Matrix SOIL
7. Number of containers per sample: 1 (Or see CoC _____)
8. Samples are in correct container Yes [✓] No [ ]
9. Paperwork agrees with samples? Yes [✓] No [ ]
10. Samples have: Tape [ ] Hazard labels [ ] Rad labels [ ] Appropriate sample labels [✓]
11. Samples are: In good condition [✓] Leaking [ ] Broken Container [ ] Missing [ ]
12. Samples are: Preserved [ ] Not preserved [ ] pH _____ Preservative _____
13. Describe any anomalies:

    _____

    _____

    _____
14. Was P.M. notified of any anomalies? Yes [ ] No [ ] Date _____
15. Inspected by JR Date: 9/27/07 Time: 10:55

Customer Sample No.	cpm	mR/hr	Wipe	Customer Sample No.	cpm	mR/hr	wipe

Ion Chamber Ser. No. _____ Calibration date _____

Alpha Meter Ser. No. _____ Calibration date _____

Beta/Gamma Meter Ser. No. _____ Calibration date _____

Section 3.0
CLP-Like Summary Report

5-Day Gamma Count

E B E R L I N E S E R V I C E S / R I C H M O N D
SAMPLE DELIVERY GROUP 8811

SDG 8811	Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion	Contract 1017112

S U M M A R Y D A T A S E C T I O N

T A B L E O F C O N T E N T S

About this section	1
Sample Summaries	3
Prep Batch Summary	5
Work Summary	6
Method Blanks	8
Lab Control Samples	9
Duplicates	10
Data Sheets	11
Method Summaries	17
Report Guides	18
End of Section	32

Melissa Mannion
Prepared by

Melissa Mannion
Reviewed by

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-TOC
Version	3.06
Report date	11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

SDG 8811
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

ABOUT THE DATA SUMMARY SECTION

The Data Summary Section of a Data Package has all data, in several useful orders, necessary for first level, routine review of the data package for a Sample Delivery Group (SDG). This section follows the Data Package Narrative, which has an overview of the data package and a discussion of special problems. It is followed by the Raw Data Section, which has full details.

The Data Summary Section has several groups of reports:

SAMPLE SUMMARIES

The Sample and QC Summary Reports show all samples, including QC samples, reported in one SDG. These reports cross-reference client and lab sample identifiers.

PREPARATION BATCH SUMMARY

The Preparation Batch Summary Report shows all preparation batches (lab groupings reflecting how work was organized) relevant to the reported SDG with information necessary to check the completeness and consistency of the SDG.

WORK SUMMARY

The Work Summary Report shows all samples and work done on them relevant to the reported SDG.

METHOD BLANKS

The Method Blank Reports, one for each Method Blank relevant to the SDG, show all results and primary supporting information for the blanks.

LAB CONTROL SAMPLES

The Lab Control Sample Reports, one for each Lab Control Sample relevant to the SDG, show all results, recoveries and primary supporting information for these QC samples.

DUPLICATES

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

ABOUT THE DATA SUMMARY SECTION

The Duplicate Reports, one for each Duplicate and Original sample pair relevant to the SDG, show all results, differences and primary supporting information for these QC samples.

MATRIX SPIKES

The Matrix Spike Reports, one for each Spiked and Original sample pair relevant to the SDG, show all results, recoveries and primary supporting information for these QC samples.

DATA SHEETS

The Data Sheet Reports, one for each client sample in the SDG, show all results and primary supporting information for these samples.

METHOD SUMMARIES

The Method Summary Reports, one for each test used in the SDG, show all results, QC and method performance data for one analyte on one or two pages. (A test is a short code for the method used to do certain work to the client's specification.)

REPORT GUIDES

The Report Guides, one for each of the above groups of reports, have documentation on how to read the associated reports.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

LAB SAMPLE SUMMARY

SDG 8811
Contact Melissa C. Mannion

Client Tetra Tech EC, Inc.
Contract 1017112

LAB SAMPLE ID	CLIENT SAMPLE ID	LOCATION	MATRIX	LEVEL	PROJ. NO.	CHAIN OF CUSTODY	COLLECTED
R709160-01	021-124-ST-001	Treasure Island	SOIL		CTO_21		09/24/07 10:15
R709160-02	021-233-SL-002S	Treasure Island	SOIL		CTO_21		09/25/07 14:22
R709160-03	021-233-SL-001N	Treasure Island	SOIL		CTO_21		09/25/07 14:30
R709160-04	021-121-SL-005	Treasure Island	SOIL		CTO_21		09/26/07 08:35
R709160-05	021-121-SL-006	Treasure Island	SOIL		CTO_21		09/26/07 08:45
R709160-06	021-344-CL-001	Treasure Island	SOIL		CTO_21		09/26/07 15:35
R709160-07	Lab Control Sample		SOIL		CTO_21		
R709160-08	Method Blank		SOIL		CTO_21		
R709160-09	Duplicate (R709160-03)	Treasure Island	SOIL		CTO_21		09/25/07 14:30

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-LS
Version 3.06
Report date 11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

QC SUMMARY

SDG 8811
Contact Melissa C. Mannion

Client Tetra Tech EC, Inc.
Contract 1017112

QC BATCH	CHAIN OF CUSTODY	CLIENT SAMPLE ID	MATRIX	% MOIST	SAMPLE AMOUNT	BASIS AMOUNT	DAYS SINCE RECEIVED	DAYS SINCE COLL	LAB SAMPLE ID	DEPARTMENT SAMPLE ID
8811		021-121-SL-005	SOIL	3.0	46 g		09/27/07	1	R709160-04	8811-004
		021-121-SL-006	SOIL	1.9	39 g		09/27/07	1	R709160-05	8811-005
		021-124-ST-001	SOIL	3.4	48 g		09/27/07	3	R709160-01	8811-001
		021-233-SL-001N	SOIL	0.8	165 g		09/27/07	2	R709160-03	8811-003
		021-233-SL-002S	SOIL	2.9	116 g		09/27/07	2	R709160-02	8811-002
		021-344-CL-001	SOIL	0.9	62 g		09/27/07	1	R709160-06	8811-006
		Method Blank	SOIL						R709160-08	8811-008
		Lab Control Sample	SOIL						R709160-07	8811-007
		Duplicate (R709160-03)	SOIL	0.8	165 g		09/27/07	2	R709160-09	8811-009

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-QS
Version 3.06
Report date 11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

SDG 8811
Contact Melissa C. Mannion

PREP BATCH SUMMARY

Client Tetra Tech EC, Inc.
Contract 1017112

TEST	MATRIX	METHOD	PREPARATION BATCH	ERROR 2σ %	PLANCHETS ANALYZED — CLIENT	MORE	RE	BLANK	LCS	DUP/ORIG	MS/ORIG	QUALIFIERS
Gamma Spectroscopy												
GAM	SOIL	Gamma Scan	6107-206	15.0	6			1	1	1/1		

Duplicates and Matrix Spikes are those with original (Client) sample in this Sample Delivery Group.
Blank and LCS planchets are those in the same preparation batch as some Client, Duplicate or Spike sample.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-PBS
Version 3.06
Report date 11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

LAB WORK SUMMARY

SDG 8811
Contact Melissa C. Mannion

Client Tetra Tech EC, Inc.
Contract 1017112

LAB SAMPLE / COLLECTED / RECEIVED	CLIENT SAMPLE ID / LOCATION / CUSTODY	Proj. No.	MATRIX	PLANCHET	TEST	SUF-FIX	ANALYZED	REVIEWED	BY	METHOD
R709160-01 09/24/07 09/27/07	021-124-ST-001 Treasure Island	CTO_21	SOIL	8811-001	GAM		10/24/07	10/24/07	CSS	Gamma Scan
R709160-02 09/25/07 09/27/07	021-233-SL-002S Treasure Island	CTO_21	SOIL	8811-002	GAM		10/24/07	10/24/07	CSS	Gamma Scan
R709160-03 09/25/07 09/27/07	021-233-SL-001N Treasure Island	CTO_21	SOIL	8811-003	GAM		10/24/07	10/24/07	CSS	Gamma Scan
R709160-04 09/26/07 09/27/07	021-121-SL-005 Treasure Island	CTO_21	SOIL	8811-004	GAM		10/24/07	10/24/07	CSS	Gamma Scan
R709160-05 09/26/07 09/27/07	021-121-SL-006 Treasure Island	CTO_21	SOIL	8811-005	GAM		10/24/07	10/24/07	CSS	Gamma Scan
R709160-06 09/26/07 09/27/07	021-344-CL-001 Treasure Island	CTO_21	SOIL	8811-006	GAM		10/24/07	10/24/07	CSS	Gamma Scan
R709160-07	Lab Control Sample	CTO_21	SOIL	8811-007	GAM		10/24/07	10/24/07	CSS	Gamma Scan
R709160-08	Method Blank	CTO_21	SOIL	8811-008	GAM		10/24/07	10/24/07	CSS	Gamma Scan
R709160-09 09/25/07 09/27/07	Duplicate (R709160-03) Treasure Island	CTO_21	SOIL	8811-009	GAM		10/24/07	10/24/07	CSS	Gamma Scan

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-LWS
Version 3.06
Report date 11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

SDG 8811
Contact Melissa C. Mannion

WORK SUMMARY, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

COUNTS OF TESTS BY SAMPLE TYPE

TEST	Proj. No.	METHOD	REFERENCE	CLIENT	MORE	RE	BLANK	LCS	DUP SPIKE	TOTAL
GAM	CTO_21	Gamma Scan	EPA 901.1	6			1	1	1	9
TOTALS				6			1	1	1	9

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-LWS
Version 3.06
Report date 11/19/07

EBERLINE SERVICES / RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-008 Method Blank

METHOD BLANK

SDG 8811 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1017112

Lab sample id R709160-08 Client sample id Method Blank
Dept sample id 8811-008 Material/Matrix SOIL
Proj. No. CTO_21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		278		U	GAM
Cobalt-60	10198-40-0	U		14.9	0.036	U	GAM
Cesium-137	10045-97-3	U		16.3	0.113	U	GAM
Europium-152	14683-23-9	U		82.7	0.130	U	GAM
Europium-154	15585-10-1	U		30.1	0.230	U	GAM
Thallium-208	14913-50-9	U		12.3		U	GAM
Lead-210	14255-04-0	U		1050		U	GAM
Bismuth-212	14913-49-6	U		140		U	GAM
Lead-212	15092-94-1	U		31.3		U	GAM
Bismuth-214	14733-03-0	U		25.3		U	GAM
Lead-214	15067-28-4	U		34.9		U	GAM
Radium-226	13982-63-3	U		24.6	1.00	U	GAM
Actinium-228	14331-83-0	U		46.8		U	GAM
Thorium-230	14269-63-7	U		1970		U	GAM
Thorium-232	7440-29-1	U		46.8	1.69	U	GAM
Protactinium-234m	378783-76-7	U		1670		U	GAM
Thorium-234	15065-10-8	U		7.00		U	GAM
Uranium-235	15117-96-1	U		48.1	0.195	U	GAM
Americium-241	14596-10-2	U		45.2		U	GAM

Treaure Island

QC-BLANK #62970

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-007

Lab Control Sample

LAB CONTROL SAMPLE

SDG 8811 — Client Tetra Tech EC, Inc.

Contact Melissa C. Mannion — Contract 1017112

Lab sample id R709160-07 — Client sample id Lab Control Sample

Dept sample id 8811-007 — Material/Matrix SOIL

Proj. No. CTO 21

ANALYTE	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ADDED pCi/g	2σ ERR pCi/g	REC %	2σ LMTS (TOTAL)	PROTOCOL LIMITS
Cobalt-60	510	81	9.27	0.036		GAM	472	19	108	82-118	75-125
Cesium-137	528	83	14.3	0.113		GAM	476	19	111	82-118	75-125
Americium-241	541	84	19.4			GAM	505	20	107	83-117	75-125

Treaure Island

QC-LCS #62969

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-LCS
Version 3.06
Report date 11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-009

021-233-SL-001N

DUPLICATE

SDG 8811 | Client Tetra Tech EC, Inc.

Contact Melissa C. Mannion | Contract 1017112

DUPLICATE	ORIGINAL	
Lab sample id R709160-09	Lab sample id R709160-03	Client sample id 021-233-SL-001N
Dept sample id 8811-009	Dept sample id 8811-003	Location/Matrix Treasure Island SOIL
	Received 09/27/07	Collected/Weight 09/25/07 14:30 165 g
% moisture 0.8	% moisture 0.8	Custody/Proj. No. CTO 21

qw RPD 25%

ANALYTE	DUPLICATE pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ORIGINAL pCi/g	2σ ERR (TOTAL)	MDA pCi/g	QUALI-FIERS	RPD %	2σ TOT	DER σ
Potassium-40	U		0.797		U	GAM	U		0.845	U	-		0.1
Cobalt-60	U		0.059	0.036	U	GAM	U		0.054	U	-		0.1
Cesium-137	U		0.061	0.113	U	GAM	U		0.041	U	-		0.5
Europium-152	U		0.540	0.130	U	GAM	U		0.313	U	-		0.7
Europium-154	U		0.185	0.230	U	GAM	U		0.138	U	-		0.4
Thallium-208	U		0.059		U	GAM	U		0.048	U	-		0.3
Lead-210	2.15	0.69	0.760			GAM	1.96	0.70	0.837		9	48	0.4
Bismuth-212	U		0.872		U	GAM	U		0.548	U	-		0.6
Lead-212	0.106	0.071	0.088			GAM	U		0.089	U	17	117	0.3
Bismuth-214	2.08	0.36	0.136			GAM	2.03	0.34	0.092		2	24	0.2
Lead-214	2.58	0.43	0.158			GAM	2.38	0.38	0.106		8	23	0.7
Radium-226	2.02	0.35	0.132	1.00		GAM	1.97	0.32	0.090		3	24	0.2
Actinium-228	U		0.274		U	GAM	U		0.211	U	-		0.4
Thorium-230	U		5.51		U	GAM	U		3.90	U	-		0.5
Thorium-232	U		0.274	1.69	U	GAM	0.241	0.17	0.169		13	127	0.2
Protactinium-234m	U		9.78		U	GAM	U		7.16	U	-		0.4
Thorium-234	U		0.035		U	GAM	U		0.024	U	-		0.5
Uranium-235	U		0.273	0.195	U	GAM	U		0.188	U	-		0.5
Americium-241	U		0.066		U	GAM	U		0.057	U	-		0.2

Treaure Island

QC-DUP#3 62971

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-DUP
Version 3.06
Report date 11/19/07

EBERLINE SERVICES / RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-001 021-124-ST-001

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-01	Client sample id	021-124-ST-001
Dept sample id	8811-001	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/24/07 10:15 48 g
% moisture	3.4	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		4.82		U	GAM
Cobalt-60	10198-40-0	U		0.457	0.036	U	GAM
Cesium-137	10045-97-3	U		0.202	0.113	U	GAM
Europium-152	14683-23-9	U		1.43	0.130	U	GAM
Europium-154	15585-10-1	U		0.499	0.230	U	GAM
Thallium-208	14913-50-9	U		0.208		U	GAM
Lead-210	14255-04-0	U		18.0		U	GAM
Bismuth-212	14913-49-6	U		2.40		U	GAM
Lead-212	15092-94-1	U		0.322		U	GAM
Bismuth-214	14733-03-0	0.520	0.50	0.442			GAM
Lead-214	15067-28-4	0.703	0.45	0.455			GAM
Radium-226	13982-63-3	0.505	0.49	0.429	1.00		GAM
Actinium-228	14331-83-0	U		0.884		U	GAM
Thorium-230	14269-63-7	U		30.8		U	GAM
Thorium-232	7440-29-1	U		1.46	1.69	U	GAM
Protactinium-234m	378783-76-7	U		28.9		U	GAM
Thorium-234	15065-10-8	U		0.117		U	GAM
Uranium-235	15117-96-1	U		0.734	0.195	U	GAM
Americium-241	14596-10-2	U		0.753		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-002 021-233-SL-002S

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-02	Client sample id	021-233-SL-002S
Dept sample id	8811-002	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/25/07 14:22 116 g
% moisture	2.9	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		2.75		U	GAM
Cobalt-60	10198-40-0	U		0.121	0.036	U	GAM
Cesium-137	10045-97-3	U		0.118	0.113	U	GAM
Europium-152	14683-23-9	U		0.931	0.130	U	GAM
Europium-154	15585-10-1	U		0.350	0.230	U	GAM
Thallium-208	14913-50-9	U		0.127		U	GAM
Lead-210	14255-04-0	3.48	1.1	1.29			GAM
Bismuth-212	14913-49-6	U		1.48		U	GAM
Lead-212	15092-94-1	U		0.182		U	GAM
Bismuth-214	14733-03-0	3.15	0.55	0.220			GAM
Lead-214	15067-28-4	3.62	0.63	0.268			GAM
Radium-226	13982-63-3	3.06	0.54	0.214	1.00		GAM
Actinium-228	14331-83-0	U		0.523		U	GAM
Thorium-230	14269-63-7	U		6.34		U	GAM
Thorium-232	7440-29-1	U		0.523	1.69	U	GAM
Protactinium-234m	378783-76-7	U		20.0		U	GAM
Thorium-234	15065-10-8	U		0.041		U	GAM
Uranium-235	15117-96-1	U		0.403	0.195	U	GAM
Americium-241	14596-10-2	U		0.101		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-003 021-233-SL-001N

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-03	Client sample id	021-233-SL-001N
Dept sample id	8811-003	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/25/07 14:30 165 g
% moisture	0.8	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		0.845		U	GAM
Cobalt-60	10198-40-0	U		0.054	0.036	U	GAM
Cesium-137	10045-97-3	U		0.041	0.113	U	GAM
Europium-152	14683-23-9	U		0.313	0.130	U	GAM
Europium-154	15585-10-1	U		0.138	0.230	U	GAM
Thallium-208	14913-50-9	U		0.048		U	GAM
Lead-210	14255-04-0	1.96	0.70	0.837			GAM
Bismuth-212	14913-49-6	U		0.548		U	GAM
Lead-212	15092-94-1	U		0.089		U	GAM
Bismuth-214	14733-03-0	2.03	0.34	0.092			GAM
Lead-214	15067-28-4	2.38	0.38	0.106			GAM
Radium-226	13982-63-3	1.97	0.32	0.090	1.00		GAM
Actinium-228	14331-83-0	U		0.211		U	GAM
Thorium-230	14269-63-7	U		3.90		U	GAM
Thorium-232	7440-29-1	0.241	0.17	0.169	1.69		GAM
Protactinium-234m	378783-76-7	U		7.16		U	GAM
Thorium-234	15065-10-8	U		0.024		U	GAM
Uranium-235	15117-96-1	U		0.188	0.195	U	GAM
Americium-241	14596-10-2	U		0.057		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-004 021-121-SL-005

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-04	Client sample id	021-121-SL-005
Dept sample id	8811-004	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/26/07 08:35 46 g
% moisture	3.0	Custody/Proj. No.	CTO_21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	1.84	1.6	1.49			GAM
Cobalt-60	10198-40-0	U		0.166	0.036	U	GAM
Cesium-137	10045-97-3	U		0.164	0.113	U	GAM
Europium-152	14683-23-9	U		1.05	0.130	U	GAM
Europium-154	15585-10-1	U		0.442	0.230	U	GAM
Thallium-208	14913-50-9	U		0.209		U	GAM
Lead-210	14255-04-0	3.39	1.6	2.13			GAM
Bismuth-212	14913-49-6	U		2.23		U	GAM
Lead-212	15092-94-1	U		0.320		U	GAM
Bismuth-214	14733-03-0	U		0.361		U	GAM
Lead-214	15067-28-4	U		0.506		U	GAM
Radium-226	13982-63-3	U		0.351	1.00	U	GAM
Actinium-228	14331-83-0	U		0.682		U	GAM
Thorium-230	14269-63-7	U		16.1		U	GAM
Thorium-232	7440-29-1	U		0.682	1.69	U	GAM
Protactinium-234m	378783-76-7	U		111		U	GAM
Thorium-234	15065-10-8	U		0.236		U	GAM
Uranium-235	15117-96-1	U		1.09	0.195	U	GAM
Americium-241	14596-10-2	U		0.232		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-005 021-121-SL-006

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-05	Client sample id	021-121-SL-006
Dept sample id	8811-005	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/26/07 08:45 39 g
% moisture	1.9	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	2.95	2.5	1.56			GAM
Cobalt-60	10198-40-0	U		0.197	0.036	U	GAM
Cesium-137	10045-97-3	U		0.187	0.113	U	GAM
Europium-152	14683-23-9	U		1.39	0.130	U	GAM
Europium-154	15585-10-1	U		0.476	0.230	U	GAM
Thallium-208	14913-50-9	U		0.183		U	GAM
Lead-210	14255-04-0	U		15.5		U	GAM
Bismuth-212	14913-49-6	U		2.51		U	GAM
Lead-212	15092-94-1	U		0.273		U	GAM
Bismuth-214	14733-03-0	U		0.382		U	GAM
Lead-214	15067-28-4	U		0.362		U	GAM
Radium-226	13982-63-3	U		0.371	1.00	U	GAM
Actinium-228	14331-83-0	U		0.799		U	GAM
Thorium-230	14269-63-7	U		27.7		U	GAM
Thorium-232	7440-29-1	U		0.799	1.69	U	GAM
Protactinium-234m	378783-76-7	U		28.9		U	GAM
Thorium-234	15065-10-8	U		0.114		U	GAM
Uranium-235	15117-96-1	U		0.730	0.195	U	GAM
Americium-241	14596-10-2	U		0.667		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

8811-006 021-344-CL-001

DATA SHEET

SDG	8811	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1017112
Lab sample id	R709160-06	Client sample id	021-344-CL-001
Dept sample id	8811-006	Location/Matrix	Treasure Island SOIL
Received	09/27/07	Collected/Weight	09/26/07 15:35 62 g
% moisture	0.9	Custody/Proj. No.	CTO 21

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		5.74		U	GAM
Cobalt-60	10198-40-0	U		0.256	0.036	U	GAM
Cesium-137	10045-97-3	U		0.225	0.113	U	GAM
Europium-152	14683-23-9	U		1.74	0.130	U	GAM
Europium-154	15585-10-1	U		0.654	0.230	U	GAM
Thallium-208	14913-50-9	U		0.252		U	GAM
Lead-210	14255-04-0	6.87	2.4	2.82			GAM
Bismuth-212	14913-49-6	U		2.96		U	GAM
Lead-212	15092-94-1	U		0.384		U	GAM
Bismuth-214	14733-03-0	U		0.518		U	GAM
Lead-214	15067-28-4	U		0.518		U	GAM
Radium-226	13982-63-3	U		0.503	1.00	U	GAM
Actinium-228	14331-83-0	U		1.05		U	GAM
Thorium-230	14269-63-7	U		12.7		U	GAM
Thorium-232	7440-29-1	U		1.05	1.69	U	GAM
Protactinium-234m	378783-76-7	U		41.2		U	GAM
Thorium-234	15065-10-8	U		0.084		U	GAM
Uranium-235	15117-96-1	U		0.775	0.195	U	GAM
Americium-241	14596-10-2	U		0.194		U	GAM

Treaure Island

Gamma Spec. Method - EPA 901.1, 21-Day Count

Lab id	EBERL
Protocol	TTFW-CT21
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/19/07

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8811

Test GAM Matrix SOIL
SDG 8811
Contact Melissa C. Mannion

LAB METHOD SUMMARY

GAMMA SCAN
GAMMA SPECTROSCOPY

Client Tetra Tech EC, Inc.
Contract 1017112

RESULTS

LAB SAMPLE ID	RAW TEST	SUF-FIX	PLANCHET	CLIENT SAMPLE ID	Cobalt-60	Cesium-137	Americium-241
Preparation batch 6107-206							
R709160-01			8811-001	021-124-ST-001	U	U	U
R709160-02			8811-002	021-233-SL-002S	U	U	U
R709160-03			8811-003	021-233-SL-001N	U	U	U
R709160-04			8811-004	021-121-SL-005	U	U	U
R709160-05			8811-005	021-121-SL-006	U	U	U
R709160-06			8811-006	021-344-CL-001	U	U	U
R709160-07			8811-007	Lab Control Sample	ok	ok	ok
R709160-08			8811-008	Method Blank	U	U	U
R709160-09			8811-009	Duplicate (R709160-03)	- U	- U	- U
Nominal values and limits from method				RDLs (pCi/g)	0.036	0.113	
Treaure Island							

METHOD PERFORMANCE

SAMPLE ID	RAW TEST	SUF-FIX	CLIENT SAMPLE ID	MDA pCi/g	ALIQ g	PREP FAC	DILU-TION	YIELD %	EFF %	COUNT min	FWHM keV	DRIFT KeV	DAYS HELD	PREPARED	ANAL-YZED	DETECTOR
Preparation batch 6107-206 2σ prep error 15.0 % Reference Lab Notebook #6107, pg.206																
R709160-01			021-124-ST-001	0.457	45.7					296			30	10/01/07	10/24	JR,08,00
R709160-02			021-233-SL-002S	0.121	113					296			29	10/01/07	10/24	JR,06,00
R709160-03			021-233-SL-001N	0.054	164					293			29	10/01/07	10/24	JR,07,00
R709160-04			021-121-SL-005	0.166	44.6					292			28	10/01/07	10/24	JR,01,00
R709160-05			021-121-SL-006	0.197	38.1					273			28	10/01/07	10/24	JR,05,00
R709160-06			021-344-CL-001	0.256	61.4					197			28	10/01/07	10/24	JR,06,00
R709160-07			*Lab Control Sample*	9.27	1.00					198				10/01/07	10/24	JR,07,00
R709160-08			Method Blank	14.9	1.00					198				10/01/07	10/24	JR,08,00
R709160-09			Duplicate (R709160-03)	0.059	164					197			29	10/01/07	10/24	JR,01,00
Nominal values and limits from method				0.036	1.00					100			180			

PROCEDURES REFERENCE EPA 901.1
HWP-100 Sample Preparation for Gamma Spectrometry, rev 2

AVERAGES ± 2 SD FOR 9 SAMPLES
MDA 2.83 ± 10.9
YIELD _____ ± _____

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-LMS
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

SAMPLE SUMMARY

The Sample and QC Summary Reports show all samples, including QC samples, reported in one Sample Delivery Group (SDG).

The Sample Summary Report fully identifies client samples and gives the corresponding lab sample identification. The QC Summary Report shows at the sample level how the lab organized the samples into batches and generated QC samples. The Preparation Batch and Method Summary Reports show this at the analysis level.

The following notes apply to these reports:

* LAB SAMPLE ID is the lab's primary identification for a sample.

* DEPARTMENT SAMPLE ID is an alternate lab id, for example one assigned by a radiochemistry department in a lab.

* CLIENT SAMPLE ID is the client's primary identification for a sample. It includes any sample preparation done by the client that is necessary to identify the sample.

* QC BATCH is a lab assigned code that groups samples to be processed and QCed together. These samples should have similar matrices.

  QC BATCH is not necessarily the same as SDG, which reflects samples received and reported together.

* All Lab Control Samples, Method Blanks, Duplicates and Matrix Spikes are shown that QC any of the samples. Due to possible reanalyses, not all results for all these QC samples may be relevant to the SDG. The Lab Control Sample, Method Blank, Duplicate, Matrix Spike and Method Summary Reports detail these relationships.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

PREPARATION BATCH SUMMARY

The Preparation Batch Summary Report shows all preparation batches in one Sample Delivery Group (SDG) with information necessary to check the completeness and consistency of the SDG.

The following notes apply to this report:

* The preparation batches are shown in the same order as the Method Summary Reports are printed.

* Only analyses of planchets relevant to the SDG are included.

* Each preparation batch should have at least one Method Blank and LCS in it to validate client sample results.

* The QUALIFIERS shown are all qualifiers other than U, J, B, L and H that occur on any analysis in the preparation batch. The Method Summary Report has these qualifiers on a per sample basis.

  These qualifiers should be reviewed as follows:

  X Some data has been manually entered or modified. Transcription errors are possible.

  P One or more results are 'preliminary'. The data is not ready for final reporting.

  2 There were two or more results for one analyte on one planchet imported at one time. The results in DVD may not be the same as on the raw data sheets.

  Other lab defined qualifiers may occur. In general, these should be addressed in the SDG narrative.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

WORK SUMMARY

The Work Summary Report shows all samples, including QC samples, and all relevant analyses in one Sample Delivery Group (SDG). This report is often useful as supporting documentation for an invoice.

The following notes apply to this report:

* TEST is a code for the method used to measure associated analytes. Results and related information for each analyte are on the Data Sheet Report. In special cases, a test code used in the summary data section is not the same as in associated raw data. In this case, both codes are shown on the Work Summary.

* SUFFIX is the lab's code to distinguish multiple analyses (recounts, reworks, reanalyses) of a fraction of the sample. The suffix indicates which result is being reported. An empty suffix normally identifies the first attempt to analyze the sample.

* The LAB SAMPLE ID, TEST and SUFFIX uniquely identify all supporting data for a result. The Method Summary Report for each TEST has method performance data, such as yield, for each lab sample id and suffix and procedures used in the method.

* PLANCHET is an alternate lab identifier for work done for one test. It, combined with the TEST and SUFFIX, may be the best link to raw data.

* For QC samples, only analyses that directly QC some regular sample are shown. The Lab Control Sample, Method Blank, Duplicate, Matrix Spike and Method Summary Reports detail these relationships.

* The SAS (Special Analytical Services) Number is a client or lab assigned code that reflects special processing for samples, such as rapid turn around. Counts of tests done are lists by SAS number since it is likely to affect prices.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

DATA SHEET

The Data Sheet Report shows all results and primary supporting information for one client sample or Method Blank. This report corresponds to both the CLP Inorganics and Organics Data Sheet.

The following notes apply to this report:

* TEST is a code for the method used to measure an analyte. If the TEST is empty, no data is available; the analyte was not analyzed for.

* The LAB SAMPLE ID and TEST uniquely identify work within the Summary Data Section of a Data Package. The Work Summary and Method Summary Reports further identify raw data that underlies this work.

  The Method Summary Report for each TEST has method performance data, such as yield, for each Lab Sample ID and a list of procedures used in the method.

* ERRORs can be labeled TOTAL or COUNT. TOTAL implies a preparation (non-counting method) error has been added, as square root of sum of squares, to the counting error denoted by COUNT. The preparation errors, which may vary by preparation batch, are shown on the Method Summary Report.

* A RESULT can be 'N.R.' (Not Reported). This means the lab did this work but chooses not to report it now, possibly because it was reported at another time.

* When reporting a Method Blank, a RESULT can be 'N.A.' (Not Applicable). This means there is no reported client sample work in the same preparation batch as the Blank's result. This is likely to occur when the Method Blank is associated with reanalyses of selected work for a few samples in the SDG.

The following qualifiers are defined by the DVD system:

U The RESULT is less than the MDA (Minimum Detectable Activity). If the MDA is blank, the ERROR is used as the limit.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

DATA SHEET

J The RESULT is less than the RDL (Required Detection Limit) and no U qualifier is assigned.

B A Method Blank associated with this sample had a result without a U flag and, after correcting for possibly different aliquots, that result is greater than or equal to the MDA for this sample.

Normally, B is not assigned if U is. When method blank subtraction is shown on this report, B flags are assigned based on the unsubtracted values while U's are assigned based on the subtracted ones. Both flags can be assigned in this case.

For each sample result, all Method Blank results in the same preparation batch are compared. The Method Summary Report documents this and other QC relationships.

L Some Lab Control Sample that QC's this sample had a low recovery. The lab can disable assignment of this qualifier.

H Similar to 'L' except the recovery was high.

P The RESULT is 'preliminary'.

X Some data necessary to compute the RESULT, ERROR or MDA was manually entered or modified.

2 There were two or more results available for this analyte. The reported result may not be the same as in the raw data.

Other qualifiers are lab defined. Definitions should be in the SDG narrative.

The following values are underlined to indicate possible problems:

* An MDA is underlined if it is bigger than its RDL.

* An ERROR is underlined if the 1.645 sigma counting error is bigger than both the MDA and the RESULT, implying that the MDA

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

DATA SHEET

may not be a good estimate of the 'real' minimum detectable activity.

* A negative RESULT is underlined if it is less than the negative of its 2 sigma counting ERROR.

* When reporting a Method Blank, a RESULT is underlined if greater than its MDA. If the MDA is blank, the 2 sigma counting error is used in the comparison.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

LAB CONTROL SAMPLE

The Lab Control Sample Report shows all results, recoveries and primary supporting information for one Lab Control Sample.

The following notes apply to this report:

* All fields in common with the Data Sheet Report have similar usage. Refer to its Report Guide for details.

* An amount ADDED is the lab's value for the actual amount spiked into this sample with its ERROR an estimate of the error of this amount.

  An amount added is underlined if its ratio to the corresponding RDL is outside protocol specified limits.

* REC (Recovery) is RESULT divided by ADDED expressed as a percent.

* The first, computed limits for the recovery reflect:

  1. The error of RESULT, including that introduced by rounding the result prior to printing.

     If the limits are labeled (TOTAL), they include preparation error in the result. If labeled (COUNT), they do not.

  2. The error of ADDED.

  3. A lab specified, per analyte bias. The bias changes the center of the computed limits.

* The second limits are protocol defined upper and lower QC limits for the recovery.

* The recovery is underlined if it is outside either of these ranges.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

DUPLICATE

The Duplicate Report shows all results, differences and primary supporting information for one Duplicate and associated Original sample.

The following notes apply to this report:

* All fields in common with the Data Sheet Report have similar usage. This applies both to the Duplicate and Original sample data. Refer to the Data Sheet Report Guide for details.

  If the Duplicate has data for a TEST and the lab did not do this test to the Original, the Original's RESULTs are underlined.

* The RPD (Relative Percent Difference) is the absolute value of the difference of the RESULTs divided by their average expressed as a percent.

  If both RESULTs are less than their MDAs, no RPD is computed and a '-' is printed.

  For an analyte, if the lab did work for both samples but has data for only one, the MDA from the sample with data is used as the other's result in the RPD.

* The first, computed limit is the sum, as square root of sum of squares, of the errors of the results divided by the average result as a percent, hence the relative error of the difference rather than the error of the relative difference. The errors include those introduced by rounding the RESULTs prior to printing.

  If this limit is labeled TOT, it includes the preparation error in the RESULTs. If labeled CNT, it does not.

  This value reported for this limit is at most 999.

* The second limit for the RPD is the larger of:

  1. A fixed percentage specified in the protocol.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

Client Tetra Tech EC, Inc.
Contract 1017112

DUPLICATE

2. A protocol factor (typically 2) times the average MDA as a percent of the average result. This limit applies when the results are close to the MDAs.

* The RPD is underlined if it is greater than either limit.

* If specified by the lab, the second limit column is replaced by the Difference Error Ratio (DER), which is the absolute value of the difference of the results divided by the quadratic sum of their one sigma errors, the same errors as used in the first limit.

  Except for differences due to rounding, the DER is the same as the RPD divided by the first RPD limit with the limit scaled to 1 sigma.

* The DER is underlined if it is greater than the sigma factor, typically 2 or 3, shown in the header for the first RPD limit.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

MATRIX SPIKE

The Matrix Spike Report shows all results, recoveries and primary supporting information for one Matrix Spike and associated Original sample.

The following notes apply to this report:

* All fields in common with the Data Sheet Report have similar usage. This applies both to the Spiked and Original sample data. Refer to the Data Sheet Report Guide for details.

  If the Spike has data for a TEST and the lab did not do this test to the Original, the Original's RESULTs are underlined.

* An amount ADDED is the lab's value for the actual amount spiked into the Spike sample with its ERROR an estimate of the error of this amount.

  An amount is underlined if its ratio to the corresponding RDL is outside protocol specified limits.

* REC (Recovery) is the Spike RESULT minus the Original RESULT divided by ADDED expressed as a percent.

* The first, computed limits for the recovery reflect:

  1. The errors of the two RESULTs, including those introduced by rounding them prior to printing.

     If the limits are labeled (TOTAL), they include preparation error in the result. If labeled (COUNT), they do not.

  2. The error of ADDED.

  3. A lab specified, per analyte bias. The bias changes the center of the computed limits.

* The second limits are protocol defined upper and lower QC limits for the recovery.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

MATRIX SPIKE

These limits are left blank if the Original RESULT is more than a protocol defined factor (typically 4) times ADDED. This is a way of accounting for that when the spike is small compared to the amount in the original sample, the recovery is unreliable.

* The recovery is underlined (out of spec) if it is outside either of these ranges.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

SDG 8811
Contact Melissa C. Mannion

REPORT GUIDE

Client Tetra Tech EC, Inc.
Contract 1017112

METHOD SUMMARY

The Method Summary Report has two tables. One shows up to five results measured using one method. The other has performance data for the method. There is one report for each TEST, as used on the Data Sheet Report.

The following notes apply to this report:

* Each table is subdivided into sections, one for each preparation batch. A preparation batch is a group of aliquots prepared at roughly the same time in one work area of the lab using the same method.

  There should be Lab Control Sample and Method Blank results in each preparation batch since this close correspondence makes the QC meaningful. Depending on lab policy, Duplicates need not occur in each batch since they QC sample dependencies such as matrix effects.

* The RAW TEST column shows the test code used in the raw data to identify a particular analysis if it is different than the test code in the header of the report. This occurs in special cases due to method specific details about how the lab labels work.

  The Lab Sample or Planchet ID combined with the (Raw) Test Code and Suffix uniquely identify the raw data for each analysis.

* If a result is less than both its MDA and RDL, it is replaced by just 'U' on this report. If it is greater than or equal to the RDL but less than the MDA, the result is shown with a 'U' flag.

  The J and X flags are as on the data sheet.

* Non-U results for Method Blanks are underlined to indicate possible contamination of other samples in the preparation batch. The Method Blank Report has supporting data.

* Lab Control Sample and Matrix Spike results are shown as: ok, No data, LOW or HIGH, with the last two underlined. 'No data' means no amount ADDED was specified. 'LOW' and 'HIGH'

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

METHOD SUMMARY

correspond to when the recovery is underlined on the Lab Control Sample or Matrix Spike Report. See these reports for supporting data.

* Duplicate sample results are shown as: ok, No data, or OUT, with the last two underlined. 'No data' means there was no original sample data found for this duplicate. 'OUT' corresponds to when the RPD is underlined on the Duplicate Report. See this report for supporting data.

* If the MDA column is labeled 'MAX MDA', there was more than one result measured by the reported method and the MDA shown is the largest MDA. If not all these results have the same RDL, the MAX MDA reflects only those results with RDL equal to the smallest one.

  MDAs are underlined if greater than the printed RDL.

* Aliquots are underlined if less than the nominal value specified for the method.

* Prepareation factors are underlined if greater than the nominal value specified for the method.

* Dilution factors are underlined if greater than the nominal value specified for the method.

* Residues are underlined if outside the range specified for the method. Residues are not printed if yields are.

* Yields, which may be gravimetric, radiometric or some type of recovery depending on the method, are underlined if outside the range specified for the method.

* Efficiencies are underlined if outside the range specified for the method. Efficiencies are detector and geometry dependent so this test is only approximate.

* Count times are underlined if less than the nominal value

METHOD SUMMARY

specified for the method.

* Resolutions (as FWHM; Full Width at Half Max) are underlined if greater than the method specified limit.

* Tracer drifts are underlined if their absolute values are greater than the method specified limit. Tracer drifts are not printed if percent moistures are.

* Days Held are underlined if greater than the holding time specified in the protocol.

* Analysis dates are underlined if before their planchet's preparation date or, if a limit is specified, too far after it.

For some methods, ratios as percentages and error estimates for them are computed for pairs of results. A ratio column header like '1÷3' means the ratio of the first result column and the third result column.

Ratios are not computed for Lab Control Sample, Method Blank or Matrix Spike results since their matrices are not necessarily similar to client samples'.

The error estimate for a ratio of results from one planchet reflects only counting errors since other errors should be correlated. For a ratio involving different planchets, if QC limits are computed based on total errors, the error for the ratio allows for the preparation errors for the planchets.

The ratio is underlined (out of spec) if the absolute value of its difference from the nominal value is greater than its error estimate. If no nominal value is specified, this test is not done.

For Gross Alpha or Gross Beta results, there may be a column showing the sum of other Alpha or Beta emitters. This sum includes all relevant results in the DVD database, whether reported or not. Results in the sum are weighted by a particles/decay value specified by the lab for each relevant analyte. Results less than their MDA are not included.

SDG 8811
Contact Melissa C. Mannion

GUIDE, cont.

Client Tetra Tech EC, Inc.
Contract 1017112

METHOD SUMMARY

No sums are computed for Lab Control, Method Blank or Matrix Spike samples since their various planchets may not be physically related.

If a ratio of total isotopic to Gross Alpha or Beta is shown, the error for the ratio reflects both the error in the Gross result and the sum, as square root of sum of squares, of the errors in the isotopic results.

For total elemental uranium or thorium results, there may be a column showing the total weight computed from associated isotopic results. Ignoring results less than their MDAs, this is a weighted sum of the isotopic results. The weights depend on the molecular weight and half-life of each isotope so as to convert activities (decays) to weight (atoms).

If a ratio of total computed to measured elemental uranium or thorium is shown, the error for the ratio reflects the errors in all the measurements.

Lab id EBERL
Protocol TTFW-CT21
Version Ver 1.0
Form DVD-RG
Version 3.06
Report date 11/19/07

Section 4.0
Aliquot Information

LOG-IN VERIFICATION
All samples
All planchets

R709160 TETRATECH_FW
Tetra Tech EC, Inc.
Alameda Point

CTO 021

Pr Mgr.... MCM Rcvd... 09/27/07
Charge.... 00-000 Due.... 27-OCT-07
Chemist... Value... 0.
Created... 27-SEP-07 Billed.. 0.
Billing status.. COMPLETE
Calc. units..... PCI /Unit alq Min Pri
/ 0

Record book 06107
p.p. 206-207
10/31/07 carr/trac

smp	elm	typ	mg rec	dpm rec Ash wgt	1st sep		2nd sep		aliquot			
1		GLS	0.00	0.0000	0.000	0	0.000	0	45.73	✓	gram	# 0
2		GLS	0.00	0.0000	0.000	0	0.000	0	113.0	✓	gram	# 0
3		GLS	0.00	0.0000	0.000	0	0.000	0	163.7	✓	gram	# 0
4		GLS	0.00	0.0000	0.000	0	0.000	0	44.60	✓	gram	# 0
5		GLS	0.00	0.0000	0.000	0	0.000	0	38.07	✓	gram	# 0
6		GLS	0.00	0.0000	0.000	0	0.000	0	61.44	✓	gram	# 0
7		GLS	0.00	0.0000	0.000	0	0.000	0	1.000	✓	smpl	# 0
8		GLS	0.00	0.0000	0.000	0	0.000	0	1.000	✓	smpl	# 0
9		GLS	0.00	0.0000	0.000	0	0.000	0	163.7	✓	gram	# 0

Carriers/Tracers used -----

206 709160

8811

Ak 10/31/07

WORK RECORD

Date	Analysis	Proc. / Steps	Sample	Analyst	Remarks
09.28.07	soil Prep	SPP 060 REV 0	1-6	[illegible]	
10.01-07	MC	SPP 061 REV 0	1-6	[illegible]	
10-01-07	GLS	SPP 100 REV 0	1-9	[illegible]	

Ak 10/02/07

709160 TETRA TECH 10/31/07 207

Recd: 09.27.07

0928.07 8811 OTHER SOLID Due: 10.02.07.

[GLSJ,

Cust ID TO	FRACT	WTS RSV(g)	ACID GLS(g)
8811-1 021-124-ST-001 09.24.07 10:15	1	47.58	45.73
-2 021-233-SL-002S 09.25.07 14:22	1	116.40	113.02
-3 021-233-SL-001N 09.25.07 14:30	1	165.10	163.71
-4 021-121-SL-005 09.25.07 08:35	1	46.05	44.60
-5 021-121-SL-006 09.25.07 08:45	1	38.82	38.07
-6 021-344-CL-001 09.26.07 15:35	1	61.98	61.44
-7 LCS			
-8 BLANK			
-9 Dup #3			163.71
DONE BY:		10/28	10/31

% MC

	GWW(g)	TW(g)	NWW(g)	GDW(g)	NDW(g)	% MC	DONE BY:	CKD BY:
8811-1	54.14	6.56	47.58	52.54	45.98	3.31		
-2	122.94	6.54	116.40	119.57	113.03	2.90		
-3	171.64	6.54	165.10	170.27	163.73	0.83		
-4	52.60	6.55	46.05	51.20	44.65	3.04		
-5	45.37	6.55	38.82	44.63	38.08	1.91		
-6	68.53	6.55	61.98	67.99	61.44	0.87		

10/02/07

Section 5.0
Preparation Log For Quality Control Samples, Standards and Tracer/Carrier Certification

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 • U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

#410 Rec'd 12/21/05 R Prenton

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

72015A-207 Am^{241} R1

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.768 E3
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	December 19, 2005 12:00 EST 353.708 05
RELATIVE EXPANDED UNCERTAINTY (k=2):	2.0%

Impurities: γ-impurities <0.1%
α-impurities <0.1%

5.06320 grams 1M HCl solution.

P O NUMBER 00003035, Item 1

SOURCE PREPARED BY: M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED: [signature] 12-20-2005

Am-241 R1 in 1N HCL Prep'd 9/14/06

$$0371\,g \times \frac{3768\,dps}{5.063209} \times \frac{60\,sec}{min} \times \frac{1}{100\,mL} = 2249\ dpm/mL \pm 1.0\%$$

@ 353.708 05

R Prenton

✓ K. Yamamoto 9/14/06

9/14/06 RP

Prep of Am-241 R1

IB QC

Gross wt 78.4395 g
Tare wt 73.4024 g
Net wt 5.0371 g

Balance Used #36

Procedure CT-T03 Rev 03 6/16/06

Tared a 100mL vol. flask + top. Opened Am-241 Analytics 7201SA-207 vial, Log 410 3.768 E3 dps in 5.06320g on Dec. 19, 2005 12:00 EST

Transferred Am 241 solution into the tared 100mL vol. flask, Weigh Am-241 sol., flask + top.

Diluted to mark with 1NHCL. Mixed. Trasferred to a 4oz PB.

$$5.0371\ g \times \frac{3768\ dps}{5.06320\ g} \times \frac{60\ sec}{min} \times \frac{1}{100\ mL} = 7249\ dpm/mL \pm 1.0\%$$ @ 353,708 05

K Prenton

✓ K. Yamamoto 9/14/06

9/15/06 RP — Verif of Am^{241} RI IB QC

Pipetted into 3 ea 50mL beakers;

0.1mL Am^{241} RI + 0.5mL Am^{243} II

Cont'd Procedure CT-VAM-2 Rev03 6/16/06

1501499-501 R Brenton

9/15/06 RP — Prep of U^{232} F-QI-A-(08) 3

Transferred ~250mL U^{232} F-QI-A-(06)

into 8oz WM PB

18.04 dpm/mL ± 0.4% @ 076.766-06

R Brenton

9/18/06 RP — Prep of H^3 AFI-A-(05) BA

Transferred ~100mL H^3 AFI-A

into a 4oz WMPB.

1.324E5 dpm/mL ± 0.9% @ 246.708 98

R Brenton

#361

National Institute of Standards & Technology

Certificate

Co^{60} K1

Standard Reference Material 4915E
Cobalt-60 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive cobalt-60 chloride, non-radioactive cobalt chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of ionization chambers and solid-state gamma-ray spectrometry systems.

Radiological Hazard

The SRM ampoule contains cobalt-60 with a total activity of approximately 400 kBq. Cobalt-60 decays by beta-particle emission. None of the beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 8 to 2500 keV are emitted. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least January 2005.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
April 1995 (Text only revised November 1997)

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

Rec'd 5/5/00 L.Stenton

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have an acid concentration and a carrier concentration comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

#361

Co^{60} KI

PROPERTIES OF SRM 4915E
(Certified values are shown in bold type)

Source identification number	NIST SRM 4915E		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.016 ± 0.002) g·mL^{-1} at 22.1 °C [b]***		
Solution mass	**(5.063 ± 0.002) g [b]**		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L^{-1})	Mass Fraction (g·g^{-1})
	H_2O HCl $CoCl_2$ $^{60}CoCl_2$	54 1.0 1×10^{-3} 3×10^{-8}	0.96 0.04 1×10^{-4} 4×10^{-9}
Radiological Properties:			
Radionuclide	**Cobalt-60**		
Reference time	**1200 EST, 1 January 1995**		
Massic activity of the solution [c] (Activity per unit mass of solution)	**75.55 kBq·g^{-1}**		
Relative expanded uncertainty (k=2)	**0.54%** [d]		
Photon-emitting impurities	None detected [e]		
Half lives used	Cobalt-60: (5.2714 ± 0.0005) a [f] Radium-226: (1600 ± 7) a [f]		
Measuring instrument	Pressurized "4π"γ ionization chamber A calibrated using a cobalt-60 solution whose activity was determined by 4πß-γ-coincidence and anticoincidence counting		

Co^{60} KI prep. in 1N HCl.

7/7/00 RP
~~5.06~~

$5.0262g \times 75.55 \frac{kBq}{g} \times 60 \frac{dpm}{Bq} \times 1000 \times \frac{1}{100ml} = 2.278E5$ dpm/ml ± 0.28

@ ~~001.833-95~~ 7/ R.
001.708-95
R Prenton 7/7/00
K. Yamamoto 7/10/00

carrier content: 0.1104 mg/ml Co^0

*Notes and references are on pages 5 and 6.

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [g]	Relative Sensitivity Factor, $\lvert \partial y/\partial x_i \rvert \cdot (x_i/y)$ [h]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [i]
PIC A net response per gram of SRM 4915E, measured relative to RRS10 [j]	Standard deviation of the mean for 350 repeated measurements (A)	0.02	1.0	0.02
PIC A background response, measured relative to RRS10	Standard deviation of the mean for >250 repeated measurements (A)	0.25	0.001 [k]	0.0003
PIC A net response for RRS100, measured relative to RRS10	Standard deviation of the mean for >100 repeated measurements (A)	0.06	1.0	0.06
PIC A net response per Bq of cobalt-60 in solution, measured relative to RRS100.	Standard deviation of the mean for 720 repeated measurements (A)	0.02	1.0	0.02
Gravimetric measurements	Estimated (B)	0.01	1.0	0.01
Half life of cobalt-60 Half life of radium-226	Standard uncertainty of the half life (A)	0.01 [m] 0.44 [m]	0.03 [n] 0.006 [n]	0.0003 0.003
Activity used to calibrate PIC A net response per Bq of cobalt-60 in solution	Standard uncertainty of the activity determined by 4πß-γ-coincidence and anticoincidence counting (B)	0.20	1.0	0.20
Live-time [p]	Estimated (B)	0.10	1.0	0.10
PIC A charge collection	Estimated (B)	0.05	1.0	0.05
Source Positioning	Estimated (B)	0.05	1.0	0.05
Photon-emitting impurities	Limit of detection (B) [q]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.27
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.54

*Notes and references are on pages 5 and 6.

[j] The response of pressurized ionization chamber A (PIC A) is determined from measurement of the time required to collect a given amount of charge on a stable fixed capacitor. All of the response measurements in the NIST pressurized ionization chambers are made relative to the response of one or more artifact standards. These artifact standards consist of microgram quantities of aged radium-226 in small welded stainless-steel capsules. These capsules are encapsulated in plastic rods whose dimensions are similar to those of the standard NIST ampoule. The artifact standards are called **Radium Reference Sources** and are designated as RRSx, where x is the nominal mass (in micrograms) of radium-226 in the capsule.

[k] $|\partial y/\partial x_i| \cdot (x_i/y)$ = (average background response)/(average net sample response)

[m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

[p] The live time is determined by counting the pulses from a gated oscillator.

[q] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i$ = 100%. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of Co-60)}·{(Bq of impurity)/(Bq of Co-60)}. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), January 1995.

#361

Co^{60} K1

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	300	2	0.3

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) \equiv |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] Estimated limits of detection for photon-emitting impurities are:
76 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 90 and 1169 keV,
24 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 1177 and 1328 keV, and
8 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 1336 and 1900 keV, provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of cobalt-60.

[f] The stated uncertainty is the standard uncertainty. See reference [5].

[g] Relative standard uncertainty of the input quantity x_i.

[h] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[i] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

7/7/00 RP

Prep of Co^{60} KI

Gross 84.3604 g
Tare 79.3342 g
Net 5.0262 g

Balance used #2
Satorius Model 1702

Tared a 100 ml. vol. flask and top.
Opened Co^{60} Nist 4915E. log #361, 75.55 kBq·g⁻¹
7/7/00 RP @ 1200 EST. 1 Jan 1995. Transferred
Co^{60} solution into a tared vol. flask.
Weighed Co^{60} solution, flask and top.
Pipetted 1 ml of Co Pl carrier (10.81 mg/ml Co^0)
into the flask. Diluted to mark with
1N HCl. Transfer to 4oz P.B.

$$5.0262\,g \times 75.55\,\frac{kBq}{g^{-1}} \times 60\,\frac{\cancel{Bq}\ dpm}{\cancel{g}\ Bq} \times 1000 \times \frac{1}{100\,ml} = 2.278E5\ dpm/ml \pm 0.28\%$$

7/7/00 RP

@ 001.708-95 ~~@ 001.833-95~~
7/7/00 RP ~~001.833-95~~

Co^0 carrier content

$$\left[\left(5.0262\,g \times \cancel{0.0001}\ 7/7/00\,RP\ \frac{mg}{g}\ CoCl_2 \times 0.4539\,\frac{Co^0}{CoCl_2}\right) + 10.81\,mg\ \cancel{Co^0}\ 7/7/00\,RP\right] \times \frac{1}{100\,ml}$$

$= 0.1104\ mg/ml\ Co^0$

R Prenton

Calculations checked. K. Yamamoto 7/10/00

6/11/07 TAC Prep of Co^{60} K1-F-(04) 1B

Procedure CT-T04, Rev. 03 6/16/06

Pipetted 4.1 mL (4×1000 mL + 100 mL) ≃ 4.18 g.

of Co^{60} K1 2.278E5 dpm/mL ± 0.3% into

a 100 mL vol. Flask Diluted to mark with

1 N HCl. Transferred to a 4 oz WM PB.

9340 dpm/mL ± 0.7% @ 001.70895

J. Alaoui

6/12/07 TAC Prep of Am^{243} H-H1-A-(04) 3

Transferred 250 mL Am^{243} H-H1-A into

a 8 oz WM PB

25.18 dpm/mL ± 0.90% @ 282.777-06

J Alaoui

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 • U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

409 Rec'd 12/21/05 R Prenton

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

72016-207 Cs^{137} Q1

Cs-137 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated with an ionization chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Cs-137
ACTIVITY (dps):	3.690 E4
HALF-LIFE:	3.007 E1 years
CALIBRATION DATE:	December 19, 2005 12:00 EST 353.708 DS
RELATIVE EXPANDED UNCERTAINTY (k=2):	1.7%

Impurities: γ-impurities <0.1%

5.01264 grams 0.1M HCl solution with 30 µg/g Cs carrier.

P O NUMBER: 00003035, Item 2

SOURCE PREPARED BY: M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED: 12-20-2005

Cs-137 Q1 prep'd 11/10/06 .1N HCl

$4.9808\,g \times \frac{36900\ dps}{5.01264\,g} \times \frac{60\,sec}{min} \times \frac{1}{100\,mL} = 2.200E4\ dpm/mL \pm 0.9\%$ @ 353.708 DS

0.0546 mg/mL Cs_2PtCl_6 carrier content

R Prenton 11/10/06

✓ K. Yamamoto 11/12/06

1/10/06 RP

Prep of Cs^{137} QC

1A QC

Gross wt. 76.0174 g
Tare wt ~~T.K.~~ 71.0366
Net wt 4.9808 g

Balance used #36

Procedure CT-T03, Rev2, 4/15/02

Tared a 100mL vol. flask + top. Opened Cs-137 vial Analytics 70 72016-207, Log 409 3.690E4 dps in 5.01264 g on Dec. 19, 2005 12:00 EST. Transferred Cs-137 sol. into the tared vol. flask. Tared Cs-137 sol., vol. flask + top. Added 100µL Cs D-A6 carrier 50.77 mg/mL Cs_2PtCl_6 to the same flask. Diluted to mark with 0.1M HCL. Transferred to 40z PB.

$$4.9808\,g \times \frac{36900\,dps}{5.01264\,g} \times \frac{60\,sec}{min} \times \frac{L}{100\,mL} = 2.200E4\,dpm/mL \pm 0.9\%\ @\ 353.70805$$

carrier content
0.0546 mg/mL Cs_2PtCl_6

K Brenton

✓ K. Yamamoto 1/12/06

6/27/05 RP

Standardization of Cs D-A6 carrier

Procedure CT-CCS, Rev 02. 4/15/02
7.2 Standardization, Balance 2 Model 1702 Sartorius
2 mL a/q from Cs D-A5
Prep. see C-3 pg 39

6/27/05 RP	21	22	23	1
Tare wt	12.4876 g	12.5112 g	12.4712 g	12.5446 g
"	~~12.4875~~ 6/27/05 RP	12.5112	12.4712	12.5446
"	12.4876			
Avg wt	12.4876 g	12.5112 g	12.4712 g	12.5446 g
Gross wt	12.5893 g	12.6126 g	12.5732 g	12.6458 g
"	12.5893	12.6127	12.5730	12.6456
Avg "	12.5893 g	12.61265 g	12.5731 g	12.6457 g
Avg Tare wt	12.4876	12.5112	12.4712	12.5446
	0.1017 g	0.10145 g	0.1019 g	0.1011 g

mean $\frac{101.54 \text{ mg}}{2 \text{ mL}}$ = 50.77 mg/mL Cs_2PtCl_6 ± 0.17% @ 180 05

K Trenton

K. Yamamoto 6/29/05

68

8/10/07 RP

Prep of Cs-137 QI-A-(04) 1B QC

Procedure CT-T04, Rev 03, 6/16/06

Pipetted 10mL (10.00 g) of Cs-137 QI 22900 dpm/mL ± 0.9% into a 100mL vol. flask.

Diluted to mark with 0.1N HCl
Transferred to 402 WM PB
Cs-137 8/10/07 RP
2200 dpm/mL ~~± 0.9~~ 0.9% @ 353.708-05

RP Seaton

8/17/07 RP

Verif. of Tc 99 EI 1507 50-55

Pipetted into 3ea LSC ~~Vials~~ 8/17/07 RP vials;

0.1mL Tc-99 EI 97050 dpm/mL 1507 ~~50-53~~ 50-52

0.1mL Tc-99 DI 96840 " 1507 ~~52-54~~ 8/17/07 RP 53-55

Cont'd Procedure CT-VB-1, Rev 02 6/16/06

Blank 1507-301 5mL H2O + 15mL Ultima Gold AB

RP Seaton

14 9/4/07

Section 6.0
Sample Analysis Raw Data

5-Day Gamma Count

Thermo/NUtech Ge(Li) Analysis Report

02-OCT-07 PAGE 1

IDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
021-124-ST-001	00049401		TMA # (GLS) 8811	1
TZERO = 267.719 2007			45.7300 GRAM	Aliquot
K 40	2.188E+00	< 2.188E+00		DET LIM
Co 60	1.501E-01	< 1.501E-01		DET LIM
Cs137	1.682E-01	< 1.682E-01		DET LIM
Eu152	1.347E+00	< 1.347E+00		DET LIM
Eu154	5.531E-01	< 5.531E-01		DET LIM
Tl208	1.652E-01	< 2.285E-01		DET LIM
Pb210	1.741E+00	(3.629 +/- 1.304) E+00		35.9%
Bi212	2.377E+00	< 2.377E+00		DET LIM
Pb212	2.946E-01	< 2.946E-01		DET LIM
Bi214	3.894E-01	(4.467 +/- 3.422) E-01		76.6%
Pb214	3.842E-01	(4.557 +/- 3.518) E-01		77.2%
Ra226	3.782E-01	(4.338 +/- 3.323) E-01		76.6%
Ac228	7.671E-01	< 7.671E-01		DET LIM
Th230	1.198E+01	< 1.198E+01		DET LIM
Th232	7.671E-01	< 7.671E-01		DET LIM
Th234	9.503E-02	< 9.503E-02		DET LIM
Pa234m	3.024E+01	< 3.024E+01		DET LIM
U 235	5.790E-01	< 5.789E-01		DET LIM
Am241	1.760E-01	< 1.759E-01		DET LIM
021-233-SL-002S	00049402		TMA # (GLS) 8811	2
TZERO = 268.891 2007			113.0200 GRAM	Aliquot
K 40	1.508E+00	< 1.508E+00		DET LIM
Co 60	8.532E-02	< 8.532E-02		DET LIM
Cs137	8.552E-02	< 8.552E-02		DET LIM
Eu152	6.915E-01	< 6.915E-01		DET LIM
Eu154	2.832E-01	< 2.832E-01		DET LIM
Tl208	9.262E-02	< 9.262E-02		DET LIM
Pb210	9.350E+00	< 9.350E+00		DET LIM
Bi212	1.206E+00	< 1.206E+00		DET LIM
Pb212	1.440E-01	< 1.440E-01		DET LIM
Bi214	1.750E-01	(2.232 +/- 0.226) E+00		10.1%
Pb214	2.151E-01	(2.682 +/- 0.258) E+00		9.6%
Ra226	1.700E-01	(2.167 +/- 0.219) E+00		10.1%
Ac228	3.826E-01	< 3.826E-01		DET LIM
Th230	1.516E+01	< 1.516E+01		DET LIM
Th232	3.826E-01	< 3.826E-01		DET LIM
Th234	5.200E-02	< 5.200E-02		DET LIM
Pa234m	1.515E+01	< 1.515E+01		DET LIM
U 235	3.543E-01	< 3.543E-01		DET LIM
Am241	3.314E-01	< 3.314E-01		DET LIM

N LIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
021-233-SL-001N	00049403	TMA # (GLS) 8811 3		
TZERO = 268.896 2007		163.7100 GRAM		Aliquot
K 40	2.083E+00	< 2.083E+00		DET LIM
Co 60	9.021E-02	< 9.021E-02		DET LIM
Cs137	8.377E-02	< 8.377E-02		DET LIM
Eu152	6.761E-01	< 6.761E-01		DET LIM
Eu154	2.650E-01	< 2.650E-01		DET LIM
Tl208	8.277E-02	< 8.277E-02		DET LIM
Pb210	9.172E-01	(2.176 +/- 0.660) E+00		30.3%
Bi212	1.175E+00	< 1.175E+00		DET LIM
Pb212	1.326E-01	< 1.326E-01		DET LIM
Bi214	1.880E-01	(9.775 +/- 2.270) E-01		23.2%
Pb214	1.969E-01	(1.186 +/- 0.218) E+00		18.4%
Ra226	1.826E-01	(9.493 +/- 2.204) E-01		23.2%
Ac228	3.751E-01	< 3.751E-01		DET LIM
Th230	4.713E+00	< 4.713E+00		DET LIM
Th232	3.751E-01	< 3.751E-01		DET LIM
Th234	3.036E-02	< 3.036E-02		DET LIM
Pa234m	1.301E+01	< 1.301E+01		DET LIM
U 235	2.918E-01	< 2.918E-01		DET LIM
Am241	7.029E-02	< 7.029E-02		DET LIM
-121-SL-005	00049404	TMA # (GLS) 8811 4		
TZERO = 268.650 2007		44.6000 GRAM		Aliquot
K 40	2.235E+00	< 2.235E+00		DET LIM
Co 60	1.787E-01	< 1.787E-01		DET LIM
Cs137	1.547E-01	< 1.547E-01		DET LIM
Eu152	1.224E+00	< 1.224E+00		DET LIM
Eu154	5.271E-01	< 5.271E-01		DET LIM
Tl208	1.740E-01	< 1.740E-01		DET LIM
Pb210	3.097E+00	< 3.510E+00		DET LIM
Bi212	2.229E+00	< 2.229E+00		DET LIM
Pb212	2.393E-01	< 2.846E-01		DET LIM
Bi214	3.203E-01	< 4.370E-01		DET LIM
Pb214	3.754E-01	< 6.868E-01		DET LIM
Ra226	3.110E-01	< 4.244E-01		DET LIM
Ac228	7.022E-01	< 7.021E-01		DET LIM
Th230	1.829E+01	< 1.829E+01		DET LIM
Th232	7.022E-01	< 7.021E-01		DET LIM
Th234	2.542E-01	< 2.542E-01		DET LIM
Pa234m	2.784E+01	< 1.003E+02		DET LIM
U 235	6.287E-01	< 1.282E+00		DET LIM
Am241	2.980E-01	< 2.980E-01		DET LIM

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
021-121-SL-006	00049405	TMA # (GLS) 8811 5		
TZERO = 268.657 2007		38.0700 GRAM		Aliquot
K 40	6.182E+00	< 6.182E+00		DET LIM
Co 60	2.630E-01	< 2.630E-01		DET LIM
Cs137	2.610E-01	< 3.651E-01		DET LIM
Eu152	1.689E+00	< 1.689E+00		DET LIM
Eu154	7.758E-01	< 7.758E-01		DET LIM
Tl208	2.743E-01	< 2.743E-01		DET LIM
Pb210	2.458E+01	< 2.458E+01		DET LIM
Bi212	3.638E+00	< 3.638E+00		DET LIM
Pb212	4.346E-01	< 4.346E-01		DET LIM
Bi214	5.766E-01	< 5.766E-01		DET LIM
Pb214	5.996E-01	< 5.996E-01		DET LIM
Ra226	5.827E-01	< 5.827E-01		DET LIM
Ac228	1.145E+00	< 1.145E+00		DET LIM
Th230	4.269E+01	< 4.269E+01		DET LIM
Th232	1.145E+00	< 1.145E+00		DET LIM
Th234	1.811E-01	< 1.811E-01		DET LIM
Pa234m	4.405E+01	< 4.405E+01		DET LIM
U 235	1.039E+00	< 1.039E+00		DET LIM
Am241	9.809E-01	< 9.809E-01		DET LIM
021-344-CL-001	00049406	TMA # (GLS) 8811 6		
TZERO = 269.941 2007		61.4400 GRAM		Aliquot
K 40	8.324E-01	(4.408 +/- 0.956) E+00		21.7%
Co 60	6.486E-02	< 6.487E-02		DET LIM
Cs137	7.281E-02	< 7.281E-02		DET LIM
Eu152	4.802E-01	< 4.802E-01		DET LIM
Eu154	1.842E-01	< 1.842E-01		DET LIM
Tl208	8.144E-02	(1.535 +/- 0.872) E-01		56.8%
Pb210	8.588E-01	(4.974 +/- 0.711) E+00		14.3%
Bi212	8.574E-01	< 8.574E-01		DET LIM
Pb212	9.470E-02	(3.493 +/- 0.829) E-01		23.7%
Bi214	1.512E-01	(3.069 +/- 1.358) E-01		44.2%
Pb214	1.640E-01	(5.193 +/- 1.633) E-01		31.4%
Ra226	1.469E-01	(2.980 +/- 1.319) E-01		44.2%
Ac228	3.178E-01	< 3.178E-01		DET LIM
Th230	5.446E+00	< 5.446E+00		DET LIM
Th232	2.845E-01	(2.751 +/- 2.570) E-01		93.4%
Th234	3.779E-02	< 3.779E-02		DET LIM
Pa234m	1.110E+01	< 1.110E+01		DET LIM
U 235	2.448E-01	< 2.448E-01		DET LIM
Am241	7.480E-02	< 7.480E-02		DET LIM

LIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
QC-LCS #62969	00049407	TMA # (GLS) 8811 7		
TZERO = 274.981 2007		1.0000 SMPL		Aliquot
K 40	7.467E+01	< 7.467E+01		DET LIM
Co 60	5.696E+00	(4.716 +/- 0.145) E+02		3.1%
Cs137	8.677E+00	(5.082 +/- 0.131) E+02		2.6%
Eu152	6.435E+01	< 6.435E+01		DET LIM
Eu154	1.499E+01	< 1.499E+01		DET LIM
Tl208	6.407E+00	< 6.407E+00		DET LIM
Pb210	5.893E+02	< 5.893E+02		DET LIM
Bi212	9.188E+01	< 9.188E+01		DET LIM
Pb212	8.734E+00	< 8.734E+00		DET LIM
Bi214	1.196E+01	< 1.196E+01		DET LIM
Pb214	1.260E+01	< 1.260E+01		DET LIM
Ra226	1.162E+01	< 1.162E+01		DET LIM
Ac228	3.368E+01	< 3.368E+01		DET LIM
Th230	8.436E+02	< 8.436E+02		DET LIM
Th232	3.368E+01	< 3.368E+01		DET LIM
Th234	2.985E+00	< 2.985E+00		DET LIM
Pa234m	1.402E+03	< 1.402E+03		DET LIM
U 235	2.021E+01	< 2.021E+01		DET LIM
Am241	3.197E+01	(5.447 +/- 0.282) E+02		5.2%
QC-BLANK #62970	00049408	TMA # (GLS) 8811 8		
TZERO = 274.981 2007		1.0000 SMPL		Aliquot
K 40	3.437E+01	< 3.437E+01		DET LIM
Co 60	3.217E+00	< 3.217E+00		DET LIM
Cs137	3.147E+00	< 3.147E+00		DET LIM
Eu152	2.167E+01	< 2.167E+01		DET LIM
Eu154	7.954E+00	< 7.953E+00		DET LIM
Tl208	3.197E+00	< 3.197E+00		DET LIM
Pb210	6.223E+01	< 1.253E+02		DET LIM
Bi212	4.033E+01	< 4.033E+01		DET LIM
Pb212	4.939E+00	< 4.939E+00		DET LIM
Bi214	7.765E+00	< 1.305E+01		DET LIM
Pb214	6.840E+00	< 1.002E+01		DET LIM
Ra226	7.541E+00	< 1.267E+01		DET LIM
Ac228	1.408E+01	< 1.408E+01		DET LIM
Th230	2.425E+02	< 2.425E+02		DET LIM
Th232	1.408E+01	< 1.408E+01		DET LIM
Th234	1.517E+00	< 1.517E+00		DET LIM
Pa234m	4.950E+02	< 4.950E+02		DET LIM
U 235	1.087E+01	< 1.087E+01		DET LIM
Am241	3.447E+00	< 3.447E+00		DET LIM

Thermo/NUtech Ge(Li) Analysis Report

02-OCT-07 PAGE 1

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
QC-DUP#3 62971	00049421		TMA # (GLS) 8811	9
TZERO = 268.896 2007			163.7100 GRAM	Aliquot
K 40	9.836E-01	< 9.836E-01		DET LIM
Co 60	4.161E-02	< 4.161E-02		DET LIM
Cs137	3.998E-02	< 3.999E-02		DET LIM
Eu152	3.222E-01	< 3.222E-01		DET LIM
Eu154	1.262E-01	< 1.262E-01		DET LIM
Tl208	4.183E-02	< 4.184E-02		DET LIM
Pb210	5.707E-01	(1.806 +/- 0.456) E+00		25.2%
Bi212	5.426E-01	< 5.426E-01		DET LIM
Pb212	6.390E-02	< 6.390E-02		DET LIM
Bi214	7.996E-02	(8.862 +/- 1.344) E-01		15.2%
Pb214	9.108E-02	(1.152 +/- 0.143) E+00		12.4%
Ra226	7.765E-02	(8.606 +/- 1.305) E-01		15.2%
Ac228	1.749E-01	< 1.749E-01		DET LIM
Th230	2.309E+00	< 2.309E+00		DET LIM
Th232	1.749E-01	< 1.749E-01		DET LIM
Th234	1.455E-02	< 1.455E-02		DET LIM
Pa234m	6.759E+00	< 6.759E+00		DET LIM
U 235	1.415E-01	< 1.415E-01		DET LIM
Am241	3.574E-02	< 3.574E-02		DET LIM

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

GLS 8811-7
LCS
62969
PASS

Planchet Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (SMPL)	Yield
7	LCS				274.981-07	JR	1	1

Analytical Results

Sample No.	QA Type	Analyte	Result (PCI/SMPL)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/SMPL)
7	LCS	Am241	5.447E+02	2.820E+01	5.2	3.197E+01
7	LCS	Co 60	4.716E+02	1.450E+01	3.1	5.696E+00
7	LCS	Cs137	5.082E+02	1.310E+01	2.6	8.677E+00

Standard Info

Nuclide	Half Life (days)	Standard Id	Qty (ml)	Activity (dpm/mL)	Reference Date	Decay Date	Added (PCI)	Added Error (%)
AM-241	157900	R1	0.5	2249	353.708-2005	274.981-07	5.051E+02	4
CO-60	1925	K1-F-(04)	0.6	9340	001.708-1995	274.981-07	4.721E+02	4
CS-137	11020	Q1-A-(04)	0.5	2200	353.708-2005	274.981-07	4.756E+02	4

Evaluation Results

Analyte	F/A Ratio	Ratio Error (%)	LCL	LWL	UWL	UCL	Status	Flag
Co 60	0.999	5	0.79	0.86	1.14	1.21	PASS	
Cs137	1.069	5	0.80	0.87	1.13	1.20	PASS	
Am241	1.078	7	0.75	0.83	1.17	1.25	PASS	

10/2-07

62969

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

GLS 8811-8
BLANK
62970
PASS

Planchet Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (SMPL)	Yield
8	BLANK				274.981-07	JR	1	1

Analytical Results

Sample No.	QA Type	Analyte	Result (PCI/SMPL)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/SMPL)
8	BLANK	Cs137	< 3.147E+00			3.147E+00

Evaluation Results

Analyte	Result (PCI/SMPL)	MDA (PCI/SMPL)	Status	Flag
Cs137	< 3.147E+00	3.147E+00	PASS	

BW 10-2-07

62970

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (GRAM)	Yield
9	DUP	268.896-7			274.981-07	JR	163.71	1
3	ORIGINAL	268.896-7			274.835-07	JR	163.71	1

Sample No.	QA Type	Analyte	Result (PCI/GRAM)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/GRAM)
9	DUP	Pb214	1.152E+00	1.430E-01	12.4	9.108E-02
3	ORIGINAL	Pb214	1.186E+00	2.180E-01	18.4	1.969E-01

Analyte	Result (PCI/GRAM)	MDA (PCI/GRAM)	UCL	RPD	RER	Criterion	Status	Flag
Pb214	1.152E+00	9.108E-02	20.00	3			PASS	

BW 10-2-07

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**********************************************************************
8811    GLS   1        G-1 JR 274.836  7  206.42 MIN    45.73000 GR       168
LIBR=TTIH  REF TIME= 267.719  7       100 mL in Parkway Jar
**  **********************************************************************
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JWR 10.2.07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00644	0.157	2.221E+02 s		<	2.188E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 9.428E-01	3G		
**** (889.26)	1.000000	0.00984	0.159	1.619E+01 s		<	1.692E-01
**** (1120.52)	1.000000	0.00810	0.147	1.809E+01 s		<	1.890E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.974E-01	4G		
**** (1173.21)	0.999200	0.00779	0.128	1.646E+01 s		<	1.626E-01
**** (1332.48)	1.000000	0.00698	0.106	1.520E+01 s		<	1.501E-01
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 9.213E-01	16G		
**** (1691.00)	0.457000	0.00566	0.103	3.994E+01 s		<	4.270E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.996E-01	3G		
**** (661.64)	0.851000	0.01252	0.182	1.707E+01 s		<	1.682E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.990E-01	48G		
**** (121.78)	0.254000	0.04322	0.295	2.684E+01 s		<	2.647E-01
[illegible] (295.97)	0.004000	0.02328	0.256	2.751E+03	55.20%		2.713E+01
[illegible] (344.31)	0.245000	0.02075	0.227	4.464E+01 s		<	4.402E-01
841 (841.53)	0.001000	0.01029	0.162	1.575E+04	40.22%		1.553E+02
**** (963.36)	0.132000	0.00921	0.166	1.366E+02 s		<	1.347E+00
**** (1112.04)	0.124000	0.00815	0.137	1.351E+02 s		<	1.332E+00
**** (1408.02)	0.198000	0.00666	0.141	1.067E+02 s		<	1.052E+00
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.984E-01	48G		
**** (123.07)	0.390000	0.04295	0.289	1.727E+01 s		<	1.703E-01
582 (582.03)	0.008000	0.01385	0.127	1.148E+03	70.78%		1.133E+01
**** (723.26)	0.202000	0.01166	0.188	7.970E+01 s		<	7.863E-01
**** (1004.75)	0.170000	0.00889	0.143	9.433E+01 s		<	9.306E-01
**** (1274.49)	0.336000	0.00725	0.137	5.606E+01 s		<	5.531E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 9.355E-01	22G		
296 (295.95)	0.290900	0.02328	0.256	3.785E+01	55.20%		3.986E-01
**** (316.50)	0.830700	0.02213	0.243	1.323E+01 s		<	1.393E-01
**** (468.06)	0.476000	0.01642	0.205	2.617E+01 s		<	2.756E-01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
582 (583.14)	0.860000	0.01383	0.127	1.070E+01 s	70.78%		1.054E-01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
47 (46.50)	0.040000	0.05556	0.819	3.684E+02 s	17.96%		3.629E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
(295.10)	0.000240	0.02333	0.256	4.575E+04	55.20%		4.507E+02
582 (583.14)	0.310000	0.01383	0.127	2.968E+01	70.78%		2.923E-01
*** (727.17)	0.066500	0.01161	0.186	2.413E+02 s		<	2.377E+00
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		

****	(238.63)	0.431000	0.02731	0.352	2.991E+01 s		<r 2.946E-01
Bi214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
6	(609.30)	0.470000	0.01335	0.285	4.535E+01 s38.31%		4.467E-01
Pb214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 23G		
296	(295.20)	0.190000	0.02332	0.256	5.781E+01 55.20%		5.694E-01
353	(352.00)	0.360000	0.02040	0.340	4.627E+01 s38.60%		4.557E-01
Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00 48G		
186	(186.10)	0.040000	0.03266	0.328	2.508E+02 s51.86%		2.470E+00
296	(295.20)	0.201000	0.02332	0.256	5.465E+01 55.20%		5.383E-01
353	(351.96)	0.393000	0.02040	0.340	4.238E+01 s38.60%		4.174E-01
609	(609.32)	0.484000	0.01335	0.285	4.403E+01 s38.31%		4.338E-01
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 9.994E-01 48G		
****	(49.80)	0.087000	0.05556	0.333	6.883E+01 s	<	6.784E-01
64	(62.50)	0.002500	0.05620	0.425	3.023E+03 59.74%		2.979E+01
****	(79.70)	0.018000	0.05314	0.400	4.177E+02 s	<	4.117E+00
****	(94.00)	0.013500	0.04967	0.461	6.868E+02 s	<r	6.769E+00
****	(210.60)	0.012600	0.02990	0.282	7.477E+02 s	<	7.369E+00
****	(236.00)	0.115000	0.02753	0.326	1.031E+02 s	<	1.016E+00
****	(254.70)	0.009100	0.02603	0.220	9.276E+02 s	<	9.143E+00
****	(256.20)	0.063000	0.02591	0.264	1.618E+02 s	<	1.595E+00
****	(285.60)	0.016500	0.02391	0.244	6.188E+02 s	<	6.099E+00
296	(296.60)	0.003900	0.02324	0.256	2.826E+03 55.20%		2.786E+01
****	(300.00)	0.018900	0.02305	0.235	5.398E+02 s	<	5.320E+00
****	(304.40)	0.013500	0.02279	0.256	8.315E+02 s	<	8.196E+00
****	(329.90)	0.029000	0.02144	0.262	4.215E+02 s	<	4.155E+00
****	(334.40)	0.011500	0.02122	0.246	1.009E+03 s	<	9.948E+00
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 41G		
****	(911.10)	0.250000	0.00964	0.188	7.788E+01 s	<	7.671E-01
Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00 8G		
****	(68.00)	0.005900	0.05550	0.398	1.216E+03 s	<	1.198E+01
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00 42G		
841	(840.20)	0.008500	0.01031	0.162	1.851E+03 40.22%		1.823E+01
****	(911.10)	0.250000	0.00964	0.188	7.788E+01 s	<	7.671E-01
****	(968.90)	0.150000	0.00916	0.152	1.106E+02 s	<	1.090E+00
****	(63.81)	0.010101	0.05607	0.483	8.523E+02 s	<	8.395E+00
Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 10G		
****	(92.30)	0.999999	0.05009	0.483	9.647E+00 s	<r	9.503E-02
Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
****	(1001.03)	0.006000	0.00892	0.164	3.070E+03 s	<	3.024E+01
U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00 34G		
****	(143.78)	0.132600	0.03894	0.304	5.878E+01 s	<	5.789E-01
186	(185.72)	0.540000	0.03271	0.328	1.855E+01 s51.86%		1.827E-01
Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00 41G		
****	(59.54)	0.359000	0.05639	0.362	1.786E+01 s	<	1.759E-01

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8811    GLS   1       G-1 JR 274.836  7  206.42 MIN    45.73000 GR       168
LIBR=TTIH  REF TIME= 267.719  7      100 mL in Parkway Jar
```

Group	8811	Time of count	274.836 2007
Sample	1	Reference GMT	267.719 2007
Element		Elapsed Live Tm	206.4167
Type code	GLS	Dead Time Pct	0.008073
ID	021-124-ST-001	Background GMT	272.802 2007
Geometry, detector	JR-1	Standard GMT	272.776 2007
Aliquot	45.73	Days since T0	7.116638
Unit of Aliquot	GRAM	Time on	13:03 PDT 1-OCT
Data Sheet Units	PCI /GRAM	Time off	16:29 PDT 1-OCT
Library	TTIH	Calc Time	08:52 02-OCT-07
Slope	1.004868	Width slope	0.004696
Intercept	2.091488	Width offset	0.57
X**2 TERM	-0.16260576E-05	Sensitivity	4.

NP:[7,67]168.GSP 16 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	26.6	22	12	56	2.50	194	24.4	9.42E-01	10.8	0.150	0	2.47
2	5	31.1	22	12	229	2.50	75	28.9	3.61E-01	37.7	0.241	0	0.00
3	0	46.6	42	6	282	2.19	169	44.3	8.19E-01	18.0	0.810	0	0.00
4	0	63.6	57	9	497	1.97	249	61.2	1.21E+00	18.4	5.61	0	0.00
5	0	70.2	66	6	389	2.69	119	67.8	5.74E-01	29.1	5.51	0	0.00
	0	92.9	87	7	333	1.92	250	90.3	1.21E+00	13.9	4.99	0	0.00
	0	186.2	179	9	281	2.31	170	183.3	8.26E-01	20.2	3.27	0	0.00
8	0	239.4	232	9	289	1.46	115	236.3	5.58E-01	27.3	2.73	0	0.00
9	0	296.4	289	9	209	1.82	73	293.0	3.52E-01	39.5	2.33	0	0.00
10	0	352.8	346	9	146	2.47	113	349.2	5.49E-01	23.1	2.08	0	0.00
11	0	511.5	502	12	137	3.19	269	507.3	1.30E+00	10.5	1.54	0	0.00
12	0	582.4	574	8	67	5.68	62	578.1	2.99E-01	28.0	1.40	0	0.00
13	0	609.2	600	11	108	1.92	92	604.7	4.48E-01	23.9	1.35	0	0.00
14	0	796.5	788	9	47	2.04	37	791.5	1.80E-01	40.9	1.09	0	0.00
15	0	840.8	833	7	41	3.53	33	835.8	1.62E-01	40.2	1.04	0	0.00
16	0	1021.4	1010	11	35	2.50	25	1016.0	1.20E-01	53.1	0.879	0	0.00

FWHM=SQRT(5.07634E+00 + 6.36767E-03 *E)

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BACKGROUND INFO 8811    GLS   1       274.836  7 G- 1     BG DATE 272.802  7

    0 PEAKS REJECTED BY BACKGROUND

BACKGROUND INFO 8811    GLS   1       274.836  7 G- 1     BG DATE 272.802  7

    0 PEAKS REJECTED BY BACKGROUND

BACKGROUND INFO 8811    GLS   1       274.836  7 G- 1     BG DATE 272.802  7
```

PEAK			BACKGROUND			NET	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR

```
  63.60    1.2053 18.43        62.00  0.7807 15.69         0.4247  59.74
  92.86    1.2090 13.89        92.00  1.0917  3.91         0.1172 147.80R
 1 .22     0.8258 20.24       186.00  0.4981  6.18         0.3277  51.86
 2.43      0.5583 27.32       238.60  0.5190  4.01         0.0392 392.42R
 296.38    0.3516 39.55       295.20  0.0954 27.04         0.2562  55.20
 352.80    0.5487 23.10       351.90  0.2089 16.18         0.3398  38.60
 511.47    1.3015 10.54       511.00  1.3391  4.21        -0.0376 394.82R
 582.44    0.2986 27.96       583.10  0.1714 19.66         0.1272  70.78
 609.17    0.4479 23.88       609.30  0.1633 12.98         0.2846  38.31
    3 PEAKS REJECTED BY BACKGROUND

*************************************************************************
INTERFERING ISOTOPE ANALYSIS 8811    GLS   1       274.836  7 G- 1
*************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 8811 1 GLS RUN AT 274.836/2007

BACKGROUND FOR GELI DETECTOR 1 OF 272.802/2007 2641.5 MIN

EN GY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
52.0	0.7807	15.69	511.0	1.3391	4.21	1120.3	0.0446	32.06
92.0	1.0917	3.91	583.1	0.1714	19.66	1173.2	0.0272	0.00
143.0	0.0931	38.79	609.3	0.1633	12.98	1238.1	0.0285	0.00
186.0	0.4981	6.18	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0725	21.78	727.2	0.0348	16.65	1377.7	0.0319	0.00
238.6	0.5190	4.01	846.0	0.0656	55.51	1461.0	0.0714	26.33
279.0	0.0000	0.00	860.4	0.0372	0.00	1586.0	0.0000	0.00
295.2	0.0954	27.04	911.1	0.0868	18.20	1591.0	0.0620	0.00
338.4	0.0607	33.42	968.9	0.0455	32.96	1729.6	0.0061	0.00
351.9	0.2089	16.18	1001.0	0.0458	35.39	1764.5	0.0374	37.99

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 10/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
218.883	7	1.7454	14.137	138.
223.775	7	1.7551	14.882	22.
230.918	7	1.7347	13.890	35.
237.741	7	1.7237	13.528	28.
258.777	7	1.7442	14.353	29.
265.711	7	1.7599	15.213	22.
265.864	7	1.5439	11.619	38.NG
2 918	7	1.5464	12.253	26.NG
.063	7	1.5169	11.690	20.NG
272.730	7	1.5111	11.869	23.NG
AVERAGE		1.7438	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
70.013	7	1.0668	4.608	26.
71.872	7	1.0549	5.509	41.
76.856	7	1.0713	7.228	30.
81.670	7	1.0534	5.600	25.
103.972	7	0.8203	15.248	21.
192.664	7	0.9760	34.750	25.
197.727	7	2.1369	18.219	45.
205.876	7	0.9740	30.810	21.
216.753	7	0.9677	15.266	24.
272.776	7	0.8535	10.320	20.
AVERAGE		1.0235	0.048	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 272.776 7
ENERGY= 2.091488 + 1.0048681*CH + -1.626058E-06*CH**2
FWHM =SQRT(1.8082 + 0.004696*ENERGY) (CO60= 2.840)

EFFICIENCIES FOR GEOMETRY JR 1 CALIBRATED 207.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.555600	100.0	4.819200	300.0	2.304700	0.0	0.000000
55.0	5.631600	110.0	4.582500	500.0	1.562100	0.0	0.000000
60.0	5.636600	130.0	4.152700	700.0	1.197600	0.0	0.000000
65.0	5.592800	150.0	3.787300	1000.0	0.892900	0.0	0.000000
70.0	5.516200	170.0	3.479400	1400.0	0.669100		
80.0	5.307100	190.0	3.218900	2000.0	0.489700		
90.0	5.065700	250.0	2.638800	3000.0	0.348600		

8811 1 GLS GSTOR 168

	PK	ENERGY	CPM	%ERR	COMMENT
	1	26.6	0.94	10.8	
	2	31.1	0.36	37.7	
	3	46.6	0.82	18.0	Pb210s
b	4	63.6	0.42	59.7	Th232s
	5	70.2	0.57	29.1	
b	7	186.2	0.33	51.9	Cs136 U 235s Ra226s
b	9	296.4	0.26	55.2	Ra226 Ru103
b	10	352.8	0.34	38.6	Ra226s Pb214s
b	12	582.4	0.13	70.8	Th228 Tl208s
b	13	609.2	0.28	38.3	Ru103 Ra226s Bi214s
	14	796.5	0.18	40.9	Cs134
	15	840.8	0.16	40.2	Ac228
	16	1021.4	0.12	53.1	
			REJECTED PEAKS		
B	6	92.9	0.12	99.9	Th234s Th227s
B	8	239.4	0.04	99.9	Th228 Th228 Pb212s
B	11	511.5	-0.04	99.9	Th228 La140 Ru106 Na 22

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********************************************************************************
8811    GLS   2        G-5 JR 274.836  7  206.50 MIN    113.02000 GR        527
LIBR=TTIH  REF TIME= 268.891  7        100 mL in Jar (temp)
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10.2.07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00507	0.211	3.783E+02 s		<r	1.508E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 9.520E-01	3G		
**** (889.26)	1.000000	0.00818	0.180	2.206E+01 s		<	9.234E-02
1121 (1120.52)	1.000000	0.00659	0.586	8.896E+01 s	13.94%		3.724E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.979E-01	4G		
**** (1173.21)	0.999200	0.00630	0.144	2.295E+01 s		<	9.165E-02
**** (1332.48)	1.000000	0.00556	0.119	2.136E+01 s		<	8.532E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 9.338E-01	16G		
**** (1691.00)	0.457000	0.00434	0.114	5.741E+01 s		<	2.450E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.996E-01	3G		
**** (661.64)	0.851000	0.01067	0.195	2.145E+01 s		<	8.552E-02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.991E-01	48G		
**** (121.78)	0.254000	0.04080	0.459	4.425E+01 s		<	1.765E-01
5 (295.97)	0.004000	0.02256	2.805	3.108E+04	6.92%		1.240E+02
**** (344.31)	0.245000	0.01949	0.284	5.956E+01 s		<	2.376E-01
**** (963.36)	0.132000	0.00761	0.174	1.733E+02 s		<	6.915E-01
**** (1112.04)	0.124000	0.00664	0.150	1.824E+02 s		<	7.276E-01
**** (1408.02)	0.198000	0.00526	0.144	1.386E+02 s		<	5.530E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.987E-01	48G		
**** (123.07)	0.390000	0.04082	0.412	2.587E+01 s		<	1.032E-01
**** (723.26)	0.202000	0.00987	0.189	9.487E+01 s		<	3.786E-01
**** (1004.75)	0.170000	0.00732	0.172	1.386E+02 s		<	5.530E-01
**** (1274.49)	0.336000	0.00581	0.139	7.097E+01 s		<	2.832E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 9.458E-01	22G		
295 (295.95)	0.290900	0.02257	2.807	4.276E+02	6.92%		1.802E+00
**** (316.50)	0.830700	0.02115	0.306	1.743E+01 s		<	7.346E-02
**** (468.06)	0.476000	0.01459	0.241	3.468E+01 s		<	1.461E-01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
**** (583.14)	0.860000	0.01193	0.238	2.324E+01 s		<	9.262E-02
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
**** (46.50)	0.040000	0.00393	0.369	2.346E+03 s		<	9.350E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
295 (295.10)	0.000240	0.02263	2.805	5.164E+05	6.92%		2.058E+03
**** (727.17)	0.066500	0.00982	0.198	3.025E+02 s		<	1.206E+00
212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
**** (238.63)	0.431000	0.02769	0.431	3.612E+01 s		<r	1.440E-01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G		

610	(609.30)	0.470000	0.01147	3.019	5.600E+02	s	5.06%	2.232E+00
767	(768.70)	0.050000	0.00933	0.428	9.177E+02		21.25%	3.658E+00
935	(934.80)	0.030000	0.00781	0.126	5.371E+02		43.85%	2.141E+00
1[illegible]1	(1120.40)	0.170000	0.00659	0.586	5.229E+02		13.94%	2.084E+00
[illegible]9	(1238.30)	0.060000	0.00598	0.131	3.658E+02		64.59%	1.458E+00
[illegible]378	(1379.00)	0.050000	0.00538	0.088	3.279E+02		74.34%	1.307E+00
1508	(1509.00)	0.020000	0.00490	0.044	4.492E+02		***** %	1.790E+00
1765	(1764.00)	0.170000	0.00415	0.332	4.708E+02		20.62%	1.877E+00

Pb214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 23G

242	(241.90)	0.076000	0.02734	1.376	6.625E+02		9.91%	2.641E+00
295	(295.20)	0.190000	0.02262	2.805	6.526E+02		6.92%	2.601E+00
352	(352.00)	0.360000	0.01908	4.622	6.729E+02	s	4.80%	2.682E+00
767	(768.40)	0.000800	0.00934	0.428	5.734E+04		21.25%	2.285E+02

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 1.000E+00 48G

186	(186.10)	0.040000	0.03417	1.745	1.277E+03	s	14.60%	5.089E+00
242	(242.00)	0.078000	0.02732	1.376	6.458E+02		9.91%	2.574E+00
295	(295.20)	0.201000	0.02262	2.805	6.169E+02		6.92%	2.459E+00
352	(351.96)	0.393000	0.01908	4.622	6.163E+02	s	4.80%	2.456E+00
610	(609.32)	0.484000	0.01147	3.019	5.438E+02	s	5.06%	2.167E+00
767	(768.40)	0.053200	0.00934	0.428	8.622E+02		21.25%	3.436E+00
935	(934.10)	0.033400	0.00782	0.126	4.821E+02		43.85%	1.921E+00
1121	(1120.30)	0.160000	0.00659	0.586	5.556E+02		13.94%	2.214E+00
1239	(1238.10)	0.062000	0.00598	0.131	3.540E+02		64.59%	1.411E+00
1378	(1377.60)	0.041800	0.00538	0.088	3.918E+02		74.34%	1.562E+00
1765	(1764.50)	0.166000	0.00415	0.332	4.823E+02		20.62%	1.922E+00

Th227 7.951E+03 DAYS LAMBDA= 8.718E-05 DECAY= 9.995E-01 48G

* [illegible]	(49.80)	0.087000	0.00483	0.404	9.623E+02	s	<	3.837E+00
[illegible]	(79.70)	0.018000	0.02807	0.443	8.766E+02	s	<	3.496E+00
**	(94.00)	0.013500	0.03576	0.447	9.260E+02	s	<r	3.692E+00
****	(210.60)	0.012600	0.03095	0.391	1.004E+03	s	<	4.002E+00
****	(236.00)	0.115000	0.02797	0.383	1.189E+02	s	<	4.743E-01
****	(254.70)	0.009100	0.02604	0.331	1.396E+03	s	<	5.569E+00
****	(256.20)	0.063000	0.02590	0.334	2.048E+02	s	<	8.166E-01
****	(285.60)	0.016500	0.02336	0.312	8.095E+02	s	<	3.228E+00
295	(296.60)	0.003900	0.02252	2.805	3.194E+04		6.92%	1.274E+02
****	(300.00)	0.018900	0.02227	0.307	7.291E+02	s	<	2.907E+00
****	(304.40)	0.013500	0.02196	0.320	1.078E+03	s	<	4.299E+00
****	(329.90)	0.029000	0.02031	0.316	5.368E+02	s	<	2.141E+00
****	(334.40)	0.011500	0.02005	0.296	1.285E+03	s	<	5.125E+00
352	(350.50)	0.000800	0.01916	4.622	3.016E+05		4.80%	1.203E+03

Ac228 5.133E+12 DAYS LAMBDA= 1.350E-13 DECAY= 1.000E+00 41G

****	(911.10)	0.250000	0.00800	0.192	9.600E+01	s	<	3.826E-01

Th230 2.812E+07 DAYS LAMBDA= 2.465E-08 DECAY= 1.000E+00 8G

****	(68.00)	0.005900	0.01898	0.426	3.805E+03	s	<	1.516E+01

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 42G

****	(911.10)	0.250000	0.00800	0.192	9.600E+01	s	<	3.826E-01
****	(968.90)	0.150000	0.00757	0.185	1.628E+02	s	<	6.487E-01
****	(63.81)	0.010101	0.01539	0.409	2.627E+03	s	<	1.047E+01

T[illegible]34 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 10G

[illegible]	(92.30)	0.999999	0.03506	0.457	1.305E+01	s	<r	5.200E-02

Pa234m 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 48G

[illegible]67	(766.36)	0.002060	0.00936	0.428	2.221E+04		21.25%	8.853E+01

****	(1001.03)	0.006000	0.00735	0.168	3.802E+03 s	<	1.515E+01

U 235 2.571E+11 DAYS LAMBDA= 2.696E-12 DECAY= 1.000E+00 34G

*	* (143.78)	0.132600	0.03968	0.468	8.889E+01 s	<	3.543E-01
	6 (185.72)	0.540000	0.03422	1.745	9.443E+01 s	14.60%	3.764E-01
	242 (240.93)	0.000700	0.02744	1.376	7.166E+04	9.91%	2.856E+02

Am241 1.582E+05 DAYS LAMBDA= 4.381E-06 DECAY= 1.000E+00 41G

****	(59.54)	0.359000	0.01179	0.352	8.315E+01 s	<	3.314E-01

```
*****************************************************************************
8811    GLS    2        G-5 JR 274.836  7  206.50 MIN   113.02000 GR       527
LIBR=TTIH  REF TIME= 268.891  7        100 mL in Jar (temp)
*   ***************************************************************************

*****************************************************************************
* Group......................... 8811 * Time of count          274.836 2007 *
* Sample........................... 2 * Reference GMT........ 268.891 2007 *
* Element.......................... * Elapsed Live Tm............. 206.5 *
* Type code...................... GLS * Dead Time Pct................... 0.0 *
* ID............. S  021-233-SL-002S * Background GMT....... 272.802 2007 *
* Geometry, detector........... JR-5 * Standard GMT......... 272.749 2007 *
* Aliquot..................... 113.02 * Days since T0............ 5.945129 *
* Unit of Aliquot............... GRAM * Time on.......... 13:03 PDT  1-OCT *
* Data Sheet Units........ PCI /GRAM * Time off......... 16:29 PDT  1-OCT *
* Library...................... TTIH * Calc Time......... 08:43 02-OCT-07 *
*****************************************************************************
* Slope..................... 1.003658 * Width slope.............. 0.007587 *
* Intercept................ 2.270109 * Width offset............. 0.334976 *
* X**2 TERM......... -0.16903048E-05 * Sensitivity..................... 4. *
  NP:[7,67]527.GSP                  23 PEAKS

*****************************************************************************
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN       CPM  ERR  EFF  K  FIT
  1  5   27.5   22 10   178 3.07    282   25.1  1.37E+00 11.20.166  0 13.70
  2  5   31.1   22 10   269 1.70     73   28.7  3.56E-01 36.70.241  0  0.00
  3  6   75.0   70  9   432 1.56    153   72.5  7.43E-01 22.3 2.42  0  0.91
  4  6   77.1   70  9   263 1.03    199   74.6  9.63E-01 13.4 2.58  0  0.00
  5  0   87.2   81  8   636 2.00    132   84.6  6.42E-01 36.6 3.23  0  0.00
     0   92.9   88  5   380 1.31     73   90.3  3.55E-01 42.9 3.51  0  0.00
  7  0  186.3  179 10   654 2.16    413  183.4  2.00E+00 12.6 3.41  0  0.00
  8  5  238.7  233 10   136 1.15     65  235.6  3.15E-01 27.0 2.77  0  0.35
  9  5  242.1  233 10   203 1.72    284  239.1  1.38E+00  9.9 2.73  0  0.00
 10  0  295.3  288  9   307 2.06    594  292.1  2.88E+00  6.7 2.26  0  0.00
 11  0  352.0  343 11   250 2.00    968  348.6  4.69E+00  4.6 1.96  0  0.00
 12  0  511.3  504 10   149 2.18     92  507.6  4.45E-01 27.9 1.35  0  0.00
 13  0  609.7  601 10    97 2.04    634  605.8  3.07E+00  4.9 1.17  0  0.00
 14  0  767.4  758 11    61 3.73     88  763.3  4.28E-01 21.30.945  0  0.00
 15  0  934.5  929  6    32 2.02     26  930.3  1.26E-01 43.90.789  0  0.00
 16  0 1120.7 1112  9    43 2.69    125 1116.5  6.06E-01 13.50.666  0  0.00
 17  0 1238.5 1230 14    68 2.77     30 1234.3  1.44E-01 59.00.605  0  0.00
 18  0 1378.1 1370 11    39 4.70     24 1374.0  1.14E-01 57.60.539  0  0.00
 19  0 1461.7 1453 14    28 3.35     60 1457.7  2.91E-01 26.20.509  0  0.00
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN       CPM  ERR  EFF  K  FIT
 20  0 1507.7 1503 11    31 1.67      9 1503.7  4.40E-02132.90.495  0  0.00
 21  0 1686.7 1681  6     1 2.01     16 1683.1  7.75E-02 33.20.442  0  0.00
 22  0 1731.3 1722 13    16 2.69     23 1727.7  1.12E-01 45.80.430  0  0.00
 23  0 1765.2 1757 13    18 2.99     76 1761.7  3.67E-01 18.10.421  0  0.00
FWHM=SQRT( 3.42064E+00 +  3.54755E-03 *E)

*****************************************************************************
BACKGROUND INFO 8811    GLS    2        274.836  7 G- 5     BG DATE 272.802  7
*****************************************************************************

v--------PEAK---------v     v------BACKGROUND------v     v------NET----v
 ENERGY       CPM  %ERROR      ENERGY       CPM  %ERROR         CPM  %ERROR

  92.93    0.3548 42.92        92.00  0.3549  8.09        -0.0001******R
 186.28    2.0014 12.58       186.00  0.2564 15.17         1.7451 14.60
 238.66    0.3154 27.04       238.60  0.2912 14.39         0.0242392.51R
```

295.31	2.8757	6.75	295.20	0.0708	0.00	2.8048	6.92
351.98	4.6865	4.61	351.90	0.0649	78.68	4.6216	4.80
511.26	0.4454	27.93	511.00	0.6126	6.20	-0.1672	77.77R
.71	3.0683	4.94	609.30	0.0494	35.20	3.0189	5.06
20.74	0.6063	13.47	1120.30	0.0203	1.48	0.5860	13.94
1238.51	0.1435	59.04	1238.10	0.0123	0.00	0.1312	64.59
1378.08	0.1138	57.56	1377.70	0.0257	0.00	0.0881	74.34
1461.74	0.2906	26.21	1460.80	0.2394	7.31	0.0512	152.60R
1731.27	0.1122	45.85	1729.60	0.0145	0.00	0.0978	52.63
1765.21	0.3673	18.13	1764.50	0.0348	46.80	0.3324	20.62

4 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 8811 GLS 2 274.836 7 G- 5

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 2 GLS RUN AT 274.836/2007

BACKGROUND FOR GELI DETECTOR 5 OF 272.802/2007 2641.6 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
52.0	0.0373	22.51	511.0	0.6126	6.20	1120.3	0.0203	1.48
92.0	0.3549	8.09	583.1	0.0857	18.91	1173.2	0.0204	0.00
143.0	0.0872	0.00	609.3	0.0494	35.20	1238.1	0.0123	0.00
186.0	0.2564	15.17	661.6	0.0238	0.00	1332.5	0.0196	0.00
198.0	0.0860	42.55	727.2	0.0233	0.00	1377.7	0.0257	0.00
238.6	0.2912	14.39	846.0	0.0364	39.85	1460.8	0.2394	7.31
279.0	0.0510	0.00	860.4	0.0351	0.00	1586.0	0.0565	0.00
295.2	0.0708	0.00	911.1	0.0782	30.58	1591.3	0.0321	0.00
338.4	0.0607	35.44	968.9	0.0412	33.74	1729.6	0.0145	0.00
351.9	0.0649	78.68	1001.0	0.0429	0.00	1764.5	0.0348	46.80

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 10/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
209.926	7	0.9386	2.801	35.
216.995	7	0.9512	3.439	20.
223.795	7	0.9726	3.094	32.
230.945	7	0.9672	2.766	22.
237.835	7	0.7685	9.509	32.NG
237.932	7	1.0341	2.167	32.
244.938	7	0.9271	3.606	33.
2[illegible]727	7	0.9096	5.110	24.
[illegible].802	7	0.8496	4.322	24.NG
272.749	7	1.0075	4.369	28.
AVERAGE		0.9635	0.041	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
130.842	6	1.0028	5.576	21.
92.687	7	0.9684	5.181	32.
96.820	7	0.9834	2.940	21.
133.833	7	0.9676	3.554	28.
154.021	7	0.9495	3.720	30.
237.968	7	0.9561	5.349	22.
247.756	7	0.9184	1.921	33.
256.871	7	0.9518	4.083	37.NG
258.825	7	0.9210	4.231	27.
265.838	7	0.9645	5.696	35.
AVERAGE		0.9584	0.026	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 272.749 7
ENERGY= 2.270109 + 1.0036577*CH + -1.690305E-06*CH**2
FWHM =SQRT(0.3350 + 0.007588*ENERGY) (CO60= 3.232)

EFFICIENCIES FOR GEOMETRY JR 5 CALIBRATED 50.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.488400	100.0	3.779100	300.0	2.226900	0.0	0.000000
55.0	0.821500	110.0	3.988900	500.0	1.374900	0.0	0.000000
60.0	1.216500	130.0	4.066100	700.0	1.016600	0.0	0.000000
65.0	1.641400	150.0	3.898500	1000.0	0.735300	0.0	0.000000
70.0	2.065800	170.0	3.639600	1400.0	0.529500		
80.0	2.827400	190.0	3.362900	2000.0	0.363500		
90.0	3.401900	250.0	2.649600	3000.0	0.240400		

8811 2 GLS GSTOR 527

	PK	ENERGY	CPM	%ERR	COMMENT
	1	27.5	1.37	11.2	
	2	31.1	0.36	36.7	
	3	75.0	0.74	22.3	
	4	77.1	0.96	13.4	
	5	87.2	0.64	36.6	Cs136 Cd109
b	7	186.3	1.75	14.6	Cs136 U 235s Ra226s
	9	242.1	1.38	9.9	Ra226 Th228 La140
b	10	295.3	2.80	6.9	Ra226 Ru103
b	11	352.0	4.62	4.8	Ra226s Pb214s
b	13	609.7	3.02	5.1	Ru103 Ra226s Bi214s
	14	767.4	0.43	21.3	Ra226
	15	934.5	0.13	43.9	Ra226
b	16	1120.7	0.59	13.9	Ra226 Sc 46s
b	17	1238.5	0.13	64.6	Ra226
b	18	1378.1	0.09	74.3	Ra226
	20	1507.7	0.04	99.9	NO GEN
	21	1686.7	0.08	33.2	NO GEN
b	22	1731.3	0.10	52.6	
b	23	1765.2	0.33	20.6	Ra226
			REJECTED PEAKS		
B	6	92.9	0.00	99.9	Th234s Th227s
B	8	238.7	0.02	99.9	Th228 Pb212s
B	12	511.3	-0.17	77.8	Th228 La140 Ru106 Na 22
B	19	1461.7	0.05	99.9	K 40s

****
8811 GLS 3 G-6 JR 274.836 7 206.58 MIN 163.71001 GR 528
LJBR=TTIH REF TIME= 268.896 7 100 mLs in JAR
****

MW10207

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00722	0.601	7.570E+02 s		<r	2.083E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 9.521E-01	3G		
**** (889.26)	1.000000	0.01119	0.286	2.560E+01 s		<	7.398E-02
1119 (1120.52)	1.000000	0.00916	0.637	6.960E+01 s	29.74%		2.011E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.979E-01	4G		
**** (1173.21)	0.999200	0.00879	0.302	3.433E+01 s		<	9.467E-02
**** (1332.48)	1.000000	0.00785	0.257	3.272E+01 s		<	9.021E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 9.339E-01	16G		
**** (1691.00)	0.457000	0.00631	0.168	5.814E+01 s		<	1.713E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.996E-01	3G		
**** (661.64)	0.851000	0.01431	0.371	3.043E+01 s		<	8.377E-02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.991E-01	48G		
**** (121.78)	0.254000	0.04988	0.599	4.725E+01 s		<	1.301E-01
, (295.97)	0.004000	0.02688	2.457	2.285E+04	12.69%		6.294E+01
)** (344.31)	0.245000	0.02391	0.469	7.997E+01 s		<	2.202E-01
768 (768.90)	0.000800	0.01265	0.440	4.352E+04	33.71%		1.199E+02
**** (963.36)	0.132000	0.01045	0.339	2.455E+02 s		<	6.761E-01
**** (1112.04)	0.124000	0.00922	0.294	2.575E+02 s		<	7.092E-01
**** (1408.02)	0.198000	0.00747	0.233	1.573E+02 s		<	4.331E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.987E-01	48G		
**** (123.07)	0.390000	0.04958	0.593	3.064E+01 s		<	8.443E-02
**** (723.26)	0.202000	0.01331	0.356	1.324E+02 s		<	3.649E-01
**** (1004.75)	0.170000	0.01008	0.285	1.664E+02 s		<	4.584E-01
1119 (1118.20)	0.001000	0.00917	0.637	6.943E+04	29.74%		1.913E+02
**** (1274.49)	0.336000	0.00816	0.264	9.620E+01 s		<	2.650E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 9.459E-01	22G		
295 (295.95)	0.290900	0.02688	2.459	3.144E+02	12.69%		9.147E-01
**** (316.50)	0.830700	0.02553	0.522	2.459E+01 s		<	7.154E-02
**** (468.06)	0.476000	0.01885	0.404	4.503E+01 s		<	1.310E-01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
**** (583.14)	0.860000	0.01583	0.410	3.008E+01 s		<r	8.277E-02
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
46 (46.50)	0.040000	0.04546	1.438	7.907E+02 s	15.17%		2.176E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
, (295.10)	0.000240	0.02694	2.457	3.800E+05	12.69%		1.046E+03
)** (727.17)	0.066500	0.01325	0.376	4.269E+02 s		<	1.175E+00
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
**** (238.63)	0.431000	0.03160	0.656	4.820E+01 s		<r	1.326E-01

Bi214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 48G

[illegible]9	(609.30)	0.470000	0.01529	2.552	3.553E+02	s11.61%	9.775E-01
[illegible]3	(768.70)	0.050000	0.01265	0.440	6.962E+02	33.71%	1.916E+00
[illegible]19	(1120.40)	0.170000	0.00916	0.637	4.091E+02	29.74%	1.126E+00
1764	(1764.00)	0.170000	0.00607	0.460	4.461E+02	23.45%	1.228E+00

Pb214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 23G

242	(241.90)	0.076000	0.03128	1.514	6.370E+02	12.10%	1.753E+00
295	(295.20)	0.190000	0.02693	2.457	4.802E+02	12.69%	1.321E+00
352	(352.00)	0.360000	0.02351	3.647	4.309E+02 s	9.19%	1.186E+00
768	(768.40)	0.000800	0.01265	0.440	4.350E+04	33.71%	1.197E+02

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 1.000E+00 48G

185	(186.10)	0.040000	0.03787	1.962	1.296E+03 s	17.65%	3.565E+00
242	(242.00)	0.078000	0.03127	1.514	6.208E+02	12.10%	1.708E+00
295	(295.20)	0.201000	0.02693	2.457	4.539E+02	12.69%	1.249E+00
352	(351.96)	0.393000	0.02351	3.647	3.947E+02 s	9.19%	1.086E+00
609	(609.32)	0.484000	0.01529	2.552	3.450E+02 s	11.61%	9.493E-01
768	(768.40)	0.053200	0.01265	0.440	6.541E+02	33.71%	1.800E+00
1119	(1120.30)	0.160000	0.00916	0.637	4.347E+02	29.74%	1.196E+00
1764	(1764.50)	0.166000	0.00607	0.460	4.570E+02	23.45%	1.257E+00

Th227 7.951E+03 DAYS LAMBDA= 8.718E-05 DECAY= 9.995E-01 48G

****	(49.80)	0.087000	0.05585	0.499	1.027E+02 s	<	2.826E-01
****	(79.70)	0.018000	0.05957	0.614	5.731E+02 s	<	1.578E+00
****	(94.00)	0.013500	0.05657	0.670	8.774E+02 s	<	2.416E+00
****	(210.60)	0.012600	0.03464	0.593	1.359E+03 s	<	3.740E+00
****	(236.00)	0.115000	0.03186	0.620	1.691E+02 s	<	4.655E-01
[illegible]	(254.70)	0.009100	0.03010	0.543	1.982E+03 s	<	5.455E+00
****	(256.20)	0.063000	0.02997	0.530	2.805E+02 s	<	7.723E-01
****	(285.60)	0.016500	0.02761	0.526	1.154E+03 s	<	3.177E+00
****	(300.00)	0.018900	0.02660	0.487	9.677E+02 s	<	2.664E+00
****	(304.40)	0.013500	0.02631	0.521	1.468E+03 s	<	4.040E+00
****	(329.90)	0.029000	0.02472	0.509	7.094E+02 s	<	1.953E+00
****	(334.40)	0.011500	0.02446	0.495	1.758E+03 s	<	4.839E+00
352	(350.50)	0.000800	0.02359	3.647	1.933E+05	9.19%	5.321E+02

Ac228 5.133E+12 DAYS LAMBDA= 1.350E-13 DECAY= 1.000E+00 41G

****	(911.10)	0.250000	0.01096	0.373	1.363E+02 s	<	3.751E-01

Th230 2.812E+07 DAYS LAMBDA= 2.465E-08 DECAY= 1.000E+00 8G

****	(68.00)	0.005900	0.06080	0.614	1.713E+03 s	<	4.713E+00
185	(184.00)	0.000140	0.03817	1.962	3.672E+05	17.65%	1.010E+03

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 42G

464	(463.00)	0.040000	0.01901	0.303	3.988E+02	47.75%	1.097E+00
****	(911.10)	0.250000	0.01096	0.373	1.363E+02 s	<	3.751E-01
****	(968.90)	0.150000	0.01040	0.371	2.375E+02 s	<	6.536E-01
****	(63.81)	0.010101	0.06071	0.656	1.071E+03 s	<	2.945E+00

Th234 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 10G

****	(92.30)	0.999999	0.05697	0.629	1.104E+01 s	<	3.036E-02

P[illegible]34m 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 48G

[illegible]	(1001.03)	0.006000	0.01012	0.287	4.730E+03 s	<	1.301E+01

U 235 2.571E+11 DAYS LAMBDA= 2.696E-12 DECAY= 1.000E+00 34G

73	(72.81)	0.004000	0.06051	3.559	1.470E+04	10.18%	4.046E+01
85	(84.24)	0.051000	0.05873	3.226	1.077E+03	7.86%	2.963E+00

****	(143.78)	0.132600	0.04511	0.634	1.061E+02	s	<	2.918E-01
185	(185.72)	0.540000	0.03792	1.962	9.584E+01	s	17.65%	2.637E-01
242	(240.93)	0.000700	0.03137	1.514	6.895E+04		12.10%	1.897E+02

Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00			41G
****	(59.54)	0.359000	0.06016	0.552	2.555E+01	s	<	7.029E-02

```
**********************************************************************
8811    GLS   3        G-6 JR 274.836  7  206.58 MIN    163.71001 GR        528
LTTR=TTIH  REF TIME= 268.896  7       100 mLs in JAR
*   **********************************************************************

**********************************************************************
* Group..................... 8811 * Time of count          274.836 2007 *
* Sample.....................    3 * Reference GMT........ 268.896 2007 *
* Element.....................     * Elapsed Live Tm....... 206.5833 *
* Type code..................... GLS * Dead Time Pct....... 0.016132 *
* ID..... N  021-233-SL-001N * Background GMT....... 272.802 2007 *
* Geometry, detector..... JR-6 * Standard GMT......... 272.710 2007 *
* Aliquot.................. 163.71 * Days since T0..... 5.939606 *
* Unit of Aliquot.............. GRAM * Time on.......... 13:03 PDT  1-OCT *
* Data Sheet Units........ PCI /GRAM * Time off......... 16:29 PDT  1-OCT *
* Library..................... TTIH * Calc Time......... 08:43 02-OCT-07 *
**********************************************************************
* Slope..................... 0.992709 * Width slope.............. 0.016255 *
* Intercept................. 1.733058 * Width offset.................. 0.0 *
* X**2 TERM..... -0.12655339E-05 * Sensitivity..................... 4. *
  NP:[7,67]528.GSP                 22 PEAKS

**********************************************************************
 PK IT    ENRG LEFT WD BKGND FWHM    AREA    CHAN        CPM  ERR  EFF  K  FIT
  1  0    24.7   20  8   491 3.79     404    23.1  1.95E+00 10.50.121  0  0.00
  2  0    32.4   30  6   655 3.40      23    30.9  1.10E-01179.50.271  0  0.00
  3  0    46.4   42  6   691 1.86     297    45.0  1.44E+00 15.20.800  0  0.00
  4  9    72.6   57 23  1160 2.53     735    71.4  3.56E+00 10.2 6.04  0 17.90
  5  9    75.1   57 23  1167 2.53    1810    73.9  8.76E+00  4.2 6.01  0  0.00
  6  5    84.8   81 15   857 2.56     666    83.7  3.23E+00  7.9 5.85  0 15.50
  7  5    92.4   81 15  1013 2.56     313    91.3  1.52E+00 19.2 5.69  0  0.00
  8  0   185.5  180 10  1201 2.00     516   185.1  2.50E+00 13.5 3.80  0  0.00
  9  3   238.6  235 14   636 2.41     182   238.7  8.82E-01 24.8 3.17  0  1.60
 10  3   242.0  235 14   443 1.79     313   242.1  1.51E+00 12.1 3.13  0  0.00
 11  0   294.8  290 11   753 2.43     620   295.3  3.00E+00  9.7 2.70  0  0.00
 12  0   351.8  347 12   690 1.99     990   352.8  4.79E+00  6.0 2.40  0  0.00
 13  0   463.8  462  7   278 3.32      63   465.7  3.03E-01 47.8 1.93  0  0.00
 14  0   510.9  508 11   373 3.14     485   513.3  2.35E+00  9.4 1.77  0  0.00
 15  0   583.1  581 10   328 2.52      51   586.0  2.47E-01 68.7 1.60  0  0.00
 16  0   609.0  604 16   448 2.92     800   612.2  3.87E+00  6.8 1.55  0  0.00
 17  0   768.0  768 10   224 2.58      91   772.7  4.40E-01 33.7 1.28  0  0.00
 18  0   913.6  909 14   307 2.33      44   919.7  2.12E-01 86.4 1.10  0  0.00
 19  0  1007.9 1010  9    83 2.62      40  1014.9  1.93E-01 49.6 1.01  0  0.00
 PK IT    ENRG LEFT WD BKGND FWHM    AREA    CHAN        CPM  ERR  EFF  K  FIT
 20  0  1119.4 1118 17   214 4.21     227  1127.5  1.10E+00 16.70.926  0  0.00
 21  0  1461.0 1466 15    59 4.69     633  1472.8  3.06E+00  5.00.726  0  0.00
 22  0  1764.2 1770 18    41 5.50     192  1779.4  9.31E-01 10.30.616  0  0.00
FWHM=SQRT( 4.37086E+00 +  9.75066E-03 *E)

**********************************************************************
BACKGROUND INFO 8811    GLS   3        274.836  7 G- 6     BG DATE 272.802  7
**********************************************************************

v--------PEAK---------v      v------BACKGROUND------v      v------NET----v
ENERGY       CPM  %ERROR       ENERGY       CPM  %ERROR         CPM  %ERROR

 92.37    1.5167 19.19         92.00  0.8142 13.56          0.7025 44.31
185.46    2.4983 13.52        186.00  0.5359 14.33          1.9624 17.65
238.59    0.8817 24.84        238.60  1.4722 15.22         -0.5905 53.06R
294.76    2.9989  9.68        295.20  0.5419 21.04          2.4569 12.69
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 351.79    4.7939  6.01       351.90  1.1473 14.90        3.6466  9.19
 510.91    2.3487  9.37       511.00  2.8009  5.39       -0.4522 59.02R
 583.06    0.2470 68.70       583.10  0.7431 18.35       -0.4961 43.89R
 609.01    3.8728  6.80       609.30  1.3204 10.29        2.5524 11.61
1119.37    1.0974 16.71      1120.30  0.4605 10.34        0.6369 29.74
1461.04    3.0628  4.97      1461.00  4.3193  9.83       -1.2564 35.89R
1764.20    0.9313 10.33      1764.50  0.4709 10.40        0.4604 23.45
    4 PEAKS REJECTED BY BACKGROUND

**************************************************************************
BACKGROUND INFO 8811    GLS   3       274.836  7 G- 6     BG DATE 272.802  7
**************************************************************************

v--------PEAK---------v     v------BACKGROUND------v     v------NET----v
ENERGY      CPM  %ERROR      ENERGY      CPM  %ERROR         CPM  %ERROR

  92.37    1.5167 19.19        92.00  0.8142 13.56        0.7025 44.31
 185.46    2.4983 13.52       186.00  0.5359 14.33        1.9624 17.65
 238.59    0.8817 24.84       238.60  1.4722 15.22       -0.5905 53.06R
 294.76    2.9989  9.68       295.20  0.5419 21.04        2.4569 12.69
 351.79    4.7939  6.01       351.90  1.1473 14.90        3.6466  9.19
 510.91    2.3487  9.37       511.00  2.8009  5.39       -0.4522 59.02R
 583.06    0.2470 68.70       583.10  0.7431 18.35       -0.4961 43.89R
 609.01    3.8728  6.80       609.30  1.3204 10.29        2.5524 11.61
1119.37    1.0974 16.71      1120.30  0.4605 10.34        0.6369 29.74
1461.04    3.0628  4.97      1461.00  4.3193  9.83       -1.2564 35.89R
1764.20    0.9313 10.33      1764.50  0.4709 10.40        0.4604 23.45
    4 PEAKS REJECTED BY BACKGROUND

**************************************************************************
INTERFERING ISOTOPE ANALYSIS 8811    GLS   3       274.836  7 G- 6
**************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 8811 3 GLS RUN AT 274.836/2007

BACKGROUND FOR GELI DETECTOR 6 OF 272.802/2007 2641.7 MIN

ERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4705	16.43	511.0	2.8009	5.39	1120.3	0.4605	10.34
92.0	0.8142	13.56	583.1	0.7431	18.35	1173.2	0.0379	0.00
143.0	0.1882	0.00	609.3	1.3204	10.29	1238.1	0.2108	21.63
186.0	0.5359	14.33	661.6	0.1709	54.18	1332.5	0.0716	0.00
198.0	0.1669	0.00	727.2	0.1836	23.04	1337.7	0.0000	0.00
238.6	1.4722	15.22	846.0	0.0589	0.00	1461.0	4.3193	9.83
279.0	0.1161	0.00	860.4	0.1162	18.50	1586.0	0.0773	0.00
295.2	0.5419	21.04	911.1	0.5861	9.09	1591.0	0.1925	19.95
338.4	0.2527	26.75	968.9	0.5197	14.70	1729.6	0.1067	20.14
351.9	1.1473	14.90	1001.0	0.0936	0.00	1764.5	0.4709	10.40

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 10/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
187.979	7	1.0053	14.210	23.
194.992	7	1.0068	13.351	29.
207.753	7	1.0155	14.364	58.
223.821	7	0.9971	14.563	22.
230.795	7	1.0016	13.550	25.
237.814	7	1.0021	13.672	25.
244.906	7	0.9920	12.742	24.
2 758	7	0.9774	13.193	24.
55.838	7	1.0076	13.473	34.
272.710	7	0.9943	13.548	26.
AVERAGE		0.9999	0.011	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
61.811	7	1.3744	14.949	20.NG
69.906	7	1.3635	14.524	20.
76.810	7	1.3438	13.154	35.
81.696	7	1.3658	13.879	25.
104.028	7	1.3821	15.760	22.
110.905	7	0.9898	14.446	38.*
124.980	7	0.9907	14.749	36.*
133.855	7	0.9852	15.294	24.*
154.043	7	0.9860	15.339	32.*
216.995	7	1.0022	16.665	21.*
AVERAGE		0.9908	0.007	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 272.710 7
ENERGY= 1.733058 + 0.9927092*CH + -1.265534E-06*CH**2
FWHM =SQRT(-2.4382 + 0.016256*ENERGY) (CO60= 4.384)

EFFICIENCIES FOR GEOMETRY JR 6 CALIBRATED 29.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.652300	100.0	5.512700	300.0	2.660400	0.0	0.000000
55.0	5.891700	110.0	5.268400	500.0	1.792700	0.0	0.000000
60.0	6.024200	130.0	4.801100	700.0	1.368100	0.0	0.000000
65.0	6.077200	150.0	4.388400	1000.0	1.012600	0.0	0.000000
70.0	6.072400	170.0	4.034000	1400.0	0.750900		
80.0	5.951400	190.0	3.731100	2000.0	0.541800		
90.0	5.748900	250.0	3.052100	3000.0	0.379700		

8811 3 GLS GSTOR 528

	PK	ENERGY	CPM	%ERR	COMMENT
	1	24.7	1.95	10.5	
	2	32.4	0.11	99.9	
	3	46.4	1.44	15.2	Pb210s
	4	72.6	3.56	10.2	
	5	75.1	8.76	4.2	
	6	84.8	3.23	7.9	
b	7	92.4	0.70	44.3	Th234s
b	8	185.5	1.96	17.6	Cs137c U 235s Ra226s
	10	242.0	1.51	12.1	Ra226 Th228 La140
b	11	294.8	2.46	12.7	Ra226 Ru103
b	12	351.8	3.65	9.2	Ra226s Pb214s
	13	463.8	0.30	47.8	Ac228 Sb125
b	16	609.0	2.55	11.6	Ru103 Ra226s Bi214s
	17	768.0	0.44	33.7	Ra226
	18	913.6	0.21	86.4	NO GEN
	19	1007.9	0.19	49.6	
b	20	1119.4	0.64	29.7	Ra226 Co 60c Sc 46s
b	22	1764.2	0.46	23.5	Ra226
			REJECTED PEAKS		
B	9	238.6	-0.59	53.1	Th228 Pb212s
B	14	510.9	-0.45	59.0	Ac228 Th228 La140 Ru106 Na 22
B	15	583.1	-0.50	43.9	Th228 Tl208s
B	21	1461.0	-1.26	35.9	K 40s

8811 GLS 4 G-7 JR 274.836 7 206.73 MIN 44.60000 GR 529
L[illegible]R=TTIH REF TIME= 268.650 7 100 mLs in Parkway Jar

DW 9.10.07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00609	0.148	2.213E+02 s			< 2.235E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 9.501E-01	3G		
**** (889.26)	1.000000	0.01014	0.150	1.480E+01 s			< 1.573E-01
**** (1120.52)	1.000000	0.00806	0.128	1.588E+01 s			< 1.688E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.978E-01	4G		
**** (1173.21)	0.999200	0.00768	0.132	1.722E+01 s			< 1.743E-01
**** (1332.48)	1.000000	0.00672	0.119	1.766E+01 s			< 1.787E-01
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 9.312E-01	16G		
**** (1691.00)	0.457000	0.00518	0.077	3.248E+01 s			< 3.522E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.996E-01	3G		
**** (661.64)	0.851000	0.01334	0.174	1.531E+01 s			< 1.547E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.991E-01	48G		
** * (121.78)	0.254000	0.04799	0.365	2.997E+01 s			< 3.030E-01
* : (344.31)	0.245000	0.02289	0.248	4.423E+01 s			< 4.471E-01
66 (764.86)	0.002000	0.01170	0.261	1.115E+04		25.94%	1.128E+02
**** (963.36)	0.132000	0.00939	0.150	1.210E+02 s			< 1.224E+00
**** (1112.04)	0.124000	0.00812	0.100	9.956E+01 s			< 1.006E+00
**** (1408.02)	0.198000	0.00634	0.106	8.441E+01 s			< 8.532E-01
1458 (1457.64)	0.005000	0.00610	0.180	5.902E+03		33.09%	5.966E+01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.986E-01	48G		
**** (123.07)	0.390000	0.04770	0.363	1.952E+01 s			< 1.974E-01
511 (511.20)	0.000600	0.01667	0.237	2.369E+04		54.84%	2.396E+02
**** (723.26)	0.202000	0.01233	0.195	7.814E+01 s			< 7.903E-01
**** (1004.75)	0.170000	0.00901	0.180	1.175E+02 s			< 1.189E+00
**** (1274.49)	0.336000	0.00704	0.123	5.212E+01 s			< 5.271E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 9.437E-01	22G		
**** (316.50)	0.830700	0.02447	0.258	1.268E+01 s			< 1.357E-01
**** (468.06)	0.476000	0.01791	0.213	2.501E+01 s			< 2.677E-01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
511 (510.80)	0.230000	0.01668	0.237	6.176E+01		54.84%	6.238E-01
**** (583.14)	0.860000	0.01489	0.221	1.722E+01 s			< 1.740E-01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
47 (46.50)	0.040000	0.04040	0.289	1.786E+02 s		57.32%	1.804E+00
B[illegible]12 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
1 (510.72)	0.094000	0.01669	0.237	1.511E+02		54.84%	1.526E+00
** (727.17)	0.066500	0.01226	0.180	2.207E+02 s			< 2.229E+00
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
238 (238.63)	0.431000	0.03035	0.162	1.241E+01 s		77.05%	1.253E-01

Bi214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G			
[illegible]	(609.30)	0.470000	0.01434	0.143	2.129E+01	s	62.58%	2.150E-01
214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 23G			
242	(241.90)	0.076000	0.03005	0.141	6.157E+01		54.29%	6.218E-01
257	(258.80)	0.008000	0.02855	0.143	6.270E+02		87.10%	6.332E+00
352	(352.00)	0.360000	0.02249	0.314	3.873E+01	s	45.80%	3.912E-01
Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00 48G			
185	(186.10)	0.040000	0.03642	1.883	1.292E+03	s	9.60%	1.305E+01
242	(242.00)	0.078000	0.03004	0.141	6.001E+01		54.29%	6.061E-01
352	(351.96)	0.393000	0.02250	0.314	3.548E+01	s	45.80%	3.583E-01
609	(609.32)	0.484000	0.01434	0.143	2.067E+01	s	62.58%	2.088E-01
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 9.995E-01 48G			
****	(49.80)	0.087000	0.04963	0.550	1.275E+02	s	<	1.288E+00
63	(62.50)	0.002500	0.05618	9.264	6.597E+04		3.54%	6.666E+02
****	(79.70)	0.018000	0.05657	0.584	5.737E+02	s	<	5.798E+00
93	(94.00)	0.013500	0.05416	14.662	2.005E+04	s	2.73%	2.027E+02
113	(113.10)	0.005400	0.04993	1.198	4.445E+03		13.70%	4.492E+01
****	(210.60)	0.012600	0.03330	0.332	7.916E+02	s	<	8.000E+00
****	(236.00)	0.115000	0.03061	0.335	9.504E+01	s	<	9.604E-01
****	(254.70)	0.009100	0.02890	0.269	1.022E+03	s	<	1.032E+01
257	(256.20)	0.063000	0.02877	0.143	7.901E+01	s	87.10%	7.984E-01
****	(285.60)	0.016500	0.02649	0.244	5.576E+02	s	<	5.635E+00
****	(300.00)	0.018900	0.02551	0.239	4.962E+02	s	<	5.015E+00
****	(304.40)	0.013500	0.02522	0.245	7.189E+02	s	<	7.265E+00
****	(329.90)	0.029000	0.02368	0.240	3.501E+02	s	<	3.537E+00
[illegible]	(334.40)	0.011500	0.02343	0.244	9.046E+02	s	<	9.141E+00
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 41G			
****	(911.10)	0.250000	0.00991	0.172	6.952E+01	s	<	7.022E-01
Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00 8G			
****	(68.00)	0.005900	0.05696	0.609	1.811E+03	s	<	1.829E+01
185	(184.00)	0.000140	0.03672	1.883	3.662E+05		9.60%	3.699E+03
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00 42G			
98	(99.50)	0.012000	0.05298	0.713	1.122E+03		21.56%	1.133E+01
511	(509.60)	0.004200	0.01672	0.237	3.376E+03		54.84%	3.409E+01
****	(911.10)	0.250000	0.00991	0.172	6.952E+01	s	<	7.022E-01
****	(968.90)	0.150000	0.00934	0.142	1.017E+02	s	<	1.027E+00
1458	(1459.20)	0.009000	0.00609	0.180	3.283E+03		33.09%	3.315E+01
****	(63.81)	0.010101	0.05644	1.164	2.042E+03	s	<	2.062E+01
Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 10G			
****	(92.30)	0.999999	0.05450	1.372	2.517E+01	s	<	2.542E-01
Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G			
257	(257.90)	0.000480	0.02863	0.143	1.042E+04		87.10%	1.053E+02
766	(766.36)	0.002060	0.01168	0.261	1.085E+04		25.94%	1.096E+02
1000	(1001.03)	0.006000	0.00904	0.403	7.432E+03	s	20.36%	7.506E+01
U [illegible]35	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00 34G			
[illegible]	(109.12)	0.015100	0.05083	0.310	4.037E+02		36.52%	4.077E+00
[illegible]44	(143.78)	0.132600	0.04342	0.505	8.772E+01	s	27.09%	8.860E-01
185	(185.72)	0.540000	0.03647	1.883	9.558E+01	s	9.60%	9.654E-01
242	(240.93)	0.000700	0.03014	0.141	6.664E+03		54.29%	6.731E+01

.Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00	41G	
****	(59.54)	0.359000	0.05537	0.586	2.950E+01 s		< 2.980E-01
	(99.00)	0.000202	0.05309	0.713	6.652E+04	21.56%	6.718E+02

```
*****************************************************************************
8811    GLS    4        G-7 JR 274.836  7  206.73 MIN    44.60000 GR       529
LIBR=TTIH  REF TIME= 268.650  7      100 mLs in Parkway Jar
*   ***************************************************************************

*****************************************************************************
* Group......................... 8811 * Time of count          274.836 2007 *
* Sample........................... 4 * Reference GMT........ 268.650 2007 *
* Element.......................... * Elapsed Live Tm.......... 206.7333 *
* Type code...................... GLS * Dead Time Pct............ 0.008061 *
* ID................. 021-121-SL-005 * Background GMT....... 272.802 2007 *
* Geometry, detector........... JR-7 * Standard GMT......... 272.730 2007 *
* Aliquot....................... 44.6 * Days since T0............ 6.186157 *
* Unit of Aliquot.............. GRAM * Time on.......... 13:03 PDT  1-OCT *
* Data Sheet Units........ PCI /GRAM * Time off......... 16:31 PDT  1-OCT *
* Library....................... TTIH * Calc Time......... 08:44 02-OCT-07 *
*****************************************************************************
* Slope.................... 1.007126 * Width slope.............. 0.003193 *
* Intercept................ 2.711603 * Width offset............. 1.943238 *
* X**2 TERM......... -0.11654283E-05 * Sensitivity.................... 4. *
  NP:[7,67]529.GSP                  21 PEAKS

*****************************************************************************
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN       CPM  ERR  EFF  K  FIT
  1  4   26.3   20 10    72 1.71    164   23.4  7.95E-01 13.90.146  0  3.02
  2  4   29.5   20 10   240 2.14    112   26.6  5.42E-01 26.60.205  0  0.00
  3  0   46.8   41  5   457 1.64     60   43.7  2.89E-01 57.30.818  0  0.00
  4  0   63.2   57  6   743 1.54   2011   60.1  9.73E+00  3.1 5.62  0  0.00
  5  0   69.9   65  6   737 2.14    126   66.8  6.10E-01 35.4 5.71  0  0.00
     0   92.5   85  9   933 1.72   3158   89.2  1.53E+01  2.6 5.44  0  0.00
  7  0   98.4   94  5   364 1.35    147   95.0  7.13E-01 21.6 5.32  0  0.00
  8  6  108.9  104 13   232 1.20     64  105.4  3.10E-01 36.5 5.09  0  3.00
  9  6  112.7  104 13   331 2.00    248  109.3  1.20E+00 13.7 5.00  0  0.00
 10  0  143.7  138  6   234 1.95    116  140.0  5.62E-01 24.1 4.35  0  0.00
 11  0  185.2  177  8   271 2.00    454  181.2  2.20E+00  8.0 3.66  0  0.00
 12  5  238.2  229 11   173 2.41     98  233.9  4.74E-01 25.2 3.05  0  0.84
 13  5  241.6  229 11    86 1.18     29  237.3  1.41E-01 54.3 3.02  0  0.00
 14  0  257.3  250  8   187 1.65     30  252.9  1.43E-01 87.1 2.87  0  0.00
 15  0  352.0  342 12   162 2.64     87  347.0  4.20E-01 34.0 2.30  0  0.00
 16  0  510.7  500 11    93 2.90    258  504.7  1.25E+00 10.0 1.67  0  0.00
 17  0  609.0  598  9    78 2.26     49  602.4  2.35E-01 36.8 1.45  0  0.00
 18  0  765.7  754  8    42 2.43     54  758.2  2.61E-01 25.9 1.18  0  0.00
 19  0 1000.5  987 11    36 1.83     92  991.9  4.45E-01 18.20.905  0  0.00
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN       CPM  ERR  EFF  K  FIT
 20  0 1458.5 1442 13     9 3.85     37 1447.9  1.80E-01 33.10.614  0  0.00
 21  0 1532.4 1518  7     7 2.75      6 1521.5  2.90E-02 93.40.585  0  0.00
FWHM=SQRT( 2.81088E+00 +  4.79482E-03 *E)

*****************************************************************************
BACKGROUND INFO 8811    GLS    4        274.836  7 G- 7     BG DATE 272.802  7
*****************************************************************************

v--------PEAK---------v     v------BACKGROUND------v     v------NET----v
ENERGY       CPM  %ERROR       ENERGY       CPM  %ERROR          CPM  %ERROR

    .20    9.7281  3.11         62.00  0.4638 27.75          9.2643  3.54
 92.51   15.2736  2.60         92.00  0.6117  7.39         14.6619  2.73
143.66    0.5624 24.12        143.00  0.0574 30.84          0.5050 27.09
185.18    2.1969  7.97        186.00  0.3143 14.25          1.8826  9.60
238.21    0.4739 25.16        238.50  0.3116 12.07          0.1623 77.05
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 352.00     0.4199 33.98        351.90  0.1062 15.72          0.3136 45.80
 510.70     1.2493 10.01        511.00  1.0122  3.50          0.2370 54.84
 608.98     0.2350 36.78        609.30  0.0916 26.43          0.1434 62.58
1001.48     0.4449 18.17       1001.00  0.0417 34.54          0.4032 20.36
   0 PEAKS REJECTED BY BACKGROUND

**********************************************************************
INTERFERING ISOTOPE ANALYSIS 8811    GLS   4        274.836  7 G-  7
**********************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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. QC USED IN DATA REDUCTION OF SAMPLE 8811 4 GLS RUN AT 274. 836/2007

BACKGROUND FOR GELI DETECTOR 7 OF 272.802/2007 2641.8 MIN

ERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
52.0	0.4638	27.75	511.0	1.0122	3.50	1120.3	0.0263	47.59
92.0	0.6117	7.39	583.1	0.0800	21.24	1173.2	0.0356	29.51
143.0	0.0574	30.84	609.3	0.0916	26.43	1238.1	0.0195	0.00
186.0	0.3143	14.25	661.6	0.0377	20.70	1332.5	0.0388	40.77
198.0	0.0656	28.52	727.2	0.0256	0.00	1377.7	0.0253	0.00
238.5	0.3116	12.07	846.0	0.0581	21.85	1461.0	0.0614	12.54
279.0	0.0000	0.00	860.4	0.0351	0.00	1586.0	0.0000	0.00
295.2	0.0595	11.76	911.1	0.0671	33.40	1591.0	0.0333	0.00
338.4	0.0704	17.32	968.9	0.0428	55.35	1729.6	0.0116	0.00
351.9	0.1062	15.72	1001.0	0.0417	34.54	1764.5	0.0201	28.36

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 7 ON 10/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
71.872	7	1.0395	11.486	39.
103.898	7	0.8806	8.120	30.
109.825	7	1.0019	9.030	22.
114.670	7	0.9891	8.186	29.
127.663	7	0.9841	7.790	44.
133.833	7	0.9924	7.542	27.
15?.885	7	0.8859	11.264	14.
.032	7	0.9734	5.981	22.
3.704	7	0.9383	4.693	21.
175.828	7	0.9978	8.266	38.
AVERAGE		0.9683	0.051	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
228.781	7	0.9974	7.749	23.
230.893	7	1.0167	8.008	32.
235.819	7	1.0523	14.305	27.
237.860	7	1.0038	8.379	26.
244.938	7	1.0507	12.319	35.
258.777	7	1.0466	12.929	31.
265.711	7	1.0175	9.504	24.
265.864	7	0.8918	13.018	40.
265.918	7	1.0084	7.775	28.
272.730	7	0.9982	8.611	25.
AVERAGE		1.0213	0.023	

CALIBRATION LINE FROM STANDARD FOR G- 7 OF 272.730 7
ENERGY= 2.711603 + 1.0071259*CH + -1.165428E-06*CH**2
FWHM =SQRT(1.9432 + 0.003194*ENERGY) (CO60= 2.490)

EFFICIENCIES FOR GEOMETRY JR 7 CALIBRATED 50.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.023100	100.0	5.287100	300.0	2.551200	0.0	0.000000
55.0	5.347200	110.0	5.062500	500.0	1.699100	0.0	0.000000
60.0	5.551400	130.0	4.620300	700.0	1.270100	0.0	0.000000
65.0	5.663400	150.0	4.223800	1000.0	0.905100	0.0	0.000000
70.0	5.706100	170.0	3.881400	1400.0	0.637600		
80.0	5.653400	190.0	3.588400	2000.0	0.429900		
90.0	5.494600	250.0	2.931100	3000.0	0.279600		

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*****************************************************************************
8811   4          GLS                                    GSTOR 529
*****************************************************************************

    PK   ENERGY     CPM %ERR      COMMENT
     1    26.3     0.80 13.9 ..................................................
     2    29.5     0.54 26.6 ..................................................
     3    46.8     0.29 57.3 ........................................ Pb210s
b    4    63.2     9.26  3.5 ........................................ Th232s
     5    69.9     0.61 35.4 ..................................................
b    6    92.5    14.66  2.7 ................................ Th234s Th227s
     7    98.4     0.71 21.6 Ac228 ............................................
     8   108.9     0.31 36.5 ............................ La140 Cs136 Sb125
     9   112.7     1.20 13.7 ..................................................
b   10   143.7     0.51 27.1 ................................ Fe 59 U 235s
b   11   185.2     1.88  9.6 ........................ Cs137c U 235s Ra226s
b   12   238.2     0.16 77.0 Th228 ................................ Pb212s
    13   241.6     0.14 54.3 Ra226 Th228 ............................ La140
    14   257.3     0.14 87.1 ........................................ Th227s
b   15   352.0     0.31 45.8 ................................ Ra226s Pb214s
b   16   510.7     0.24 54.8 Ac228 Th228 ................ La140 Ru106 Na 22
b   17   609.0     0.14 62.6 ........................ Ru103 Ra226s Bi214s
    18   765.7     0.26 25.9 ........................................ Nb 95
b   19  1000.5     0.40 20.4 ........................................ Pa234s
    20  1458.5     0.18 33.1 Ac228 ............................................
    21  1532.4     0.03 93.4 ..................................................
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8811 GLS 5 G-8 JR 274.836 7 206.85 MIN 38.07000 GR 530
LTBR=TTIH REF TIME= 268.657 7 100ML IN PARKWAY JAR

MW 10.207

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00870	0.500	5.225E+02 s		<r	6.182E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 9.502E-01	3G		
**** (889.26)	1.000000	0.01312	0.258	1.963E+01 s		<	2.445E-01
**** (1120.52)	1.000000	0.01092	0.265	2.424E+01 s		<	3.019E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.978E-01	4G		
**** (1173.21)	0.999200	0.01051	0.238	2.267E+01 s		<	2.688E-01
**** (1332.48)	1.000000	0.00943	0.209	2.218E+01 s		<	2.630E-01
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 9.313E-01	16G		
**** (1691.00)	0.457000	0.00763	0.142	4.084E+01 s		<	5.189E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.996E-01	3G		
663 (661.64)	0.851000	0.01635	0.208	1.493E+01 s	64.58%		1.768E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.991E-01	48G		
**** (121.78)	0.254000	0.04555	0.537	4.643E+01 s		<	5.498E-01
* * (344.31)	0.245000	0.02585	0.384	6.064E+01 s		<	7.182E-01
**** (963.36)	0.132000	0.01234	0.232	1.426E+02 s		<	1.689E+00
**** (1112.04)	0.124000	0.01099	0.217	1.591E+02 s		<	1.884E+00
**** (1408.02)	0.198000	0.00899	0.180	1.010E+02 s		<	1.197E+00
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.986E-01	48G		
**** (123.07)	0.390000	0.04559	0.491	2.760E+01 s		<	3.271E-01
**** (723.26)	0.202000	0.01534	0.285	9.196E+01 s		<	1.090E+00
**** (1004.75)	0.170000	0.01194	0.242	1.194E+02 s		<	1.415E+00
1240 (1241.40)	0.001000	0.01002	0.256	2.557E+04	45.52%		3.030E+02
**** (1274.49)	0.336000	0.00980	0.216	6.547E+01 s		<	7.758E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 9.438E-01	22G		
**** (316.50)	0.830700	0.02768	0.416	1.811E+01 s		<	2.270E-01
**** (468.06)	0.476000	0.02081	0.333	3.361E+01 s		<	4.214E-01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
**** (583.14)	0.860000	0.01788	0.356	2.318E+01 s		<r	2.743E-01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
**** (46.50)	0.040000	0.00599	0.498	2.078E+03 s		<	2.458E+01
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
**** (727.17)	0.066500	0.01527	0.312	3.075E+02 s		<	3.638E+00
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
* * (238.63)	0.431000	0.03495	0.553	3.673E+01 s		<r	4.346E-01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G		
**** (609.30)	0.470000	0.01732	0.397	4.873E+01 s		<r	5.766E-01

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Pb214    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00  23G
**** (  352.00)    0.360000    0.02540        0.463   5.068E+01 s       <r 5.997E-01

P  6     5.851E+05 DAYS      LAMBDA= 1.185E-06     DECAY= 1.000E+00  48G
  6 (  186.10)    0.040000    0.04006        0.283   1.768E+02 s82.22 %  2.092E+00
**** (  351.96)    0.393000    0.02541        0.463   4.642E+01 s       <r 5.493E-01
**** (  609.32)    0.484000    0.01732        0.413   4.924E+01 s       <r 5.827E-01
1052 (1052.00)    0.003240    0.01150        0.226   6.070E+03  46.83 %  7.182E+01

Th227    7.951E+03 DAYS      LAMBDA= 8.718E-05     DECAY= 9.995E-01  48G
**** (   49.80)    0.087000    0.00736        0.488   7.621E+02 s       <  9.022E+00
**** (   79.70)    0.018000    0.03292        0.498   8.406E+02 s       <  9.951E+00
  93 (   94.00)    0.013500    0.04048        0.271   4.954E+02 s81.88 %  5.864E+00
**** (  210.60)    0.012600    0.03749        0.466   9.871E+02 s       <  1.169E+01
**** (  236.00)    0.115000    0.03519        0.443   1.094E+02 s       <  1.296E+00
**** (  254.70)    0.009100    0.03346        0.408   1.339E+03 s       <  1.586E+01
**** (  256.20)    0.063000    0.03331        0.462   2.201E+02 s       <  2.606E+00
**** (  285.60)    0.016500    0.03034        0.428   8.546E+02 s       <  1.012E+01
**** (  300.00)    0.018900    0.02895        0.450   8.231E+02 s       <  9.744E+00
**** (  304.40)    0.013500    0.02860        0.423   1.096E+03 s       <  1.297E+01
**** (  329.90)    0.029000    0.02675        0.423   5.451E+02 s       <  6.454E+00
**** (  334.40)    0.011500    0.02646        0.395   1.300E+03 s       <  1.539E+01

Ac228    5.133E+12 DAYS      LAMBDA= 1.350E-13     DECAY= 1.000E+00  41G
**** (  911.10)    0.250000    0.01288        0.311   9.674E+01 s       <r 1.145E+00

Th230    2.812E+07 DAYS      LAMBDA= 2.465E-08     DECAY= 1.000E+00   8G
**** (   68.00)    0.005900    0.02362        0.503   3.608E+03 s       <  4.269E+01

  2      5.113E+12 DAYS      LAMBDA= 1.356E-13     DECAY= 1.000E+00  42G
**** (  911.10)    0.250000    0.01288        0.311   9.674E+01 s       <r 1.145E+00
**** (  968.90)    0.150000    0.01229        0.316   1.713E+02 s       <r 2.027E+00
**** (   63.81)    0.010101    0.01977        0.556   2.785E+03 s       <  3.295E+01

Th234    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00  10G
**** (   92.30)    0.999999    0.03980        0.609   1.530E+01 s       <  1.811E-01

Pa234m   1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00  48G
**** (1001.03)    0.006000    0.01198        0.268   3.723E+03 s       <  4.405E+01

U 235    2.571E+11 DAYS      LAMBDA= 2.696E-12     DECAY= 1.000E+00  34G
  85 (   84.24)    0.051000    0.03580        1.096   6.004E+02  16.00 %  7.104E+00
**** (  143.78)    0.132600    0.04479        0.522   8.781E+01 s       <  1.039E+00
 186 (  185.72)    0.540000    0.04011        0.283   1.308E+01 s82.22 %  1.548E-01

Am241    1.582E+05 DAYS      LAMBDA= 4.381E-06     DECAY= 1.000E+00  41G
**** (   59.54)    0.359000    0.01576        0.469   8.290E+01 s       <  9.809E-01
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8811    GLS   5        G-8 JR 274.836  7  206.85 MIN    38.07000 GR        530
LIBR=TTIH  REF TIME= 268.657  7      100ML IN PARKWAY JAR
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Group	8811	Time of count	274.836 2007
Sample	5	Reference GMT	268.657 2007
Element		Elapsed Live Tm	206.85
Type code	GLS	Dead Time Pct	0.024166
ID	021-121-SL-006	Background GMT	272.802 2007
Geometry, detector	JR-8	Standard GMT	272.776 2007
Aliquot	38.07	Days since T0	6.17923
Unit of Aliquot	GRAM	Time on	13:03 PDT 1-OCT
Data Sheet Units	PCI /GRAM	Time off	16:31 PDT 1-OCT
Library	TTIH	Calc Time	08:45 02-OCT-07
Slope	0.982044	Width slope	0.005861
Intercept	0.395213	Width offset	2.077791
X**2 TERM	-0.13896123E-05	Sensitivity	4.

NP:[7,67]530.GSP 23 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	4	25.3	22	22	54	1.86	229	25.4	1.11E+00	12.9	0.130	0	1.73
2	4	28.1	22	22	183	3.40	392	28.2	1.90E+00	11.4	0.178	0	0.00
3	4	32.1	22	22	362	3.12	237	32.2	1.15E+00	19.4	0.264	0	0.00
4	4	35.8	22	22	319	2.10	105	36.1	5.09E-01	29.4	0.368	0	0.00
	4	39.2	22	22	467	2.31	74	39.5	3.56E-01	46.5	0.482	0	0.00
	0	74.8	71	10	927	3.52	648	75.8	3.13E+00	9.9	2.88	0	0.00
7	5	85.2	83	9	455	1.76	227	86.3	1.10E+00	16.0	3.59	0	2.22
8	5	87.9	83	9	343	1.23	67	89.1	3.23E-01	45.2	3.75	0	0.00
9	0	92.8	92	7	576	2.17	196	94.1	9.47E-01	21.8	3.98	0	0.00
10	0	186.0	185	8	670	1.48	166	189.1	8.03E-01	28.7	4.01	0	0.00
11	0	239.8	241	8	517	1.63	219	243.8	1.06E+00	19.5	3.48	0	0.00
12	0	338.7	342	7	350	1.83	27	344.6	1.29E-01	118.1	2.70	0	0.00
13	0	351.9	355	8	348	2.36	124	358.1	6.02E-01	28.0	2.63	0	0.00
14	0	511.3	515	12	299	2.96	556	520.7	2.69E+00	7.8	1.97	0	0.00
15	0	583.5	591	7	176	2.49	57	594.2	2.78E-01	42.2	1.81	0	0.00
16	0	609.6	616	11	218	2.59	180	620.9	8.73E-01	18.8	1.75	0	0.00
17	0	662.8	670	10	169	1.78	99	675.1	4.79E-01	26.9	1.64	0	0.00
18	0	910.6	923	12	134	2.40	84	928.1	4.08E-01	29.8	1.30	0	0.00
19	0	969.2	981	15	156	5.14	100	987.9	4.83E-01	31.4	1.23	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1052.1	1069	11	93	4.78	47	1072.6	2.26E-01	46.8	1.16	0	0.00
21	0	1240.1	1260	13	117	3.16	53	1264.6	2.56E-01	45.5	1.01	0	0.00
22	0	1462.0	1483	15	55	3.19	446	1491.5	2.16E+00	6.1	0.874	0	0.00
23	0	1764.8	1795	15	38	4.56	65	1801.2	3.13E-01	26.7	0.744	0	0.00

FWHM=SQRT(4.39599E+00 + 7.88590E-03 *E)

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BACKGROUND INFO 8811    GLS   5        274.836  7 G- 8      BG DATE 272.802  7
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PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
92.80	0.9470	21.85	92.00	0.6763	11.76	0.2707	81.88
186.03	0.8035	28.71	186.00	0.5201	6.31	0.2833	82.22
239.75	1.0602	19.45	238.50	0.8372	14.87	0.2230	108.04R

338.66	0.1288	118.08	338.40	0.1963	32.92	-0.0675	244.90R
351.93	0.6017	27.97	351.90	0.6210	15.88	-0.0193	******R
5[illegible].32	2.6873	7.76	511.00	2.6200	3.25	0.0673	334.90R
[illegible].47	0.2779	42.20	583.10	0.5059	17.77	-0.2280	64.79R
[illegible]09.60	0.8725	18.76	609.30	0.8115	12.93	0.0611	318.37R
662.78	0.4790	26.93	661.60	0.2713	13.60	0.2077	64.58
910.63	0.4076	29.82	911.10	0.4955	11.64	-0.0880	152.89R
969.20	0.4830	31.45	968.90	0.3504	25.80	0.1326	133.28R
1462.04	2.1581	6.09	1460.80	3.2053	9.82	-1.0471	32.56R
1764.75	0.3130	26.75	1764.50	0.3709	8.25	-0.0580	153.81R

10 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 8811 GLS 5 274.836 7 G- 8

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 5 GLS RUN AT 274.836/2007

BACKGROUND FOR GELI DETECTOR 8 OF 272.802/2007 2642.0 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
52.0	0.1802	21.19	511.0	2.6200	3.25	1173.2	0.0886	23.35
92.0	0.6763	11.76	583.1	0.5059	17.77	1238.1	0.1439	24.04
143.0	0.1599	0.00	609.3	0.8115	12.93	1332.5	0.1073	28.97
186.0	0.5201	6.31	661.6	0.2713	13.60	1377.7	0.0953	23.29
198.0	0.1381	25.49	727.2	0.1538	27.05	1460.8	3.2053	9.82
238.5	0.8372	14.87	860.0	0.0870	20.23	1586.0	0.1222	0.00
279.0	0.1577	0.00	911.1	0.4955	11.64	1591.0	0.1364	38.20
295.2	0.2895	15.23	968.9	0.3504	25.80	1729.6	0.0771	28.65
338.4	0.1963	32.92	1001.0	0.0596	28.52	1764.5	0.3709	8.25
351.9	0.6210	15.88	1120.3	0.3289	8.91	0.0	0.0000	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 8 ON 10/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
322.765	5	0.8833	18.759	31.*
322.789	5	0.8727	17.160	43.*
322.825	5	0.8755	17.370	41.*
352.103	5	0.8703	18.548	21.*
355.939	5	0.8663	19.048	20.*
58.691	6	0.9079	17.307	83.*
3[illegible]732	6	0.8798	18.209	22.*
[illegible].689	7	0.9437	22.807	27.
[illegible].871	7	0.9404	23.280	21.
272.776	7	1.0035	20.890	19.
AVERAGE		0.9626	0.035	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
204.881	7	1.1362	25.018	46.
217.047	7	1.0416	16.537	20.
223.821	7	1.0227	17.367	23.
230.814	7	1.0609	16.105	21.
235.924	7	1.0859	16.521	23.
237.814	7	1.0688	16.230	26.
244.906	7	1.0631	16.854	25.
258.758	7	1.0718	16.115	25.
265.894	7	1.0763	16.178	23.
272.710	7	1.1426	21.341	27.NG
AVERAGE		1.0614	0.020	

CALIBRATION LINE FROM STANDARD FOR G- 8 OF 272.776 7
ENERGY= 0.395214 + 0.9820449*CH + -1.389612E-06*CH**2
FWHM =SQRT(2.0778 + 0.005861*ENERGY) (CO60= 3.144)

EFFICIENCIES FOR GEOMETRY JR 8 CALIBRATED 155.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.745100	100.0	4.245900	300.0	2.895100	0.0	0.000000
55.0	1.159800	110.0	4.454100	500.0	1.999200	0.0	0.000000
60.0	1.619100	130.0	4.554100	700.0	1.571400	0.0	0.000000
65.0	2.087900	150.0	4.421700	1000.0	1.198900	0.0	0.000000
70.0	2.537700	170.0	4.201800	1400.0	0.903800		
80.0	3.312100	190.0	3.958600	2000.0	0.656700		
90.0	3.878100	250.0	3.393800	3000.0	0.478800		

8811 5 GLS GSTOR 530

	PK	ENERGY	CPM	%ERR	COMMENT
	1	25.3	1.11	12.9	
	2	28.1	1.90	11.4	
	3	32.1	1.15	19.4	
	4	35.8	0.51	29.4	
	5	39.2	0.36	46.5	Ru103
	6	74.8	3.13	9.9	
	7	85.2	1.10	16.0	Cs136
	8	87.9	0.32	45.2	Cd109
b	9	92.8	0.27	81.9	Th234s Th227s
b	10	186.0	0.28	82.2	Cs136 U 235s Ra226s
b	17	662.8	0.21	64.6	Cs137s
	20	1052.1	0.23	46.8	Ra226
	21	1240.1	0.26	45.5	
			REJECTED PEAKS		
B	11	239.8	0.22	99.9	Th228 Th228 Pb212s
B	12	338.7	-0.07	99.9	Ac228
B	13	351.9	-0.02	99.9	Ra226s Pb214s
B	14	511.3	0.07	99.9	Th228 La140 Ru106 Na 22
B	15	583.5	-0.23	64.8	Th228 Tl208s
B	16	609.6	0.06	99.9	Ru103 Ra226s Bi214s
B	18	910.6	-0.09	99.9	Th232s Ac228s
B	19	969.2	0.13	99.9	Ac228 Sb124 Th232s
B	22	1462.0	-1.05	32.6	K 40s
B	23	1764.8	-0.06	99.9	Ra226

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**********************************************************************
8811    GLS   6        G-1 JR 274.981  7  867.35 MIN     61.44000 GR        531
LIBR=TTIH  REF TIME= 269.941  7       100 mL in Parkway Jar
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BW 10.2.07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
1462 (1460.85)	0.110000	0.00644	0.426		6.012E+02	s10.84%	4.408E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 9.592E-01	3G		
**** (889.26)	1.000000	0.00984	0.077		7.854E+00	s	< 6.003E-02
**** (1120.52)	1.000000	0.00810	0.078		9.681E+00	s	< 7.400E-02
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.982E-01	4G		
**** (1173.21)	0.999200	0.00779	0.072		9.205E+00	s	< 6.761E-02
**** (1332.48)	1.000000	0.00698	0.062		8.832E+00	s	< 6.487E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 9.436E-01	16G		
**** (1691.00)	0.457000	0.00566	0.049		1.898E+01	s	< 1.475E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.997E-01	3G		
**** (661.64)	0.851000	0.01252	0.106		9.928E+00	s	< 7.281E-02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.993E-01	48G		
**** (121.78)	0.254000	0.04322	0.165		1.499E+01	s	< 1.100E-01
(271.05)	0.000700	0.02485	0.124		7.129E+03	44.73%	5.230E+01
5 (295.97)	0.004000	0.02328	0.150		1.612E+03	49.79%	1.183E+01
**** (344.31)	0.245000	0.02075	0.133		2.620E+01	s	< 1.922E-01
**** (963.36)	0.132000	0.00921	0.080		6.545E+01	s	< 4.802E-01
**** (1112.04)	0.124000	0.00815	0.075		7.468E+01	s	< 5.479E-01
**** (1408.02)	0.198000	0.00666	0.063		4.750E+01	s	< 3.485E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.989E-01	48G		
**** (123.07)	0.390000	0.04295	0.162		9.666E+00	s	< 7.094E-02
**** (723.26)	0.202000	0.01166	0.087		3.676E+01	s	< 2.698E-01
**** (1004.75)	0.170000	0.00889	0.076		5.059E+01	s	< 3.713E-01
**** (1274.49)	0.336000	0.00725	0.061		2.510E+01	s	< 1.842E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 9.539E-01	22G		
295 (295.95)	0.290900	0.02328	0.151		2.223E+01	49.79%	1.709E-01
**** (316.50)	0.830700	0.02213	0.131		7.114E+00	s	< 5.467E-02
**** (468.06)	0.476000	0.01642	0.109		1.401E+01	s	< 1.077E-01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
584 (583.14)	0.860000	0.01383	0.249		2.093E+01	s28.40%	1.535E-01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
47 (46.50)	0.040000	0.05556	1.508		6.784E+02	s 7.15%	4.974E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
295 (295.10)	0.000240	0.02333	0.150		2.681E+04	49.79%	1.966E+02
(583.14)	0.310000	0.01383	0.249		5.807E+01	28.40%	4.258E-01
* (727.17)	0.066500	0.01161	0.090		1.169E+02	s	< 8.574E-01
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
239 (238.63)	0.431000	0.02731	0.561		4.765E+01	s11.86%	3.493E-01

Bi214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 48G

[illegible]	(609.30)	0.470000	0.01335	0.263	4.185E+01	s22.12%	3.069E-01
[illegible]	(1764.00)	0.170000	0.00546	0.058	6.236E+01	53.53%	4.572E-01

Pb214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 23G

242	(241.90)	0.076000	0.02703	0.283	1.376E+02	21.38%	1.009E+00
295	(295.20)	0.190000	0.02332	0.150	3.388E+01	49.79%	2.484E-01
352	(352.00)	0.360000	0.02040	0.520	7.083E+01	s15.72%	5.193E-01

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 1.000E+00 48G

****	(186.10)	0.040000	0.03266	0.198	1.513E+02	s	<r 1.109E+00
242	(242.00)	0.078000	0.02703	0.283	1.341E+02	21.38%	9.830E-01
295	(295.20)	0.201000	0.02332	0.150	3.202E+01	49.79%	2.348E-01
352	(351.96)	0.393000	0.02040	0.520	6.487E+01	s15.72%	4.756E-01
610	(609.32)	0.484000	0.01335	0.263	4.064E+01	s22.12%	2.980E-01
1765	(1764.50)	0.166000	0.00546	0.058	6.388E+01	53.53%	4.683E-01

Th227 7.951E+03 DAYS LAMBDA= 8.718E-05 DECAY= 9.996E-01 48G

****	(49.80)	0.087000	0.05556	0.174	3.607E+01	s	< 2.646E-01
80	(79.70)	0.018000	0.05314	0.317	3.314E+02	s25.95%	2.430E+00
****	(94.00)	0.013500	0.04967	0.253	3.777E+02	s	<r 2.771E+00
210	(210.60)	0.012600	0.02990	0.168	4.449E+02	s41.54%	3.264E+00
****	(236.00)	0.115000	0.02753	0.178	5.613E+01	s	< 4.117E-01
****	(254.70)	0.009100	0.02603	0.153	6.461E+02	s	< 4.739E+00
****	(256.20)	0.063000	0.02591	0.139	8.516E+01	s	< 6.247E-01
270	(270.70)	0.000320	0.02488	0.124	1.558E+04	44.73%	1.143E+02
****	(285.60)	0.016500	0.02391	0.146	3.705E+02	s	< 2.718E+00
****	(300.00)	0.018900	0.02305	0.148	3.397E+02	s	< 2.491E+00
[illegible]	(304.40)	0.013500	0.02279	0.128	4.145E+02	s	< 3.040E+00
[illegible]	(329.90)	0.029000	0.02144	0.143	2.295E+02	s	< 1.683E+00
****	(334.40)	0.011500	0.02122	0.124	5.083E+02	s	< 3.728E+00

Ac228 5.133E+12 DAYS LAMBDA= 1.350E-13 DECAY= 1.000E+00 41G

****	(911.10)	0.250000	0.00964	0.104	4.334E+01	s	< 3.178E-01

Th230 2.812E+07 DAYS LAMBDA= 2.465E-08 DECAY= 1.000E+00 8G

****	(68.00)	0.005900	0.05550	0.243	7.428E+02	s	< 5.446E+00

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 42G

210	(209.40)	0.039000	0.03003	0.168	1.432E+02	41.54%	1.050E+00
270	(270.30)	0.032000	0.02490	0.124	1.556E+02	44.73%	1.141E+00
339	(338.40)	0.104000	0.02103	0.189	8.640E+01	35.66%	6.334E-01
912	(911.10)	0.250000	0.00964	0.090	3.752E+01	s46.72%	2.751E-01
****	(968.90)	0.150000	0.00916	0.089	6.495E+01	s	< 4.762E-01
****	(63.81)	0.010101	0.05607	0.257	4.535E+02	s	<r 3.325E+00

Th234 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 10G

****	(92.30)	0.999999	0.05009	0.258	5.154E+00	s	<r 3.779E-02

Pa234m 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 48G

****	(1001.03)	0.006000	0.00892	0.081	1.514E+03	s	< 1.110E+01

U 235 2.571E+11 DAYS LAMBDA= 2.696E-12 DECAY= 1.000E+00 34G

[illegible]0	(81.20)	0.006500	0.05279	0.317	9.236E+02	25.95%	6.772E+00
[illegible]	(143.78)	0.132600	0.03894	0.172	3.339E+01	s	< 2.448E-01
[illegible]	(185.72)	0.540000	0.03271	0.198	1.119E+01	s	<r 8.206E-02
242	(240.93)	0.000700	0.02711	0.283	1.489E+04	21.38%	1.092E+02

Am241 1.582E+05 DAYS LAMBDA= 4.381E-06 DECAY= 1.000E+00 41G

****	(59.54)	0.359000	0.05639	0.207	1.020E+01	s	< 7.480E-02

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8811    GLS   6        G-1 JR 274.981  7  867.35 MIN    61.44000 GR       531
LJ??=TTIH  REF TIME= 269.941  7      100 mL in Parkway Jar
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Group	8811	Time of count	274.981 2007
Sample	6	Reference GMT	269.941 2007
Element		Elapsed Live Tm	867.35
Type code	GLS	Dead Time Pct	0.003843
ID	021-344-CL-001	Background GMT	272.802 2007
Geometry, detector	JR-1	Standard GMT	272.776 2007
Aliquot	61.44	Days since T0	5.039947
Unit of Aliquot	GRAM	Time on	16:32 PDT 1-OCT
Data Sheet Units	PCI /GRAM	Time off	6:59 PDT 2-OCT
Library	TTIH	Calc Time	09:40 02-OCT-07

Slope	1.004868	Width slope	0.004696
Intercept	2.091488	Width offset	1.808172
X**2 TERM	-0.16260576E-05	Sensitivity	4.

NP:[7,67]531.GSP 26 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	20.5	16	6	10	1.13	11	18.3	1.25E-02	173.	70.068	0	0.00
2	0	27.2	21	9	986	2.87	926	25.0	1.07E+00	7.4	0.161	0	0.00
3	0	36.1	33	5	1278	1.55	31	33.9	3.62E-02	173.	20.377	0	0.00
4	0	46.6	40	9	2295	1.96	1308	44.3	1.51E+00	7.1	0.811	0	0.00
	10	63.5	58	25	1404	1.70	774	61.1	8.92E-01	8.2	5.61	0	4.58
	10	70.1	58	25	3677	4.32	1023	67.6	1.18E+00	13.1	5.51	0	0.00
	10	75.1	58	25	1709	1.87	565	72.6	6.51E-01	13.2	5.41	0	0.00
8	10	77.3	58	25	1429	1.52	666	74.9	7.68E-01	9.9	5.36	0	0.00
9	10	80.3	58	25	1721	1.85	275	77.8	3.17E-01	26.0	5.30	0	0.00
10	0	93.1	86	9	2386	1.92	918	90.6	1.06E+00	10.2	4.99	0	0.00
11	0	186.1	180	8	1322	1.46	466	183.1	5.38E-01	14.4	3.27	0	0.00
12	0	209.9	203	8	1128	3.57	145	206.9	1.68E-01	41.5	3.01	0	0.00
13	6	238.9	231	13	768	1.86	937	235.7	1.08E+00	5.9	2.74	0	2.21
14	6	242.0	231	13	726	2.17	245	238.8	2.83E-01	21.4	2.71	0	0.00
15	0	270.4	264	7	798	2.54	108	267.1	1.24E-01	44.7	2.50	0	0.00
16	0	294.5	288	9	1106	1.86	213	291.1	2.46E-01	28.6	2.34	0	0.00
17	0	338.5	331	9	883	1.81	217	335.0	2.50E-01	25.7	2.14	0	0.00
18	0	352.1	343	11	900	2.27	632	348.5	7.29E-01	10.2	2.08	0	0.00
19	0	511.1	501	13	791	3.18	1131	507.0	1.30E+00	5.9	1.54	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	583.5	573	13	575	2.27	365	579.2	4.20E-01	14.8	1.40	0	0.00
21	0	609.8	601	9	553	2.25	369	605.4	4.26E-01	12.7	1.35	0	0.00
22	0	911.8	901	10	282	2.58	154	906.6	1.77E-01	22.1	0.973	0	0.00
23	0	970.8	962	8	197	2.12	82	965.5	9.44E-02	34.9	0.919	0	0.00
24	0	1123.5	1112	14	258	1.42	98	1118.0	1.14E-01	37.5	0.817	0	0.00
25	0	1461.7	1448	15	206	3.29	432	1456.0	4.98E-01	8.5	0.648	0	0.00
26	0	1764.6	1753	14	95	4.74	83	1758.9	9.52E-02	28.9	0.554	0	0.00

FWHM=SQRT(3.99126E+00 + 5.11995E-03 *E)

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B? 'KGROUND INFO 8811    GLS   6       274.981  7 G- 1     BG DATE 272.802  7
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PEAK			BACKGROUND			NET	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR

63.53	0.8924	8.20	62.00	0.7807	15.69	0.1117	127.73R
93.09	1.0584	10.19	92.00	1.0917	3.91	-0.0333	348.26R
186.05	0.5376	14.37	186.00	0.4981	6.18	0.0395	210.58R
.87	1.0798	5.85	238.60	0.5190	4.01	0.5608	11.86
4.51	0.2455	28.58	295.20	0.0954	27.04	0.1501	49.79
338.51	0.2497	25.73	338.40	0.0607	33.42	0.1889	35.66
352.08	0.7290	10.21	351.90	0.2089	16.18	0.5202	15.72
511.10	1.3034	5.90	511.00	1.3391	4.21	-0.0357	267.44R
583.54	0.4203	14.78	583.10	0.1714	19.66	0.2489	28.40
609.81	0.4260	12.70	609.30	0.1633	12.98	0.2627	22.12
911.78	0.1773	22.10	911.10	0.0868	18.20	0.0904	46.72
970.77	0.0944	34.88	968.90	0.0455	32.96	0.0488	74.06
1461.71	0.4976	8.49	1461.00	0.0714	26.33	0.4262	10.84
1764.57	0.0952	28.90	1764.50	0.0374	37.99	0.0579	53.53

4 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 8811 GLS 6 274.981 7 G- 1

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 6 GLS RUN AT 274.981/2007

BACKGROUND FOR GELI DETECTOR 1 OF 272.802/2007 2641.5 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
92.0	0.7807	15.69	511.0	1.3391	4.21	1120.3	0.0446	32.06
92.0	1.0917	3.91	583.1	0.1714	19.66	1173.2	0.0272	0.00
143.0	0.0931	38.79	609.3	0.1633	12.98	1238.1	0.0285	0.00
186.0	0.4981	6.18	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0725	21.78	727.2	0.0348	16.65	1377.7	0.0319	0.00
238.6	0.5190	4.01	846.0	0.0656	55.51	1461.0	0.0714	26.33
279.0	0.0000	0.00	860.4	0.0372	0.00	1586.0	0.0000	0.00
295.2	0.0954	27.04	911.1	0.0868	18.20	1591.0	0.0620	0.00
338.4	0.0607	33.42	968.9	0.0455	32.96	1729.6	0.0061	0.00
351.9	0.2089	16.18	1001.0	0.0458	35.39	1764.5	0.0374	37.99

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 10/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
218.883	7	1.7454	14.137	138.
223.775	7	1.7551	14.882	22.
230.918	7	1.7347	13.890	35.
237.741	7	1.7237	13.528	28.
258.777	7	1.7442	14.353	29.
265.711	7	1.7599	15.213	22.
267.864	7	1.5439	11.619	38.NG
271.918	7	1.5464	12.253	26.NG
272.063	7	1.5169	11.690	20.NG
272.730	7	1.5111	11.869	23.NG
AVERAGE		1.7438	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
70.013	7	1.0668	4.608	26.
71.872	7	1.0549	5.509	41.
76.856	7	1.0713	7.228	30.
81.670	7	1.0534	5.600	25.
103.972	7	0.8203	15.248	21.
192.664	7	0.9760	34.750	25.
197.727	7	2.1369	18.219	45.
205.876	7	0.9740	30.810	21.
216.753	7	0.9677	15.266	24.
272.776	7	0.8535	10.320	20.
AVERAGE		1.0235	0.048	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 272.776 7
ENERGY= 2.091488 + 1.0048681*CH + -1.626058E-06*CH**2
FWHM =SQRT(1.8082 + 0.004696*ENERGY) (CO60= 2.840)

EFFICIENCIES FOR GEOMETRY JR 1 CALIBRATED 207.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.555600	100.0	4.819200	300.0	2.304700	0.0	0.000000
55.0	5.631600	110.0	4.582500	500.0	1.562100	0.0	0.000000
60.0	5.636600	130.0	4.152700	700.0	1.197600	0.0	0.000000
65.0	5.592800	150.0	3.787300	1000.0	0.892900	0.0	0.000000
70.0	5.516200	170.0	3.479400	1400.0	0.669100		
80.0	5.307100	190.0	3.218900	2000.0	0.489700		
90.0	5.065700	250.0	2.638800	3000.0	0.348600		

8811 6 GLS GSTOR 531

	PK	ENERGY	CPM	%ERR	COMMENT
	1	20.5	0.01	99.9	
	2	27.2	1.07	7.4	
	3	36.1	0.04	99.9	
	4	46.6	1.51	7.1	NO GEN Pb210s
	6	70.1	1.18	13.1	
	7	75.1	0.65	13.2	
	8	77.3	0.77	9.9	
	9	80.3	0.32	26.0	Ce144 I 131 Th227s
	12	209.9	0.17	41.5	Ac228 Th227s
b	13	238.9	0.56	11.9	Th228 Pb212s
	14	242.0	0.28	21.4	Ra226 Th228 La140
	15	270.4	0.12	44.7	Ac228 Fe 59p
b	16	294.5	0.15	49.8	Ra226 Ru103
b	17	338.5	0.19	35.7	Ac228
b	18	352.1	0.52	15.7	Ra226s Pb214s
b	20	583.5	0.25	28.4	Th228 Tl208s
b	21	609.8	0.26	22.1	Ru103 Ra226s Bi214s
b	22	911.8	0.09	46.7	NO GEN Th232s Ac228s
b	23	970.8	0.05	74.1	NO GEN
	24	1123.5	0.11	37.5	
b	25	1461.7	0.43	10.8	K 40s
b	26	1764.6	0.06	53.5	Ra226
		REJECTED PEAKS			
B	5	63.5	0.11	99.9	Th232s
B	0	93.1	-0.03	99.9	Th234s Th227s
B	11	186.1	0.04	99.9	Cs136 U 235s Ra226s
B	19	511.1	-0.04	99.9	Ac228 Th228 La140 Ru106 Na 22

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**********************************************************************
8811    GLS   7        G-5 JR 274.981  7  867.43 MIN      1.00000 SM        532
LJRR=TTIH  REF TIME= 274.981  7        100 mL in Jar (temp)
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10207

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00507	0.092	1.658E+02 s		<r	7.467E+01
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 1.000E+00	3G		
**** (889.26)	1.000000	0.00818	0.142	1.739E+01 s		<	7.835E+00
**** (1120.52)	1.000000	0.00659	0.124	1.886E+01 s		<	8.497E+00
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 1.000E+00	4G		
1174 (1173.21)	0.999200	0.00630	6.559	1.042E+03 s	1.68%		4.692E+02
1333 (1332.48)	1.000000	0.00556	5.823	1.047E+03 s	1.54%		4.717E+02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 1.000E+00	16G		
**** (1691.00)	0.457000	0.00434	0.042	2.113E+01 s		<	9.518E+00
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 1.000E+00	3G		
662 (661.64)	0.851000	0.01067	10.245	1.128E+03 s	1.29%		5.082E+02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 1.000E+00	48G		
**** (121.78)	0.254000	0.04080	0.235	2.266E+01 s		<	1.021E+01
* (344.31)	0.245000	0.01949	0.179	3.740E+01 s		<	1.685E+01
* (963.36)	0.132000	0.00761	0.143	1.428E+02 s		<	6.435E+01
**** (1112.04)	0.124000	0.00664	0.131	1.596E+02 s		<	7.190E+01
**** (1408.02)	0.198000	0.00526	0.049	4.666E+01 s		<	2.102E+01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 1.000E+00	48G		
**** (123.07)	0.390000	0.04082	0.212	1.331E+01 s		<	5.994E+00
**** (723.26)	0.202000	0.00987	0.131	6.570E+01 s		<	2.960E+01
**** (1004.75)	0.170000	0.00732	0.136	1.096E+02 s		<	4.936E+01
**** (1274.49)	0.336000	0.00581	0.065	3.328E+01 s		<	1.499E+01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 1.000E+00	22G		
**** (316.50)	0.830700	0.02115	0.179	1.021E+01 s		<	4.601E+00
**** (468.06)	0.476000	0.01459	0.183	2.630E+01 s		<	1.185E+01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
**** (583.14)	0.860000	0.01193	0.146	1.422E+01 s		<r	6.407E+00
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
**** (46.50)	0.040000	0.00393	0.206	1.308E+03 s		<	5.893E+02
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
**** (727.17)	0.066500	0.00982	0.133	2.040E+02 s		<	9.188E+01
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
**** (238.63)	0.431000	0.02769	0.231	1.939E+01 s		<r	8.734E+00
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G		
**** (609.30)	0.470000	0.01147	0.143	2.656E+01 s		<	1.196E+01
Pb214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	23G		

307	(305.40)	0.003000	0.02189	0.232	3.526E+03	32.22%	1.588E+03
****	(352.00)	0.360000	0.01908	0.192	2.796E+01 s	<	1.260E+01

P 6	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00		48G
*	(186.10)	0.040000	0.03417	0.251	1.840E+02 s	<r	8.288E+01
****	(351.96)	0.393000	0.01908	0.192	2.561E+01 s	<	1.154E+01
****	(609.32)	0.484000	0.01147	0.143	2.579E+01 s	<	1.162E+01

Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 1.000E+00		48G
****	(49.80)	0.087000	0.00483	0.248	5.904E+02 s	<	2.659E+02
****	(79.70)	0.018000	0.02807	0.209	4.130E+02 s	<	1.860E+02
****	(94.00)	0.013500	0.03576	0.227	4.693E+02 s	<	2.114E+02
****	(210.60)	0.012600	0.03095	0.231	5.926E+02 s	<	2.669E+02
****	(236.00)	0.115000	0.02797	0.227	7.048E+01 s	<	3.175E+01
****	(254.70)	0.009100	0.02604	0.211	8.921E+02 s	<	4.018E+02
****	(256.20)	0.063000	0.02590	0.208	1.276E+02 s	<	5.748E+01
****	(285.60)	0.016500	0.02336	0.189	4.906E+02 s	<	2.210E+02
****	(300.00)	0.018900	0.02227	0.187	4.439E+02 s	<	1.999E+02
****	(304.40)	0.013500	0.02196	0.181	6.095E+02 s	<	2.746E+02
****	(329.90)	0.029000	0.02031	0.199	3.384E+02 s	<	1.524E+02
****	(334.40)	0.011500	0.02005	0.179	7.759E+02 s	<	3.495E+02

Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00		41G
****	(911.10)	0.250000	0.00800	0.150	7.478E+01 s	<	3.368E+01

Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00		8G
****	(68.00)	0.005900	0.01898	0.210	1.873E+03 s	<	8.436E+02

Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00		42G
*	(911.10)	0.250000	0.00800	0.150	7.478E+01 s	<	3.368E+01
*	(968.90)	0.150000	0.00757	0.146	1.289E+02 s	<	5.804E+01
****	(63.81)	0.010101	0.01539	0.212	1.365E+03 s	<	6.148E+02

Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00		10G
****	(92.30)	0.999999	0.03506	0.232	6.627E+00 s	<r	2.985E+00

Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00		48G
****	(1001.03)	0.006000	0.00735	0.137	3.113E+03 s	<	1.402E+03

U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00		34G
60	(58.60)	0.001000	0.01102	5.116	4.644E+05	2.59%	2.092E+05
****	(143.78)	0.132600	0.03968	0.236	4.487E+01 s	<	2.021E+01
****	(185.72)	0.540000	0.03422	0.251	1.361E+01 s	<r	6.129E+00

Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00		41G
60	(59.54)	0.359000	0.01179	5.116	1.209E+03 s	2.59%	5.447E+02

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*****************************************************************************
8811    GLS    7        G-5 JR 274.981  7  867.43 MIN      1.00000 SM        532
LIPR=TTIH  REF TIME= 274.981  7        100 mL in Jar (temp)
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*****************************************************************************
* Group......................... 8811 * Time of count          274.981 2007 *
* Sample........................... 7 * Reference GMT........ 274.981 2007 *
* Element.........................   * Elapsed Live Tm.......... 867.4334 *
* Type code.....................GLS * Dead Time Pct............ 0.001921 *
* ID.................. QC-LCS #62969 * Background GMT....... 272.802 2007 *
* Geometry, detector........... JR-5 * Standard GMT......... 272.749 2007 *
* Aliquot......................... 1. * Days since T0................. 0.0 *
* Unit of Aliquot............... SMPL * Time on.......... 16:32 PDT  1-OCT *
* Data Sheet Units........ PCI /SMPL * Time off.......... 6:59 PDT  2-OCT *
* Library...................... TTIH * Calc Time......... 09:41 02-OCT-07 *
*****************************************************************************
* Slope.................... 1.003658 * Width slope............... 0.007587 *
* Intercept................ 2.270109 * Width offset............. 0.334976 *
* X**2 TERM......... -0.16903048E-05 * Sensitivity.................... 4. *
  NP:[7,67]532.GSP                  13 PEAKS

*****************************************************************************
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN       CPM  ERR  EFF  K  FIT
  1  0   28.4   22 10  2639 3.94   2040   26.0  2.35E+00  5.30.183  0  0.00
  2  0   59.5   53  7  3067 1.81   4438   57.1  5.12E+00  2.6 1.17  0  0.00
  3  0   92.4   87  7  2516 1.69    385   89.8  4.44E-01 22.4 3.49  0  0.00
  4  0  186.3  180  8  2927 1.65    314  183.4  3.62E-01 30.2 3.41  0  0.00
  5  0  238.1  233  6  1939 1.35    192  235.1  2.21E-01 37.4 2.78  0  0.00
  6  0  306.8  301  7  1423 3.22    201  303.6  2.32E-01 32.2 2.19  0  0.00
  7  0  338.4  333  7  1434 1.48    105  335.1  1.21E-01 61.2 2.03  0  0.00
  8  0  511.1  503 10  1369 3.18    461  507.4  5.32E-01 15.9 1.35  0  0.00
  9  0  583.3  577  7   735 2.13     87  579.5  1.00E-01 53.1 1.21  0  0.00
 10  0  662.0  652 12  1023 2.28   8907  658.1  1.03E+01  1.3 1.08  0  0.00
 11  0 1173.9 1163 16   670 3.06   5707 1169.7  6.58E+00  1.70.637  0  0.00
 12  0 1333.2 1321 15   156 3.14   5067 1329.1  5.84E+00  1.50.559  0  0.00
 13  0 1461.8 1451 13    88 3.36    216 1457.8  2.49E-01 12.20.509  0  0.00
FWHM=SQRT( 5.03595E+00 +  3.38369E-03 *E)

*****************************************************************************
BACKGROUND INFO 8811    GLS    7        274.981  7 G- 5      BG DATE 272.802  7
*****************************************************************************

v--------PEAK---------v      v------BACKGROUND------v      v------NET----v
ENERGY       CPM  %ERROR       ENERGY       CPM  %ERROR          CPM  %ERROR

  92.39    0.4435 22.40         92.00  0.3549  8.09          0.0886116.71R
 186.25    0.3622 30.17        186.00  0.2564 15.17          0.1058109.63R
 238.10    0.2210 37.40        238.60  0.2912 14.39         -0.0701132.14R
 338.40    0.1205 61.16        338.40  0.0607 35.44          0.0599128.25R
 511.11    0.5315 15.86        511.00  0.6126  6.20         -0.0811114.05R
 583.31    0.1003 53.13        583.10  0.0857 18.91          0.0146381.06R
 662.04   10.2681  1.29        661.60  0.0238  0.00         10.2444  1.29
1173.91    6.5789  1.68       1173.20  0.0204  0.00          6.5584  1.68
1333.21    5.8419  1.53       1332.50  0.0196  0.00          5.8223  1.54
1461.83    0.2495 12.18       1460.80  0.2394  7.31          0.0101345.81R
   7 PEAKS REJECTED BY BACKGROUND

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INTERFERING ISOTOPE ANALYSIS 8811    GLS    7        274.981  7 G- 5
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SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 7 GLS RUN AT 274.981/2007

BACKGROUND FOR GELI DETECTOR 5 OF 272.802/2007 2641.6 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
92.0	0.0373	22.51	511.0	0.6126	6.20	1120.3	0.0203	1.48
92.0	0.3549	8.09	583.1	0.0857	18.91	1173.2	0.0204	0.00
143.0	0.0872	0.00	609.3	0.0494	35.20	1238.1	0.0123	0.00
186.0	0.2564	15.17	661.6	0.0238	0.00	1332.5	0.0196	0.00
198.0	0.0860	42.55	727.2	0.0233	0.00	1377.7	0.0257	0.00
238.6	0.2912	14.39	846.0	0.0364	39.85	1460.8	0.2394	7.31
279.0	0.0510	0.00	860.4	0.0351	0.00	1586.0	0.0565	0.00
295.2	0.0708	0.00	911.1	0.0782	30.58	1591.3	0.0321	0.00
338.4	0.0607	35.44	968.9	0.0412	33.74	1729.6	0.0145	0.00
351.9	0.0649	78.68	1001.0	0.0429	0.00	1764.5	0.0348	46.80

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 10/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
209.926	7	0.9386	2.801	35.
216.995	7	0.9512	3.439	20.
223.795	7	0.9726	3.094	32.
230.945	7	0.9672	2.766	22.
237.835	7	0.7685	9.509	32.NG
237.932	7	1.0341	2.167	32.
247.938	7	0.9271	3.606	33.
256.727	7	0.9096	5.110	24.
258.802	7	0.8496	4.322	24.NG
272.749	7	1.0075	4.369	28.
AVERAGE		0.9635	0.041	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
130.842	6	1.0028	5.576	21.
92.687	7	0.9684	5.181	32.
96.820	7	0.9834	2.940	21.
133.833	7	0.9676	3.554	28.
154.021	7	0.9495	3.720	30.
237.968	7	0.9561	5.349	22.
247.756	7	0.9184	1.921	33.
256.871	7	0.9518	4.083	37.NG
258.825	7	0.9210	4.231	27.
265.838	7	0.9645	5.696	35.
AVERAGE		0.9584	0.026	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 272.749 7
ENERGY= 2.270109 + 1.0036577*CH + -1.690305E-06*CH**2
FWHM =SQRT(0.3350 + 0.007588*ENERGY) (CO60= 3.232)

EFFICIENCIES FOR GEOMETRY JR 5 CALIBRATED 50.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.488400	100.0	3.779100	300.0	2.226900	0.0	0.000000
55.0	0.821500	110.0	3.988900	500.0	1.374900	0.0	0.000000
60.0	1.216500	130.0	4.066100	700.0	1.016600	0.0	0.000000
65.0	1.641400	150.0	3.898500	1000.0	0.735300	0.0	0.000000
70.0	2.065800	170.0	3.639600	1400.0	0.529500		
80.0	2.827400	190.0	3.362900	2000.0	0.363500		
90.0	3.401900	250.0	2.649600	3000.0	0.240400		

8811 7 GLS GSTOR 532

	PK	ENERGY	CPM	%ERR	COMMENT
	1	28.4	2.35	5.3	
	2	59.5	5.12	2.6	Am241s
	6	306.8	0.23	32.2	
b	10	662.0	10.24	1.3	Cs137s
b	11	1173.9	6.56	1.7	Cs134+ Co 60s
b	12	1333.2	5.82	1.5	Ag110 Co 60s
			REJECTED PEAKS		
B	3	92.4	0.09	99.9	Th234s
B	4	186.3	0.11	99.9	Cs136 U 235s Ra226s
B	5	238.1	-0.07	99.9 Th228	Pb212s
B	7	338.4	0.06	99.9 Ac228	
B	8	511.1	-0.08	99.9 Th228	La140 Ru106 Na 22
B	9	583.3	0.01	99.9 Th228	Tl208s
B	13	1461.8	0.01	99.9	K 40s

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**********************************************************************
8811    GLS   8        G-7 JR 274.981  7  867.72 MIN      1.00000 SM        534
LIBR=TTIH  REF TIME= 274.981  7       100 mLs in Parkway Jar
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Mg. 10-207

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12			DECAY= 1.000E+00	1G	
**** (1460.85)	0.110000	0.00609	0.051		7.630E+01 s		<r 3.437E+01
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03			DECAY= 1.000E+00	3G	
**** (889.26)	1.000000	0.01014	0.063		6.209E+00 s		< 2.797E+00
**** (1120.52)	1.000000	0.00806	0.058		7.256E+00 s		< 3.268E+00
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04			DECAY= 1.000E+00	4G	
**** (1173.21)	0.999200	0.00768	0.056		7.357E+00 s		< 3.314E+00
**** (1332.48)	1.000000	0.00672	0.048		7.141E+00 s		<r 3.217E+00
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02			DECAY= 1.000E+00	16G	
**** (1691.00)	0.457000	0.00518	0.039		1.641E+01 s		< 7.393E+00
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05			DECAY= 1.000E+00	3G	
**** (661.64)	0.851000	0.01334	0.079		6.986E+00 s		< 3.147E+00
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04			DECAY= 1.000E+00	48G	
**** (121.78)	0.254000	0.04799	0.142		1.163E+01 s		< 5.241E+00
*** (344.31)	0.245000	0.02289	0.104		1.849E+01 s		< 8.330E+00
**** (963.36)	0.132000	0.00939	0.060		4.811E+01 s		< 2.167E+01
**** (1112.04)	0.124000	0.00812	0.056		5.554E+01 s		< 2.502E+01
**** (1408.02)	0.198000	0.00634	0.047		3.721E+01 s		< 1.676E+01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04			DECAY= 1.000E+00	48G	
**** (123.07)	0.390000	0.04770	0.144		7.744E+00 s		< 3.488E+00
**** (723.26)	0.202000	0.01233	0.077		3.078E+01 s		< 1.387E+01
**** (1004.75)	0.170000	0.00901	0.059		3.826E+01 s		< 1.723E+01
**** (1274.49)	0.336000	0.00704	0.042		1.766E+01 s		< 7.953E+00
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03			DECAY= 1.000E+00	22G	
**** (316.50)	0.830700	0.02447	0.116		5.722E+00 s		< 2.578E+00
**** (468.06)	0.476000	0.01791	0.087		1.020E+01 s		< 4.593E+00
484 (484.57)	0.031700	0.01742	0.050		9.059E+01	65.92%	4.081E+01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13			DECAY= 1.000E+00	19G	
**** (583.14)	0.860000	0.01489	0.091		7.097E+00 s		<r 3.197E+00
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13			DECAY= 1.000E+00	1G	
47 (46.50)	0.040000	0.04040	0.298		1.844E+02 s	30.77%	8.308E+01
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13			DECAY= 1.000E+00	22G	
**** (727.17)	0.066500	0.01226	0.073		8.954E+01 s		< 4.033E+01
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13			DECAY= 1.000E+00	4G	
*** (238.63)	0.431000	0.03035	0.143		1.097E+01 s		<r 4.939E+00
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13			DECAY= 1.000E+00	48G	
608 (609.30)	0.470000	0.01434	0.101		1.492E+01 s	57.05%	6.720E+00

Pb214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	23G		
241	(241.90)	0.076000	0.03005	0.079	3.464E+01	41.55%	1.560E+01	
305	(305.40)	0.003000	0.02516	0.055	7.268E+02	79.74%	3.274E+02	
[illegible]	(352.00)	0.360000	0.02249	0.094	1.160E+01	s55.64%	5.224E+00	
Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00	48G		
****	(186.10)	0.040000	0.03642	0.158	1.083E+02	s	<r 4.878E+01	
241	(242.00)	0.078000	0.03004	0.079	3.376E+01	41.55%	1.521E+01	
352	(351.96)	0.393000	0.02250	0.094	1.062E+01	s55.64%	4.785E+00	
608	(609.32)	0.484000	0.01434	0.101	1.449E+01	s57.05%	6.526E+00	
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 1.000E+00	48G		
****	(49.80)	0.087000	0.04963	0.156	3.611E+01	s	< 1.626E+01	
****	(79.70)	0.018000	0.05657	0.174	1.712E+02	s	< 7.713E+01	
****	(94.00)	0.013500	0.05416	0.177	2.416E+02	s	<r 1.088E+02	
****	(210.60)	0.012600	0.03330	0.134	3.204E+02	s	< 1.443E+02	
****	(236.00)	0.115000	0.03061	0.139	3.936E+01	s	< 1.773E+01	
****	(254.70)	0.009100	0.02890	0.114	4.351E+02	s	< 1.960E+02	
****	(256.20)	0.063000	0.02877	0.113	6.256E+01	s	< 2.818E+01	
****	(285.60)	0.016500	0.02649	0.105	2.409E+02	s	< 1.085E+02	
****	(300.00)	0.018900	0.02551	0.104	2.148E+02	s	< 9.676E+01	
305	(304.40)	0.013500	0.02522	0.055	1.611E+02	s79.74%	7.257E+01	
****	(329.90)	0.029000	0.02368	0.112	1.632E+02	s	< 7.352E+01	
****	(334.40)	0.011500	0.02343	0.119	4.417E+02	s	< 1.989E+02	
352	(350.50)	0.000800	0.02257	0.094	5.201E+03	55.64%	2.343E+03	
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	41G		
****	(911.10)	0.250000	0.00991	0.077	3.125E+01	s	<r 1.408E+01	
T[illegible]	0 2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00	8G		
[illegible]*	(68.00)	0.005900	0.05696	0.181	5.384E+02	s	< 2.425E+02	
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00	42G		
****	(911.10)	0.250000	0.00991	0.077	3.125E+01	s	<r 1.408E+01	
****	(968.90)	0.150000	0.00934	0.058	4.128E+01	s	< 1.859E+01	
****	(63.81)	0.010101	0.05644	0.184	3.223E+02	s	<r 1.452E+02	
Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	10G		
****	(92.30)	0.999999	0.05450	0.184	3.369E+00	s	<r 1.517E+00	
Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G		
****	(1001.03)	0.006000	0.00904	0.060	1.099E+03	s	< 4.950E+02	
U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00	34G		
****	(143.78)	0.132600	0.04342	0.139	2.414E+01	s	< 1.087E+01	
****	(185.72)	0.540000	0.03647	0.158	8.011E+00	s	<r 3.608E+00	
241	(240.93)	0.000700	0.03014	0.079	3.749E+03	41.55%	1.689E+03	
Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00	41G		
****	(59.54)	0.359000	0.05537	0.152	7.652E+00	s	< 3.447E+00	

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8811    GLS    8        G-7 JR 274.981  7  867.72 MIN      1.00000 SM        534
LLDR=TTIH  REF TIME= 274.981  7       100 mLs in Parkway Jar
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Group	8811	Time of count	274.981 2007
Sample	8	Reference GMT	274.981 2007
Element		Elapsed Live Tm	867.7167
Type code	GLS	Dead Time Pct	0.0
ID 0	QC-BLANK #62970	Background GMT	272.802 2007
Geometry, detector	JR-7	Standard GMT	272.730 2007
Aliquot	1.	Days since T0	0.0
Unit of Aliquot	SMPL	Time on	16:32 PDT 1-OCT
Data Sheet Units	PCI /SMPL	Time off	7:00 PDT 2-OCT
Library	TTIH	Calc Time	09:42 02-OCT-07
Slope	1.007126	Width slope	0.003193
Intercept	2.711603	Width offset	1.943238
X**2 TERM	-0.11654283E-05	Sensitivity	4.

NP:[7,67]534.GSP 23 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	3	26.5	20	12	333	2.53	557	23.7	6.42E-01	9.2	0.149	0	7.39
2	3	30.3	20	12	944	3.66	355	27.3	4.10E-01	17.2	0.222	0	0.00
3	0	47.1	38	10	1682	1.90	259	44.1	2.98E-01	30.8	0.836	0	0.00
4	0	62.8	56	7	1086	1.38	359	59.7	4.14E-01	16.1	5.61	0	0.00
[illegible]	0	70.1	64	8	1364	2.79	389	66.9	4.48E-01	17.7	5.71	0	0.00
[illegible]	6	89.5	85	9	380	1.01	48	86.2	5.58E-02	56.2	5.50	0	0.77
[illegible]	6	92.5	85	9	616	1.66	493	89.2	5.68E-01	9.1	5.44	0	0.00
8	0	185.4	176	11	1116	2.13	365	181.4	4.20E-01	18.9	3.65	0	0.00
9	6	238.1	230	11	431	1.68	229	233.8	2.64E-01	15.4	3.05	0	0.55
10	6	241.3	230	11	350	1.38	69	237.0	7.91E-02	41.5	3.02	0	0.00
11	0	294.7	287	6	461	1.29	56	290.0	6.49E-02	60.2	2.59	0	0.00
12	0	304.6	297	7	474	2.18	48	299.9	5.49E-02	79.7	2.53	0	0.00
13	0	338.1	330	7	440	2.44	100	333.2	1.15E-01	36.4	2.36	0	0.00
14	0	351.6	343	9	497	2.56	174	346.5	2.00E-01	24.7	2.30	0	0.00
15	0	483.9	476	7	251	2.93	43	478.1	4.99E-02	65.9	1.76	0	0.00
16	0	510.5	499	12	439	3.27	844	504.5	9.72E-01	6.1	1.67	0	0.00
17	0	582.6	574	7	225	2.40	74	576.1	8.56E-02	35.8	1.51	0	0.00
18	0	608.1	595	13	442	2.85	167	601.6	1.92E-01	27.1	1.45	0	0.00
19	0	909.6	896	10	165	1.43	93	901.5	1.07E-01	27.9	1.00	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1331.4	1317	8	59	1.34	17	1321.3	1.95E-02	85.1	0.677	0	0.00
21	0	1460.9	1446	10	49	2.08	46	1450.3	5.27E-02	35.9	0.613	0	0.00
22	0	1763.4	1748	8	32	3.73	20	1751.7	2.27E-02	59.2	0.502	0	0.00
23	0	2015.3	2001	5	5	2.24	14	2003.0	1.57E-02	44.0	0.426	0	0.00

FWHM=SQRT(4.91727E+00 + 1.01445E-03 *E)

BACKGROUND INFO 8811 GLS 8 274.981 7 G- 7 BG DATE 272.802 7

F[illegible]GY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
62.81	0.4143	16.06	62.00	0.4638	27.75	-0.0496	92.14R
92.54	0.5683	9.08	92.00	0.6117	7.39	-0.0433	158.33R
185.37	0.4203	18.85	186.00	0.3143	14.25	0.1059	85.93R

238.11	0.2641	15.38	238.50	0.3116	12.07	-0.0475	116.48R
294.70	0.0649	60.19	295.20	0.0595	11.76	0.0054	739.65R
338.14	0.1155	36.36	338.40	0.0704	17.32	0.0450	97.09R
351.56	0.2002	24.74	351.90	0.1062	15.72	0.0939	55.64
510.53	0.9725	6.14	511.00	1.0122	3.50	-0.0398	174.67R
582.56	0.0856	35.77	583.10	0.0800	21.24	0.0056	627.73R
608.15	0.1921	27.06	609.30	0.0916	26.43	0.1005	57.05
909.65	0.1074	27.92	911.10	0.0671	33.40	0.0403	92.79R
1331.42	0.0195	85.10	1332.50	0.0388	40.77	-0.0192	119.31R
1460.86	0.0527	35.94	1461.00	0.0614	12.54	-0.0087	234.10R
1763.35	0.0227	59.16	1764.50	0.0201	28.36	0.0026	557.48R

12 PEAKS REJECTED BY BACKGROUND

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INTERFERING ISOTOPE ANALYSIS 8811 GLS 8 274.981 7 G- 7

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SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 8 GLS RUN AT 274. 981/2007

BACKGROUND FOR GELI DETECTOR 7 OF 272.802/2007 2641.8 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
92.0	0.4638	27.75	511.0	1.0122	3.50	1120.3	0.0263	47.59
92.0	0.6117	7.39	583.1	0.0800	21.24	1173.2	0.0356	29.51
143.0	0.0574	30.84	609.3	0.0916	26.43	1238.1	0.0195	0.00
186.0	0.3143	14.25	661.6	0.0377	20.70	1332.5	0.0388	40.77
198.0	0.0656	28.52	727.2	0.0256	0.00	1377.7	0.0253	0.00
238.5	0.3116	12.07	846.0	0.0581	21.85	1461.0	0.0614	12.54
279.0	0.0000	0.00	860.4	0.0351	0.00	1586.0	0.0000	0.00
295.2	0.0595	11.76	911.1	0.0671	33.40	1591.0	0.0333	0.00
338.4	0.0704	17.32	968.9	0.0428	55.35	1729.6	0.0116	0.00
351.9	0.1062	15.72	1001.0	0.0417	34.54	1764.5	0.0201	28.36

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 7 ON 10/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
71.872	7	1.0395	11.486	39.
103.898	7	0.8806	8.120	30.
109.825	7	1.0019	9.030	22.
114.670	7	0.9891	8.186	29.
127.663	7	0.9841	7.790	44.
133.833	7	0.9924	7.542	27.
150.885	7	0.8859	11.264	14.
1[illegible]032	7	0.9734	5.981	22.
1[illegible].704	7	0.9383	4.693	21.
175.828	7	0.9978	8.266	38.
AVERAGE		0.9683	0.051	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
228.781	7	0.9974	7.749	23.
230.893	7	1.0167	8.008	32.
235.819	7	1.0523	14.305	27.
237.860	7	1.0038	8.379	26.
244.938	7	1.0507	12.319	35.
258.777	7	1.0466	12.929	31.
265.711	7	1.0175	9.504	24.
265.864	7	0.8918	13.018	40.
265.918	7	1.0084	7.775	28.
272.730	7	0.9982	8.611	25.
AVERAGE		1.0213	0.023	

CALIBRATION LINE FROM STANDARD FOR G- 7 OF 272.730 7
ENERGY= 2.711603 + 1.0071259*CH + -1.165428E-06*CH**2
FWHM =SQRT(1.9432 + 0.003194*ENERGY) (CO60= 2.490)

EFFICIENCIES FOR GEOMETRY JR 7 CALIBRATED 50.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.023100	100.0	5.287100	300.0	2.551200	0.0	0.000000
55.0	5.347200	110.0	5.062500	500.0	1.699100	0.0	0.000000
60.0	5.551400	130.0	4.620300	700.0	1.270100	0.0	0.000000
65.0	5.663400	150.0	4.223800	1000.0	0.905100	0.0	0.000000
70.0	5.706100	170.0	3.881400	1400.0	0.637600		
80.0	5.653400	190.0	3.588400	2000.0	0.429900		
90.0	5.494600	250.0	2.931100	3000.0	0.279600		

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8811   8          GLS                                          GSTOR 534
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   PK  ENERGY    CPM %ERR      COMMENT
    1   26.5    0.64  9.2 ..................................................
    2   30.3    0.41 17.2 ..................................................
    3   47.1    0.30 30.8 NO GEN.................................... Pb210s
    5   70.1    0.45 17.7 ..................................................
    6   89.5    0.06 56.2 ..................................................... Cd109
   10  241.3    0.08 41.5 Ra226 Th228 ............................... La140
   12  304.6    0.05 79.7 ................................... Ba140 Th227s
b  14  351.6    0.09 55.6 ................................... Ra226s Pb214s
   15  483.9    0.05 65.9 ..................................................
b  18  608.1    0.10 57.0 ............................ Sb125 Ra226s Bi214s
   23 2015.3    0.02 44.0 ..................................................
                  REJECTED PEAKS
B   4   62.8   -0.05 99.9 ........................................... Th232s
B   7   92.5   -0.04 99.9 ................................... Th234s Th227s
B   8  185.4    0.11 85.9 ........................... Cs137c U 235s Ra226s
B   9  238.1   -0.05 99.9 Th228 ................................... Pb212s
B  11  294.7    0.01 99.9 Ra226 ................................... Ru103
B  13  338.1    0.05 97.1 Ac228 ..................................................
B  16  510.5   -0.04 99.9 Ac228 Th228 ................... La140 Ru106 Na 22
B  17  582.6    0.01 99.9 Th228 ................................... Tl208s
B  19  909.6    0.04 92.8 ................................... Th232s Ac228s
B  20 1331.4   -0.02 99.9 ........................................... Co 60s
B  21 1460.9   -0.01 99.9 ........................................... K  40s
B  22 1763.4    0.00 99.9 Ra226 ..................................................
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8811 GLS 9 G-6 JR 274.981 7 867.52 MIN 163.71001 GR 533
LIBR=TTIH REF TIME= 268.896 7 100 mLs in JAR

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10.201

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00722	0.284	3.575E+02 s		<r	9.836E-01
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 9.509E-01	3G		
**** (889.26)	1.000000	0.01119	0.151	1.350E+01 s		<	3.905E-02
1120 (1120.52)	1.000000	0.00916	0.495	5.409E+01 s	18.48%		1.565E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.978E-01	4G		
**** (1173.21)	0.999200	0.00879	0.140	1.597E+01 s		<	4.405E-02
**** (1332.48)	1.000000	0.00785	0.118	1.509E+01 s		<	4.161E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 9.323E-01	16G		
**** (1691.00)	0.457000	0.00631	0.081	2.794E+01 s		<	8.244E-02
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.996E-01	3G		
**** (661.64)	0.851000	0.01431	0.177	1.453E+01 s		<	3.999E-02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.991E-01	48G		
**** (121.78)	0.254000	0.04988	0.302	2.383E+01 s		<	6.561E-02
5 (295.97)	0.004000	0.02688	2.213	2.058E+04	7.59%		5.668E+01
** (344.31)	0.245000	0.02391	0.236	4.024E+01 s		<	1.108E-01
768 (768.90)	0.000800	0.01265	0.372	3.682E+04	18.30%		1.014E+02
**** (963.36)	0.132000	0.01045	0.161	1.170E+02 s		<	3.222E-01
**** (1112.04)	0.124000	0.00922	0.149	1.301E+02 s		<	3.583E-01
1407 (1408.02)	0.198000	0.00747	0.070	4.714E+01 s	62.27%		1.298E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.986E-01	48G		
**** (123.07)	0.390000	0.04958	0.305	1.576E+01 s		<	4.342E-02
**** (723.26)	0.202000	0.01331	0.162	6.019E+01 s		<	1.658E-01
**** (1004.75)	0.170000	0.01008	0.147	8.554E+01 s		<	2.357E-01
**** (1274.49)	0.336000	0.00816	0.126	4.581E+01 s		<	1.262E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 9.446E-01	22G		
295 (295.95)	0.290900	0.02688	2.219	2.838E+02	7.59%		8.266E-01
**** (316.50)	0.830700	0.02553	0.246	1.160E+01 s		<	3.378E-02
**** (468.06)	0.476000	0.01885	0.194	2.156E+01 s		<	6.280E-02
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
**** (583.14)	0.860000	0.01583	0.207	1.520E+01 s		<r	4.184E-02
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
47 (46.50)	0.040000	0.04546	1.194	6.564E+02 s	12.62%		1.806E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
295 (295.10)	0.000240	0.02694	2.213	3.423E+05	7.59%		9.417E+02
(727.17)	0.066500	0.01325	0.174	1.972E+02 s		<	5.426E-01
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
**** (238.63)	0.431000	0.03160	0.316	2.322E+01 s		<r	6.390E-02

Bi214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G			
609	(609.30)	0.470000	0.01529	2.314	3.221E+02	s	7.58%	8.862E-01
768	(768.70)	0.050000	0.01265	0.372	5.889E+02		18.30%	1.620E+00
1[illegible]0	(1120.40)	0.170000	0.00916	0.494	3.174E+02		18.48%	8.732E-01
[illegible]6	(1207.00)	0.006000	0.00857	0.070	1.367E+03		55.02%	3.762E+00
1238	(1238.30)	0.060000	0.00838	0.127	2.536E+02		58.59%	6.977E-01
1378	(1379.00)	0.050000	0.00761	0.170	4.472E+02		36.67%	1.230E+00
1407	(1408.00)	0.025000	0.00747	0.070	3.733E+02		62.27%	1.027E+00
1764	(1764.00)	0.170000	0.00607	0.267	2.585E+02		28.04%	7.114E-01
Pb214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 23G			
53	(53.20)	0.022000	0.05819	0.254	1.986E+02		42.34%	5.464E-01
242	(241.90)	0.076000	0.03128	1.177	4.950E+02		7.50%	1.362E+00
259	(258.80)	0.008000	0.02974	0.330	1.389E+03		29.32%	3.822E+00
295	(295.20)	0.190000	0.02693	2.213	4.324E+02		7.59%	1.190E+00
352	(352.00)	0.360000	0.02351	3.544	4.188E+02	s	6.21%	1.152E+00
768	(768.40)	0.000800	0.01265	0.372	3.680E+04		18.30%	1.012E+02
Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00 48G			
186	(186.10)	0.040000	0.03787	1.430	9.441E+02	s	11.26%	2.598E+00
242	(242.00)	0.078000	0.03127	1.177	4.824E+02		7.50%	1.327E+00
259	(259.00)	0.005800	0.02972	0.330	1.917E+03		29.32%	5.274E+00
295	(295.20)	0.201000	0.02693	2.213	4.088E+02		7.59%	1.125E+00
352	(351.96)	0.393000	0.02351	3.544	3.836E+02	s	6.21%	1.055E+00
609	(609.32)	0.484000	0.01529	2.314	3.128E+02	s	7.58%	8.606E-01
768	(768.40)	0.053200	0.01265	0.372	5.533E+02		18.30%	1.522E+00
933	(934.10)	0.033400	0.01073	0.372	1.037E+03		23.25%	2.855E+00
1120	(1120.30)	0.160000	0.00916	0.494	3.372E+02		18.48%	9.277E-01
12[illegible]8	(1238.10)	0.062000	0.00838	0.127	2.454E+02		58.59%	6.751E-01
1[illegible]3	(1377.60)	0.041800	0.00762	0.170	5.344E+02		36.67%	1.470E+00
[illegible]7	(1408.00)	0.026000	0.00747	0.070	3.590E+02		62.27%	9.877E-01
1730	(1729.60)	0.030700	0.00618	0.065	3.413E+02		74.78%	9.390E-01
1764	(1764.50)	0.166000	0.00607	0.267	2.648E+02		28.04%	7.287E-01
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 9.995E-01 48G			
****	(49.80)	0.087000	0.05585	0.253	5.210E+01	s	<	1.434E-01
****	(79.70)	0.018000	0.05957	0.303	2.830E+02	s	<	7.791E-01
****	(94.00)	0.013500	0.05657	0.321	4.206E+02	s	<r	1.158E+00
****	(210.60)	0.012600	0.03464	0.295	6.751E+02	s	<	1.858E+00
****	(236.00)	0.115000	0.03186	0.302	8.242E+01	s	<	2.269E-01
****	(254.70)	0.009100	0.03010	0.259	9.472E+02	s	<	2.608E+00
****	(256.20)	0.063000	0.02997	0.263	1.395E+02	s	<	3.841E-01
****	(285.60)	0.016500	0.02761	0.258	5.655E+02	s	<	1.557E+00
****	(300.00)	0.018900	0.02660	0.235	4.665E+02	s	<	1.284E+00
****	(304.40)	0.013500	0.02631	0.247	6.960E+02	s	<	1.916E+00
****	(329.90)	0.029000	0.02472	0.238	3.318E+02	s	<	9.134E-01
****	(334.40)	0.011500	0.02446	0.237	8.414E+02	s	<	2.316E+00
352	(350.50)	0.000800	0.02359	3.544	1.878E+05		6.21%	5.171E+02
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 41G			
****	(911.10)	0.250000	0.01096	0.174	6.357E+01	s	<r	1.749E-01
Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00 8G			
****	(68.00)	0.005900	0.06080	0.301	8.393E+02	s	<	2.309E+00
T[illegible]2	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00 42G			
[illegible]*	(911.10)	0.250000	0.01096	0.174	6.357E+01	s	<r	1.749E-01
****	(968.90)	0.150000	0.01040	0.169	1.081E+02	s	<r	2.973E-01
****	(63.81)	0.010101	0.06071	0.309	5.045E+02	s	<r	1.388E+00

Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	10G	
****	(92.30)	0.999999	0.05697	0.301	5.290E+00 s		<r 1.455E-02
P 4m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G	
9	(257.90)	0.000480	0.02982	0.330	2.309E+04	29.32%	6.353E+01
****	(1001.03)	0.006000	0.01012	0.149	2.456E+03 s		< 6.759E+00
U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00	34G	
73	(72.81)	0.004000	0.06051	3.184	1.316E+04	5.24%	3.620E+01
85	(84.24)	0.051000	0.05873	3.323	1.110E+03	4.85%	3.053E+00
****	(143.78)	0.132600	0.04511	0.308	5.143E+01 s		< 1.415E-01
186	(185.72)	0.540000	0.03792	1.430	6.983E+01 s	11.26%	1.921E-01
242	(240.93)	0.000700	0.03137	1.177	5.358E+04	7.50%	1.474E+02
Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00	41G	
****	(59.54)	0.359000	0.06016	0.280	1.299E+01 s		< 3.574E-02

8811 GLS 9 G-6 JR 274.981 7 867.52 MIN 163.71001 GR 533
LIBR=TTIH REF TIME= 268.896 7 100 mLs in JAR

Group	8811	Time of count	274.981 2007
Sample	9	Reference GMT	268.896 2007
Element		Elapsed Live Tm	867.5167
Type code	GLS	Dead Time Pct	0.001921
ID	QC-DUP#3 62971	Background GMT	272.802 2007
Geometry, detector	JR-6	Standard GMT	272.710 2007
Aliquot	163.71	Days since T0	6.085266
Unit of Aliquot	GRAM	Time on	16:32 PDT 1-OCT
Data Sheet Units	PCI /GRAM	Time off	6:59 PDT 2-OCT
Library	TTIH	Calc Time	15:31 02-OCT-07
Slope	0.992709	Width slope	0.016255
Intercept	1.733058	Width offset	0.0
X**2 TERM	-0.12655339E-05	Sensitivity	4.

NP:[7,67]533.GSP 31 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	6	23.1	20	8	389	1.85	583	21.5	6.72E-01	8.3	0.098	0	87.50
2	6	25.9	20	8	1950	2.82	915	24.4	1.05E+00	8.9	0.140	0	0.00
3	0	32.4	29	4	1966	3.36	39	30.9	4.51E-02	161.1	0.273	0	0.00
4	0	46.6	41	9	4861	1.79	1036	45.2	1.19E+00	12.6	0.810	0	0.00
5	0	53.1	50	6	3398	1.33	221	51.7	2.54E-01	42.3	5.84	0	0.00
	0	63.0	59	7	5103	1.41	322	61.7	3.72E-01	36.9	6.06	0	0.00
	10	72.8	68	14	4605	1.89	2762	71.6	3.18E+00	5.2	6.04	0	84.30
8	10	75.1	68	14	4501	1.89	6126	73.9	7.06E+00	2.5	6.01	0	0.00
9	0	85.4	81	8	5445	3.51	2883	84.3	3.32E+00	4.9	5.84	0	0.00
10	0	92.7	90	5	3084	1.93	577	91.6	6.66E-01	15.0	5.68	0	0.00
11	0	186.1	183	8	4399	1.90	1705	185.8	1.97E+00	7.2	3.79	0	0.00
12	4	239.0	235	12	3365	2.67	817	239.1	9.42E-01	13.1	3.17	0	7.72
13	4	242.0	235	12	2032	1.52	1021	242.1	1.18E+00	7.5	3.13	0	0.00
14	0	258.8	256	7	2419	3.79	287	259.0	3.30E-01	29.3	2.98	0	0.00
15	0	295.0	291	9	2737	2.11	2390	295.5	2.75E+00	4.5	2.70	0	0.00
16	0	351.7	347	11	2664	2.11	4070	352.7	4.69E+00	3.0	2.40	0	0.00
17	0	511.1	509	12	1817	3.13	1966	513.5	2.27E+00	5.0	1.77	0	0.00
18	0	582.8	581	9	1212	2.33	383	585.8	4.42E-01	17.2	1.60	0	0.00
19	0	609.1	606	12	1467	2.74	3153	612.3	3.63E+00	3.1	1.55	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	768.2	767	10	919	2.84	323	772.9	3.72E-01	18.3	1.28	0	0.00
21	0	911.6	913	11	759	3.00	412	917.6	4.75E-01	14.4	1.11	0	0.00
22	0	933.1	933	16	994	6.00	323	939.3	3.72E-01	23.2	1.08	0	0.00
23	0	968.0	967	16	987	6.09	397	974.6	4.57E-01	18.8	1.05	0	0.00
24	0	1120.1	1121	14	822	3.91	828	1128.2	9.55E-01	8.2	0.926	0	0.00
25	0	1205.8	1212	7	367	2.38	61	1214.8	7.03E-02	55.0	0.868	0	0.00
26	0	1237.8	1243	11	607	4.24	293	1247.1	3.38E-01	17.5	0.848	0	0.00
27	0	1377.5	1382	15	561	5.53	148	1388.3	1.70E-01	36.7	0.764	0	0.00
28	0	1407.4	1416	10	346	2.69	60	1418.5	6.97E-02	62.3	0.748	0	0.00
29	0	1461.1	1465	20	552	4.56	2410	1472.9	2.78E+00	3.2	0.726	0	0.00
30	0	1729.7	1737	16	228	4.61	149	1744.6	1.72E-01	25.3	0.628	0	0.00
	0	1764.3	1769	21	278	4.05	640	1779.6	7.38E-01	7.7	0.616	0	0.00

IM=SQRT(4.65731E+00 + 1.03021E-02 *E)

BACKGROUND INFO 8811 GLS 9 274.981 7 G- 6 BG DATE 272.802 7

****

v--------PEAK---------v			v------BACKGROUND------v			v------NET----v	
F- :GY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
63.03	0.3717	36.89	62.00	0.4705	16.43	-0.0988	159.30R
92.70	0.6657	15.03	92.00	0.8142	13.56	-0.1485	100.32R
186.12	1.9659	7.20	186.00	0.5359	14.33	1.4300	11.26
239.02	0.9419	13.15	238.60	1.4722	15.22	-0.5302	48.29R
295.02	2.7546	4.48	295.20	0.5419	21.04	2.2126	7.59
351.70	4.6910	2.96	351.90	1.1473	14.90	3.5437	6.21
511.11	2.2667	4.98	511.00	2.8009	5.39	-0.5342	35.27R
582.82	0.4417	17.18	583.10	0.7431	18.35	-0.3014	51.78R
609.13	3.6343	3.05	609.30	1.3204	10.29	2.3139	7.58
911.58	0.4752	14.38	911.10	0.5861	9.09	-0.1110	78.11R
968.03	0.4572	18.77	968.90	0.5197	14.70	-0.0625	183.77R
1120.12	0.9546	8.16	1120.30	0.4605	10.34	0.4941	18.48
1237.76	0.3383	17.48	1238.10	0.2108	21.63	0.1274	58.59
1461.11	2.7781	3.24	1461.00	4.3193	9.83	-1.5412	28.16R
1729.74	0.1715	25.30	1729.60	0.1067	20.14	0.0648	74.78
1764.34	0.7377	7.66	1764.50	0.4709	10.40	0.2668	28.04

8 PEAKS REJECTED BY BACKGROUND

****

BACKGROUND INFO 8811 GLS 9 274.981 7 G- 6 BG DATE 272.802 7

****

v--------PEAK---------v			v------BACKGROUND------v			v------NET----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
3.03	0.3717	36.89	62.00	0.4705	16.43	-0.0988	159.30R
92.70	0.6657	15.03	92.00	0.8142	13.56	-0.1485	100.32R
186.12	1.9659	7.20	186.00	0.5359	14.33	1.4300	11.26
239.02	0.9419	13.15	238.60	1.4722	15.22	-0.5302	48.29R
295.02	2.7546	4.48	295.20	0.5419	21.04	2.2126	7.59
351.70	4.6910	2.96	351.90	1.1473	14.90	3.5437	6.21
511.11	2.2667	4.98	511.00	2.8009	5.39	-0.5342	35.27R
582.82	0.4417	17.18	583.10	0.7431	18.35	-0.3014	51.78R
609.13	3.6343	3.05	609.30	1.3204	10.29	2.3139	7.58
911.58	0.4752	14.38	911.10	0.5861	9.09	-0.1110	78.11R
968.03	0.4572	18.77	968.90	0.5197	14.70	-0.0625	183.77R
1120.12	0.9546	8.16	1120.30	0.4605	10.34	0.4941	18.48
1237.76	0.3383	17.48	1238.10	0.2108	21.63	0.1274	58.59
1461.11	2.7781	3.24	1461.00	4.3193	9.83	-1.5412	28.16R
1729.74	0.1715	25.30	1729.60	0.1067	20.14	0.0648	74.78
1764.34	0.7377	7.66	1764.50	0.4709	10.40	0.2668	28.04

8 PEAKS REJECTED BY BACKGROUND

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INTERFERING ISOTOPE ANALYSIS 8811 GLS 9 274.981 7 G- 6

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 9 GLS RUN AT 274.981/2007

BACKGROUND FOR GELI DETECTOR 6 OF 272.802/2007 2641.7 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
92.0	0.4705	16.43	511.0	2.8009	5.39	1120.3	0.4605	10.34
92.0	0.8142	13.56	583.1	0.7431	18.35	1173.2	0.0379	0.00
143.0	0.1882	0.00	609.3	1.3204	10.29	1238.1	0.2108	21.63
186.0	0.5359	14.33	661.6	0.1709	54.18	1332.5	0.0716	0.00
198.0	0.1669	0.00	727.2	0.1836	23.04	1337.7	0.0000	0.00
238.6	1.4722	15.22	846.0	0.0589	0.00	1461.0	4.3193	9.83
279.0	0.1161	0.00	860.4	0.1162	18.50	1586.0	0.0773	0.00
295.2	0.5419	21.04	911.1	0.5861	9.09	1591.0	0.1925	19.95
338.4	0.2527	26.75	968.9	0.5197	14.70	1729.6	0.1067	20.14
351.9	1.1473	14.90	1001.0	0.0936	0.00	1764.5	0.4709	10.40

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 10/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
187.979	7	1.0053	14.210	23.
194.992	7	1.0068	13.351	29.
207.753	7	1.0155	14.364	58.
223.821	7	0.9971	14.563	22.
230.795	7	1.0016	13.550	25.
237.814	7	1.0021	13.672	25.
244.906	7	0.9920	12.742	24.
258	7	0.9774	13.193	24.
.838	7	1.0076	13.473	34.
272.710	7	0.9943	13.548	26.
AVERAGE		0.9999	0.011	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
61.811	7	1.3744	14.949	20.NG
69.906	7	1.3635	14.524	20.
76.810	7	1.3438	13.154	35.
81.696	7	1.3658	13.879	25.
104.028	7	1.3821	15.760	22.
110.905	7	0.9898	14.446	38.*
124.980	7	0.9907	14.749	36.*
133.855	7	0.9852	15.294	24.*
154.043	7	0.9860	15.339	32.*
216.995	7	1.0022	16.665	21.*
AVERAGE		0.9908	0.007	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 272.710 7
ENERGY= 1.733058 + 0.9927092*CH + -1.265534E-06*CH**2
FWHM =SQRT(-2.4382 + 0.016256*ENERGY) (CO60= 4.384)

EFFICIENCIES FOR GEOMETRY JR 6 CALIBRATED 29.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.652300	100.0	5.512700	300.0	2.660400	0.0	0.000000
55.0	5.891700	110.0	5.268400	500.0	1.792700	0.0	0.000000
60.0	6.024200	130.0	4.801100	700.0	1.368100	0.0	0.000000
65.0	6.077200	150.0	4.388400	1000.0	1.012600	0.0	0.000000
70.0	6.072400	170.0	4.034000	1400.0	0.750900		
80.0	5.951400	190.0	3.731100	2000.0	0.541800		
90.0	5.748900	250.0	3.052100	3000.0	0.379700		

8811 9 GLS GSTOR 533

	PK	ENERGY	CPM	%ERR	COMMENT
	1	23.1	0.67	8.3	
	2	25.9	1.05	8.9	
	3	32.4	0.05	99.9	
	4	46.6	1.19	12.6	Pb210s
	5	53.1	0.25	42.3	
	7	72.8	3.18	5.2	
	8	75.1	7.06	2.5	
	9	85.4	3.32	4.9	Cs136
b	11	186.1	1.43	11.3	Cs136 U 235s Ra226s
	13	242.0	1.18	7.5	Ra226 Th228 La140
	14	258.8	0.33	29.3	Ra226 Ag110
b	15	295.0	2.21	7.6	Ra226 Ru103
b	16	351.7	3.54	6.2	Ra226s Pb214s
b	19	609.1	2.31	7.6	Ru103 Ra226s Bi214s
	20	768.2	0.37	18.3	Ra226
	22	933.1	0.37	23.2	Ra226
b	24	1120.1	0.49	18.5	Ra226 Sc 46s
	25	1205.8	0.07	55.0	
b	26	1237.8	0.13	58.6	Ra226
	27	1377.5	0.17	36.7	Ra226 La140c
	28	1407.4	0.07	62.3	Ra226 Cs134+ Eu152s
b	30	1729.7	0.06	74.8	Ra226
b	31	1764.3	0.27	28.0	Ra226
			REJECTED PEAKS		
B	6	63.0	-0.10	99.9	Th232s
B	10	92.7	-0.15	99.9	Th234s Th227s
B	12	239.0	-0.53	48.3	Th228 Pb212s
B	17	511.1	-0.53	35.3	Th228 La140 Ru106 Na 22
B	18	582.8	-0.30	51.8	Th228 Tl208s
B	21	911.6	-0.11	78.1	Th232s Ac228s
B	23	968.0	-0.06	99.9	Ac228 Sb124 Th232s
B	29	1461.1	-1.54	28.2	K 40s

21-Day Gamma Count

Thermo/NUtech Ge(Li) Analysis Report

25-OCT-07 PAGE 1

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
		DN 10.24.07		
021-124-ST-001	00049592	TMA # (GLS) 8811		1
TZERO = 267.719 2007		45.7300 GRAM		Aliquot
K 40	4.818E+00	< 4.818E+00		DET LIM
Co 60	1.672E-01	< 4.566E-01		DET LIM
Cs137	2.025E-01	< 2.025E-01		DET LIM
Eu152	1.429E+00	< 1.429E+00		DET LIM
Eu154	4.987E-01	< 4.987E-01		DET LIM
Tl208	2.075E-01	< 2.075E-01		DET LIM
Pb210	1.798E+01	< 1.798E+01		DET LIM
Bi212	2.396E+00	< 2.396E+00		DET LIM
Pb212	3.218E-01	< 3.218E-01		DET LIM
Bi214	4.415E-01	(5.202 +/- 4.901) E-01		94.2%
Pb214	4.553E-01	(7.031 +/- 4.390) E-01		62.4%
Ra226	4.287E-01	(5.052 +/- 4.760) E-01		94.2%
Ac228	8.842E-01	< 8.842E-01		DET LIM
Th230	3.077E+01	< 3.077E+01		DET LIM
Th232	8.243E-01	< 1.455E+00		DET LIM
Th234	1.174E-01	< 1.173E-01		DET LIM
Pa234m	2.893E+01	< 2.893E+01		DET LIM
U 235	7.339E-01	< 7.339E-01		DET LIM
Am241	7.534E-01	< 7.534E-01		DET LIM
021-233-SL-002S	00049593	TMA # (GLS) 8811		2
TZERO = 268.891 2007		113.0200 GRAM		Aliquot
K 40	2.753E+00	< 2.753E+00		DET LIM
Co 60	1.213E-01	< 1.213E-01		DET LIM
Cs137	1.183E-01	< 1.183E-01		DET LIM
Eu152	9.306E-01	< 9.306E-01		DET LIM
Eu154	3.504E-01	< 3.504E-01		DET LIM
Tl208	1.272E-01	< 1.272E-01		DET LIM
Pb210	1.294E+00	(3.482 +/- 0.932) E+00		26.8%
Bi212	1.479E+00	< 1.479E+00		DET LIM
Pb212	1.818E-01	< 1.818E-01		DET LIM
Bi214	2.205E-01	(3.153 +/- 0.292) E+00		9.3%
Pb214	2.677E-01	(3.625 +/- 0.314) E+00		8.7%
Ra226	2.141E-01	(3.062 +/- 0.284) E+00		9.3%
Ac228	5.227E-01	< 5.227E-01		DET LIM
Th230	6.338E+00	< 6.338E+00		DET LIM
Th232	5.227E-01	< 5.227E-01		DET LIM
Th234	4.092E-02	< 4.092E-02		DET LIM
Pa234m	2.005E+01	< 2.005E+01		DET LIM
U 235	4.032E-01	< 4.032E-01		DET LIM
Am241	1.012E-01	< 1.012E-01		DET LIM

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
021-233-SL-001N	00049594	TMA # (GLS) 8811 3		
TZERO = 268.896 2007		163.7100 GRAM		Aliquot
K 40	4.563E-01	< 8.450E-01		DET LIM
Co 60	5.387E-02	< 5.387E-02		DET LIM
Cs137	4.118E-02	< 4.118E-02		DET LIM
Eu152	3.126E-01	< 3.126E-01		DET LIM
Eu154	1.382E-01	< 1.382E-01		DET LIM
Tl208	4.777E-02	< 4.777E-02		DET LIM
Pb210	8.373E-01	(1.957 +/- 0.643) E+00		32.8%
Bi212	5.479E-01	< 5.479E-01		DET LIM
Pb212	8.911E-02	< 8.911E-02		DET LIM
Bi214	9.230E-02	(2.028 +/- 0.137) E+00		6.7%
Pb214	1.056E-01	(2.383 +/- 0.138) E+00		5.8%
Ra226	8.963E-02	(1.969 +/- 0.133) E+00		6.7%
Ac228	2.106E-01	< 2.106E-01		DET LIM
Th230	3.902E+00	< 3.902E+00		DET LIM
Th232	1.691E-01	(2.412 +/- 1.673) E-01		69.4%
Th234	2.354E-02	< 2.354E-02		DET LIM
Pa234m	7.161E+00	< 7.160E+00		DET LIM
U 235	1.879E-01	< 1.879E-01		DET LIM
Am241	5.734E-02	< 5.734E-02		DET LIM
021-121-SL-005	00049595	TMA # (GLS) 8811 4		
TZERO = 269.649 2007		44.6000 GRAM		Aliquot
K 40	1.486E+00	(1.839 +/- 1.632) E+00		88.8%
Co 60	1.660E-01	< 1.660E-01		DET LIM
Cs137	1.636E-01	< 1.636E-01		DET LIM
Eu152	1.052E+00	< 1.053E+00		DET LIM
Eu154	4.422E-01	< 4.423E-01		DET LIM
Tl208	1.771E-01	< 2.087E-01		DET LIM
Pb210	2.127E+00	(3.386 +/- 1.504) E+00		44.4%
Bi212	2.233E+00	< 2.233E+00		DET LIM
Pb212	2.799E-01	< 3.200E-01		DET LIM
Bi214	3.612E-01	< 3.612E-01		DET LIM
Pb214	3.708E-01	< 5.065E-01		DET LIM
Ra226	3.507E-01	< 3.507E-01		DET LIM
Ac228	6.816E-01	< 6.816E-01		DET LIM
Th230	1.613E+01	< 1.613E+01		DET LIM
Th232	6.816E-01	< 6.816E-01		DET LIM
Th234	2.360E-01	< 2.360E-01		DET LIM
Pa234m	2.461E+01	< 1.112E+02		DET LIM
U 235	8.313E-01	< 1.092E+00		DET LIM
Am241	2.316E-01	< 2.316E-01		DET LIM

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
8:45 26-SEP-07	00049596	TMA # (GLS) 8811		5
TZERO = 268.657 2007		38.0700 GRAM		Aliquot
K 40	1.565E+00	(2.950 +/- 2.508) E+00		85.0%
Co 60	1.970E-01	< 1.970E-01		DET LIM
Cs137	1.866E-01	< 1.866E-01		DET LIM
Eu152	1.392E+00	< 1.393E+00		DET LIM
Eu154	4.761E-01	< 4.761E-01		DET LIM
Tl208	1.827E-01	< 1.827E-01		DET LIM
Pb210	1.548E+01	< 1.548E+01		DET LIM
Bi212	2.510E+00	< 2.510E+00		DET LIM
Pb212	2.731E-01	< 2.731E-01		DET LIM
Bi214	3.823E-01	< 3.823E-01		DET LIM
Pb214	3.618E-01	< 3.618E-01		DET LIM
Ra226	3.713E-01	< 3.713E-01		DET LIM
Ac228	7.994E-01	< 7.994E-01		DET LIM
Th230	2.774E+01	< 2.774E+01		DET LIM
Th232	7.994E-01	< 7.994E-01		DET LIM
Th234	1.142E-01	< 1.142E-01		DET LIM
Pa234m	2.893E+01	< 2.893E+01		DET LIM
U 235	7.297E-01	< 7.297E-01		DET LIM
Am241	6.669E-01	< 6.669E-01		DET LIM
021-344-CL-001	00049597	TMA # (GLS) 8811		6
TZERO = 269.941 2007		61.4400 GRAM		Aliquot
K 40	5.743E+00	< 5.743E+00		DET LIM
Co 60	2.555E-01	< 2.555E-01		DET LIM
Cs137	2.252E-01	< 2.252E-01		DET LIM
Eu152	1.741E+00	< 1.741E+00		DET LIM
Eu154	6.545E-01	< 6.545E-01		DET LIM
Tl208	2.517E-01	< 2.517E-01		DET LIM
Pb210	2.818E+00	(6.874 +/- 2.239) E+00		32.6%
Bi212	2.961E+00	< 2.961E+00		DET LIM
Pb212	3.843E-01	< 3.843E-01		DET LIM
Bi214	5.183E-01	< 5.183E-01		DET LIM
Pb214	5.185E-01	< 5.185E-01		DET LIM
Ra226	5.034E-01	< 5.034E-01		DET LIM
Ac228	1.046E+00	< 1.046E+00		DET LIM
Th230	1.269E+01	< 1.269E+01		DET LIM
Th232	1.046E+00	< 1.046E+00		DET LIM
Th234	8.408E-02	< 8.408E-02		DET LIM
Pa234m	4.119E+01	< 4.119E+01		DET LIM
U 235	7.754E-01	< 7.754E-01		DET LIM
Am241	1.940E-01	< 1.940E-01		DET LIM

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
QC-LCS #62969	00049598	TMA # (GLS) 8811 7		
TZERO = 297.863 2007		1.0000 SMPL Aliquot		
K 40	9.304E+01	< 9.304E+01		DET LIM
Co 60	9.266E+00	(5.103 +/- 0.275) E+02		5.4%
Cs137	1.430E+01	(5.275 +/- 0.238) E+02		4.5%
Eu152	1.119E+02	< 1.119E+02		DET LIM
Eu154	2.456E+01	< 2.456E+01		DET LIM
Tl208	1.147E+01	< 1.147E+01		DET LIM
Pb210	2.005E+02	< 2.005E+02		DET LIM
Bi212	1.541E+02	< 1.541E+02		DET LIM
Pb212	1.720E+01	< 1.720E+01		DET LIM
Bi214	2.381E+01	< 4.645E+01		DET LIM
Pb214	2.507E+01	< 3.744E+01		DET LIM
Ra226	2.312E+01	< 4.511E+01		DET LIM
Ac228	6.165E+01	< 6.164E+01		DET LIM
Th230	7.132E+02	< 7.132E+02		DET LIM
Th232	6.165E+01	< 6.164E+01		DET LIM
Th234	4.477E+00	< 4.477E+00		DET LIM
Pa234m	2.308E+03	< 2.308E+03		DET LIM
U 235	3.313E+01	< 3.313E+01		DET LIM
Am241	1.936E+01	(5.407 +/- 0.213) E+02		3.9%
QC-BLANK #62970	00049599	TMA # (GLS) 8811 8		
TZERO = 297.863 2007		1.0000 SMPL Aliquot		
K 40	2.779E+02	< 2.779E+02		DET LIM
Co 60	9.527E+00	< 1.490E+01		DET LIM
Cs137	1.137E+01	< 1.626E+01		DET LIM
Eu152	8.268E+01	< 8.268E+01		DET LIM
Eu154	3.013E+01	< 3.013E+01		DET LIM
Tl208	1.226E+01	< 1.226E+01		DET LIM
Pb210	1.050E+03	< 1.050E+03		DET LIM
Bi212	1.405E+02	< 1.405E+02		DET LIM
Pb212	2.060E+01	< 3.129E+01		DET LIM
Bi214	2.532E+01	< 2.532E+01		DET LIM
Pb214	2.510E+01	< 3.491E+01		DET LIM
Ra226	2.458E+01	< 2.458E+01		DET LIM
Ac228	4.681E+01	< 4.681E+01		DET LIM
Th230	1.971E+03	< 1.971E+03		DET LIM
Th232	4.681E+01	< 4.681E+01		DET LIM
Th234	6.997E+00	< 6.997E+00		DET LIM
Pa234m	1.667E+03	< 1.667E+03		DET LIM
U 235	4.808E+01	< 4.808E+01		DET LIM
Am241	4.518E+01	< 4.518E+01		DET LIM

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
QC-DUP#3 62971	00049600	TMA # (GLS) 8811 9		
TZERO = 268.896 2007		163.7100 GRAM		Aliquot
K 40	7.970E-01	< 7.970E-01		DET LIM
Co 60	5.944E-02	< 5.944E-02		DET LIM
Cs137	6.113E-02	< 6.113E-02		DET LIM
Eu152	5.398E-01	< 5.398E-01		DET LIM
Eu154	1.852E-01	< 1.851E-01		DET LIM
T1208	5.057E-02	< 5.906E-02		DET LIM
Pb210	7.599E-01	(2.148 +/- 0.606) E+00		28.2%
Bi212	8.725E-01	< 8.725E-01		DET LIM
Pb212	8.802E-02	(1.064 +/- 0.688) E-01		64.7%
Bi214	1.360E-01	(2.076 +/- 0.180) E+00		8.7%
Pb214	1.585E-01	(2.585 +/- 0.188) E+00		7.3%
Ra226	1.321E-01	(2.016 +/- 0.175) E+00		8.7%
Ac228	2.739E-01	< 2.739E-01		DET LIM
Th230	5.506E+00	< 5.506E+00		DET LIM
Th232	2.739E-01	< 2.739E-01		DET LIM
Th234	3.549E-02	< 3.549E-02		DET LIM
Pa234m	9.778E+00	< 9.777E+00		DET LIM
U 235	2.727E-01	< 2.727E-01		DET LIM
Am241	6.574E-02	< 6.574E-02		DET LIM

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

GLS 8811-7
LCS
62969
PASS

Sample Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (SMPL)	Yield
7	LCS				297.863-07	JR	1	1

Analytical Results

Sample No.	QA Type	Analyte	Result (PCI/SMPL)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/SMPL)
7	LCS	Am241	5.407E+02	2.130E+01	3.9	1.936E+01
7	LCS	Co 60	5.103E+02	2.750E+01	5.4	9.266E+00
7	LCS	Cs137	5.275E+02	2.380E+01	4.5	1.430E+01

Standard Info

Nuclide	Half Life (days)	Standard Id	Qty (ml)	Activity (dpm/mL)	Reference Date	Decay Date	Added (PCI)	Added Error (%)
AM-241	157900	R1	0.5	2249	353.708-2005	297.863-07	5.050E+02	4
CO-60	1925	K1-F-(04)	0.6	9340	001.708-1995	297.863-07	4.682E+02	4
CS-137	11020	Q1-A-(04)	0.5	2200	353.708-2005	297.863-07	4.749E+02	4

Evaluation Results

Analyte	F/A Ratio	Ratio Error (%)	LCL	LWL	UWL	UCL	Status	Flag
Co 60	1.090	7	0.79	0.86	1.14	1.21	PASS	
Cs137	1.111	6	0.80	0.87	1.13	1.20	PASS	
Am241	1.071	6	0.75	0.83	1.17	1.25	PASS	

10-25-07

62969

QA Evaluation Report
Eberline Services, Inc. Richmond, CA
QA Evaluation V 1.03

GLS 8811-8
BLANK
62970
PASS

Planchet Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (SMPL)	Yield
8	BLANK				297.863-07	JR	1	1

Analytical Results

Sample No.	QA Type	Analyte	Result (PCI/SMPL)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/SMPL)
8	BLANK	Cs137	< 1.626E+01			1.137E+01

Evaluation Results

Analyte	Result (PCI/SMPL)	MDA (PCI/SMPL)	Status	Flag
Cs137	< 1.626E+01	1.137E+01	PASS	

BW 10.25.07

62970

Planchet Info

Sample No.	QA Type	Reference Date	Separation Date #1	Separation Date #2	Count Date	Geometry	Aliquot (GRAM)	Yield
9	DUP	268.896-7			297.863-07	JR	163.71	1
3	ORIGINAL	268.896-7			297.656-07	JR	163.71	1

Analysis Results

Sample No.	QA Type	Analyte	Result (PCI/GRAM)	Actual Error (2s)	Percent Error (2s)	MDA (PCI/GRAM)
9	DUP	Pb214	2.585E+00	1.880E-01	7.3	1.585E-01
3	ORIGINAL	Pb214	2.383E+00	1.380E-01	5.8	1.056E-01

Evaluation Results

Analyte	Result (PCI/GRAM)	MDA (PCI/GRAM)	UCL	RPD	RER	Criterion	Status	Flag
Pb214	2.585E+00	1.585E-01	20.00	8			PASS	

BW 10/25-07

62971

1-9 w/27

8811 GLS 1 G-8 JR 297.654 7 295.97 MIN 45.73000 GR 672

LIBR=TTIH REF TIME= 267.719 7 100ML IN PARKWAY JAR

Gn 10.24.07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G	
**** (1460.85)	0.110000	0.00870	0.468	4.891E+02 s	<r	4.818E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 7.807E-01	3G	
**** (889.26)	1.000000	0.01312	0.209	1.596E+01 s	<	2.014E-01
**** (1120.52)	1.000000	0.01092	0.251	2.302E+01 s	<r	2.904E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.893E-01	4G	
1174 (1173.21)	0.999200	0.01051	0.116	1.105E+01 s	73.04%	1.101E-01
1333 (1332.48)	1.000000	0.00943	0.293	3.111E+01 s	28.72%	3.098E-01
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 7.084E-01	16G	
**** (1691.00)	0.457000	0.00763	0.123	3.518E+01 s	<	4.891E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.981E-01	3G	
**** (661.64)	0.851000	0.01635	0.285	2.052E+01 s	<r	2.025E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.957E-01	48G	
**** (121.78)	0.254000	0.04555	0.406	3.508E+01 s	<	3.470E-01
**** (344.31)	0.245000	0.02585	0.330	5.207E+01 s	<	5.151E-01
**** (963.36)	0.132000	0.01234	0.235	1.445E+02 s	<	1.429E+00
**** (1112.04)	0.124000	0.01099	0.220	1.615E+02 s	<	1.598E+00
1408 (1408.02)	0.198000	0.00899	0.132	7.426E+01 s	62.60%	7.346E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.933E-01	48G	
**** (123.07)	0.390000	0.04559	0.410	2.306E+01 s	<	2.286E-01
**** (723.26)	0.202000	0.01534	0.234	7.561E+01 s	<	7.498E-01
**** (1004.75)	0.170000	0.01194	0.209	1.027E+02 s	<	1.019E+00
**** (1274.49)	0.336000	0.00980	0.166	5.030E+01 s	<	4.987E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 7.555E-01	22G	
**** (316.50)	0.830700	0.02768	0.351	1.525E+01 s	<	1.988E-01
**** (468.06)	0.476000	0.02081	0.309	3.118E+01 s	<	4.066E-01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G	
**** (583.14)	0.860000	0.01788	0.324	2.107E+01 s	<r	2.075E-01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G	
**** (46.50)	0.040000	0.00599	0.438	1.826E+03 s	<	1.798E+01
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G	
**** (727.17)	0.066500	0.01527	0.247	2.432E+02 s	<	2.396E+00
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G	
**** (238.63)	0.431000	0.03495	0.492	3.267E+01 s	<r	3.218E-01
i214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G	
609 (609.30)	0.470000	0.01732	0.430	5.281E+01 s	47.11%	5.202E-01
1408 (1408.00)	0.025000	0.00899	0.132	5.881E+02	62.60%	5.793E+00
1661 (1661.00)	0.012000	0.00775	0.114	1.227E+03	52.77%	1.209E+01
1765 (1764.00)	0.170000	0.00734	0.086	6.917E+01	83.04%	6.813E-01

Pb214	1.633E+12 DAYS	LAMBDA= 4.245E-13		DECAY= 1.000E+00 23G			
242	(241.90)	0.076000	0.03466	0.645	2.447E+02	25.87%	2.410E+00
352	(352.00)	0.360000	0.02540	0.653	7.138E+01	s31.21%	7.032E-01
a226	5.851E+05 DAYS	LAMBDA= 1.185E-06		DECAY= 1.000E+00 48G			
186	(186.10)	0.040000	0.04006	0.332	2.073E+02	s71.01%	2.042E+00
242	(242.00)	0.078000	0.03465	0.645	2.385E+02	25.87%	2.349E+00
352	(351.96)	0.393000	0.02541	0.653	6.538E+01	s31.21%	6.441E-01
609	(609.32)	0.484000	0.01732	0.430	5.129E+01	s47.11%	5.052E-01
1408	(1408.00)	0.026000	0.00899	0.132	5.655E+02	62.60%	5.570E+00
1661	(1661.20)	0.012100	0.00775	0.114	1.217E+03	52.77%	1.199E+01
1765	(1764.50)	0.166000	0.00734	0.086	7.085E+01	83.04%	6.979E-01
Th227	7.951E+03 DAYS	LAMBDA= 8.718E-05		DECAY= 9.974E-01 48G			
****	(49.80)	0.087000	0.00736	0.424	6.618E+02	s	< 6.536E+00
****	(79.70)	0.018000	0.03292	0.446	7.525E+02	s	< 7.432E+00
****	(94.00)	0.013500	0.04048	0.499	9.126E+02	s	<r 9.013E+00
****	(210.60)	0.012600	0.03749	0.455	9.641E+02	s	< 9.521E+00
****	(236.00)	0.115000	0.03519	0.474	1.172E+02	s	< 1.158E+00
****	(254.70)	0.009100	0.03346	0.398	1.308E+03	s	< 1.292E+01
****	(256.20)	0.063000	0.03331	0.390	1.860E+02	s	< 1.837E+00
****	(285.60)	0.016500	0.03034	0.362	7.232E+02	s	< 7.142E+00
****	(300.00)	0.018900	0.02895	0.385	7.032E+02	s	< 6.945E+00
****	(304.40)	0.013500	0.02860	0.352	9.112E+02	s	< 8.999E+00
****	(329.90)	0.029000	0.02675	0.368	4.743E+02	s	< 4.684E+00
****	(334.40)	0.011500	0.02646	0.347	1.142E+03	s	< 1.128E+01
Ac228	5.133E+12 DAYS	LAMBDA= 1.350E-13		DECAY= 1.000E+00 41G			
****	(911.10)	0.250000	0.01288	0.289	8.977E+01	s	< 8.842E-01
a230	2.812E+07 DAYS	LAMBDA= 2.465E-08		DECAY= 1.000E+00 8G			
****	(68.00)	0.005900	0.02362	0.435	3.124E+03	s	< 3.077E+01
Th232	5.113E+12 DAYS	LAMBDA= 1.356E-13		DECAY= 1.000E+00 42G			
912	(911.10)	0.250000	0.01288	0.233	7.226E+01	s63.28%	7.118E-01
****	(968.90)	0.150000	0.01229	0.242	1.315E+02	s	< 1.295E+00
****	(63.81)	0.010101	0.01977	0.459	2.297E+03	s	< 2.262E+01
Th234	1.633E+12 DAYS	LAMBDA= 4.245E-13		DECAY= 1.000E+00 10G			
****	(92.30)	0.999999	0.03980	0.474	1.191E+01	s	<r 1.173E-01
Pa234m	1.633E+12 DAYS	LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G			
****	(1001.03)	0.006000	0.01198	0.211	2.937E+03	s	< 2.893E+01
U 235	2.571E+11 DAYS	LAMBDA= 2.696E-12		DECAY= 1.000E+00 34G			
85	(84.24)	0.051000	0.03580	0.993	5.438E+02	19.10%	5.357E+00
****	(143.78)	0.132600	0.04479	0.443	7.450E+01	s	< 7.339E-01
186	(185.72)	0.540000	0.04011	0.332	1.534E+01	s71.01%	1.511E-01
242	(240.93)	0.000700	0.03475	0.645	2.650E+04	25.87%	2.610E+02
Am241	1.582E+05 DAYS	LAMBDA= 4.381E-06		DECAY= 9.999E-01 41G			
****	(59.54)	0.359000	0.01576	0.433	7.647E+01	s	< 7.534E-01

8811 GLS 1 G-8 JR 297.654 7 295.97 MIN 45.73000 GR 672

IBR=TTIH REF TIME= 267.719 7 100ML IN PARKWAY JAR

Group	8811	Time of count	297.654 2007
Sample	1	Reference GMT	267.719 2007
Element		Elapsed Live Tm	295.9667
Type code	GLS	Dead Time Pct	0.028148
ID	021-124-ST-001	Background GMT	293.842 2007
Geometry, detector	JR-8	Standard GMT	296.660 2007
Aliquot	45.73	Days since TO	29.93543
Unit of Aliquot	GRAM	Time on	8:41 PDT 24-OCT
Data Sheet Units	PCI /GRAM	Time off	13:38 PDT 24-OCT
Library	TTIH	Calc Time	13:20 24-OCT-07
Slope	0.981682	Width slope	0.006348
Intercept	0.265868	Width offset	1.937622
X**2 TERM	-0.13233024E-05	Sensitivity	4.

NP: [7,67]672.GSP 26 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	25.3	24	11	83	2.39	454	25.5	1.53E+00	5.00	.129	0	34.60
2	5	29.6	24	11	850	2.79	307	29.8	1.04E+00	17.90	.207	0	0.00
3	0	74.5	70	12	1678	3.78	1222	75.6	4.13E+00	7.4	2.86	0	0.00
4	0	85.5	84	7	1011	2.13	294	86.8	9.93E-01	19.1	3.61	0	0.00
5	0	92.7	91	7	952	1.97	202	94.2	6.82E-01	26.9	3.97	0	0.00
6	0	185.7	184	10	1281	1.93	257	189.0	8.67E-01	26.6	4.01	0	0.00
7	5	238.9	237	14	509	1.74	294	243.2	9.93E-01	13.2	3.49	0	0.78
8	5	242.4	237	14	667	2.38	191	246.8	6.45E-01	25.9	3.46	0	0.00
9	0	295.1	296	9	859	1.86	115	300.4	3.90E-01	47.9	2.94	0	0.00
10	0	352.5	355	10	690	1.97	377	359.0	1.27E+00	14.1	2.63	0	0.00
11	0	511.2	515	13	613	2.91	632	520.9	2.14E+00	9.1	1.97	0	0.00
12	0	584.0	591	9	330	1.95	144	595.1	4.88E-01	24.4	1.81	0	0.00
13	0	609.2	615	12	510	1.94	374	620.9	1.26E+00	12.8	1.75	0	0.00
14	0	661.4	671	8	262	2.03	82	674.1	2.76E-01	36.4	1.65	0	0.00
15	0	911.7	922	15	272	2.80	217	929.6	7.32E-01	18.4	1.30	0	0.00
16	0	967.0	980	13	264	6.40	106	986.0	3.57E-01	32.4	1.24	0	0.00
17	0	1121.1	1140	10	132	3.33	137	1143.5	4.63E-01	19.6	1.10	0	0.00
18	0	1174.1	1194	9	154	1.54	60	1197.6	2.03E-01	40.6	1.06	0	0.00
19	0	1333.0	1354	13	89	2.36	112	1360.1	3.78E-01	21.10	.948	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1378.2	1403	8	71	1.46	35	1406.3	1.17E-01	49.20	.918	0	0.00
21	0	1407.8	1430	12	111	1.29	39	1436.6	1.32E-01	62.60	.900	0	0.00
22	0	1461.6	1483	18	71	3.40	848	1491.6	2.86E+00	4.50	.875	0	0.00
23	0	1615.8	1643	10	38	2.84	23	1649.3	7.92E-02	62.90	.806	0	0.00
24	0	1661.3	1692	15	59	3.30	34	1695.9	1.14E-01	52.80	.786	0	0.00
25	0	1764.8	1796	11	41	3.05	134	1801.9	4.53E-01	13.80	.744	0	0.00
26	0	1873.9	1909	13	37	6.40	27	1913.5	9.16E-02	53.70	.702	0	0.00

FWHM=SQRT(4.37495E+00 + 5.55848E-03 *E)

BACKGROUND INFO 8811 GLS 1 297.654 7 G- 8 BG DATE 293.842 7

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
92.69	0.6818	26.94	92.00	0.6490	12.08	0.0328	608.21R
185.74	0.8669	26.65	179		3.88	0.3322	71.01

238.93	0.9935	13.20	238.50	0.8294	17.05	0.1640	117.55R
295.05	0.3901	47.95	295.20	0.3006	21.09	0.0895	220.75R
352.47	1.2748	14.13	351.90	0.6220	15.32	0.6528	31.21
511.25	2.1362	9.11	511.00	2.6304	3.55	-0.4942	43.65R
584.01	0.4876	24.38	583.10	0.5114	17.64	-0.0237	629.06R
609.24	1.2637	12.84	609.30	0.8336	14.55	0.4301	47.11
661.42	0.2758	36.42	661.60	0.2809	18.55	-0.0051	******R
911.70	0.7319	18.38	911.10	0.4992	11.98	0.2327	63.28
966.95	0.3566	32.45	968.90	0.3292	25.73	0.0274	524.02R
1121.11	0.4629	19.57	1120.30	0.3527	12.70	0.1102	91.74R
1174.08	0.2025	40.65	1173.20	0.0865	23.36	0.1161	73.04
1333.05	0.3784	21.13	1332.50	0.0850	31.28	0.2934	28.72
1378.19	0.1170	49.19	1377.70	0.0911	24.91	0.0259	239.09R
1461.63	2.8649	4.55	1460.80	3.1818	9.03	-0.3169	99.58R
1764.83	0.4530	13.78	1764.50	0.3667	9.63	0.0864	83.04

10 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 8811 GLS 1 297.654 7 G- 8

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 1 GLS RUN AT 297.654/2007

BACKGROUND FOR GELI DETECTOR 8 OF 293.842/2007 2563.2 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.1894	26.82	511.0	2.6304	3.55	1173.2	0.0865	23.36
92.0	0.6490	12.08	583.1	0.5114	17.64	1238.1	0.1429	27.44
143.0	0.1599	0.00	609.3	0.8336	14.55	1332.5	0.0850	31.28
186.0	0.5348	8.88	661.6	0.2809	18.55	1377.7	0.0911	24.91
198.0	0.1406	36.78	727.2	0.1464	25.76	1460.8	3.1818	9.03
238.5	0.8294	17.05	860.0	0.0834	16.18	1586.0	0.1222	0.00
279.0	0.1577	0.00	911.1	0.4992	11.98	1591.0	0.1235	37.00
295.2	0.3006	21.09	968.9	0.3292	25.73	1729.6	0.0765	28.64
338.4	0.2006	33.75	1001.0	0.0552	17.04	1764.5	0.3667	9.63
351.9	0.6220	15.32	1120.3	0.3527	12.70	0.0	0.0000	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 8 ON 10/24/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
322.789	5	0.8727	17.160	43.*
322.825	5	0.8755	17.370	41.*
352.103	5	0.8703	18.548	21.*
355.939	5	0.8663	19.048	20.*
58.691	6	0.9079	17.307	83.*
312.732	6	0.8798	18.209	22.*
146.689	7	0.9437	22.807	27.
153.871	7	0.9404	23.280	21.
72.776	7	1.0035	20.890	19.
296.660	7	1.0166	22.559	17.
AVERAGE		0.9761	0.040	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
230.814	7	1.0609	16.105	21.
235.924	7	1.0859	16.521	23.
237.814	7	1.0688	16.230	26.
244.906	7	1.0631	16.854	25.
258.758	7	1.0718	16.115	25.
265.894	7	1.0763	16.178	23.
272.710	7	1.1426	21.341	27. NG
279.758	7	1.0651	17.056	22. NG
286.721	7	1.0649	16.828	28.
293.712	7	1.0683	16.355	22.
AVERAGE		1.0694	0.008	

CALIBRATION LINE FROM STANDARD FOR G- 8 OF 296.660 7
ENERGY= 0.265868 + 0.9816827*CH + -1.323302E-06*CH**2
FWHM =SQRT(1.9376 + 0.006348*ENERGY) (CO60= 3.224)

EFFICIENCIES FOR GEOMETRY JR 8 CALIBRATED 155.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.745100	100.0	4.245900	300.0	2.895100	0.0	0.000000
55.0	1.159800	110.0	4.454100	500.0	1.999200	0.0	0.000000
60.0	1.619100	130.0	4.554100	700.0	1.571400	0.0	0.000000
65.0	2.087900	150.0	4.421700	1000.0	1.198900	0.0	0.000000
70.0	2.537700	170.0	4.201800	1400.0	0.903800		
80.0	3.312100	190.0	3.958600	2000.0	0.656700		
90.0	3.878100	250.0	3.393800	3000.0	0.478800		

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*****************************************************************************
8811    1          GLS                                    GSTOR 672
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    PK   ENERGY     CPM  %ERR       COMMENT
     1    25.3     1.53   5.0 NO GEN.........................................
     2    29.6     1.04  17.9 .........................................
     3    74.5     4.13   7.4 .........................................
     4    85.5     0.99  19.1 ........................................ Cs136
b    6   185.7     0.33  71.0 ........................ Cs137c U 235s Ra226s
     8   242.4     0.64  25.9 Ra226 Th228 ............................ La140
b   10   352.5     0.65  31.2 ................................ Ra226s Pb214s
b   13   609.2     0.43  47.1 ............................ Ru103 Ra226s Bi214s
b   15   911.7     0.23  63.3 ................................ Th232s Ac228s
b   18  1174.1     0.12  73.0 ................................ Cs134+ Co 60s
b   19  1333.0     0.29  28.7 ................................ Ag110 Co 60s
    21  1407.8     0.13  62.6 Ra226 NO GEN.................... Cs134+ Eu152s
    23  1615.8     0.08  62.9 .........................................
    24  1661.3     0.11  52.8 Ra226 ..................................
b   25  1764.8     0.09  83.0 Ra226 ..................................
    26  1873.9     0.09  53.7 .........................................
                     REJECTED PEAKS
B    5    92.7     0.03  99.9 ................................ Th234s Th227s
B    7   238.9     0.16  99.9 Th228 ................................ Pb212s
B    9   295.1     0.09  99.9 Ra226 ................................ Ru103
B   11   511.2    -0.49  43.7 Th228 ........................ La140 Ru106 Na 22
B   12   584.0    -0.02  99.9 Th228 ................................ Tl208s
B   14   661.4    -0.01  99.9 ........................................ Cs137s
B   16   967.0     0.03  99.9 ........................................ Sb124
    17  1121.1     0.11  91.7 Ra226 ................................ Sc 46s
    20  1378.2     0.03  99.9 Ra226 ..................................
    22  1461.6    -0.32  99.6 ........................................ K  40s
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8811 GLS 2 G-6 JR 297.654 7 295.95 MIN 113.02000 GR 670

IBR=TTIH REF TIME= 268.891 7 100 mLs in JAR

BW 10.24.07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00722	0.549	6.908E+02 s		<T	2.753E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 7.883E-01	3G		
**** (889.26)	1.000000	0.01119	0.304	2.717E+01 s		<	1.374E-01
1120 (1120.52)	1.000000	0.00916	1.219	1.331E+02 s	12.32%		6.729E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.897E-01	4G		
**** (1173.21)	0.999200	0.00879	0.288	3.276E+01 s		<	1.319E-01
**** (1332.48)	1.000000	0.00785	0.236	3.013E+01 s		<	1.213E-01
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 7.181E-01	16G		
**** (1691.00)	0.457000	0.00631	0.162	5.609E+01 s		<	3.113E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.982E-01	3G		
**** (661.64)	0.851000	0.01431	0.361	2.962E+01 s		<	1.183E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.959E-01	48G		
*** (121.78)	0.254000	0.04988	0.592	4.671E+01 s		<	1.870E-01
295 (295.97)	0.004000	0.02688	5.176	4.815E+04	5.83%		1.927E+02
**** (344.31)	0.245000	0.02391	0.461	7.863E+01 s		<	3.147E-01
768 (768.90)	0.000800	0.01265	0.623	6.155E+04	23.58%		2.463E+02
**** (963.36)	0.132000	0.01045	0.321	2.325E+02 s		<	9.306E-01
**** (1112.04)	0.124000	0.00922	0.303	2.653E+02 s		<	1.062E+00
**** (1408.02)	0.198000	0.00747	0.244	1.649E+02 s		<	6.600E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.936E-01	48G		
**** (123.07)	0.390000	0.04958	0.589	3.048E+01 s		<	1.222E-01
**** (723.26)	0.202000	0.01331	0.337	1.253E+02 s		<	5.027E-01
**** (1004.75)	0.170000	0.01008	0.295	1.719E+02 s		<	6.897E-01
**** (1274.49)	0.336000	0.00816	0.240	8.736E+01 s		<	3.504E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 7.639E-01	22G		
295 (295.95)	0.290900	0.02688	5.181	6.626E+02	5.83%		3.457E+00
**** (316.50)	0.830700	0.02553	0.485	2.285E+01 s		<	1.192E-01
**** (468.06)	0.476000	0.01885	0.370	4.123E+01 s		<	2.151E-01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
**** (583.14)	0.860000	0.01583	0.435	3.193E+01 s		<T	1.272E-01
1281 (1282.70)	0.000500	0.00812	0.263	6.481E+04	32.45%		2.583E+02
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
47 (46.50)	0.040000	0.04546	1.589	8.736E+02 s	13.38%		3.482E+00
T1212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
295 (295.10)	0.000240	0.02694	5.176	8.007E+05	5.83%		3.191E+03
**** (727.17)	0.066500	0.01325	0.327	3.711E+02 s		<	1.479E+00
786 (785.42)	0.011200	0.01242	0.250	1.800E+03	46.24%		7.175E+00
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
**** (238.63)	0.431000	0.03160	0.421	4.562E+01 s		<T	1.818E-01

Bi214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G			
609	(609.30)	0.470000	0.01529	5.684	7.911E+02	s	4.63%	3.153E+00
768	(768.70)	0.050000	0.01265	0.623	9.846E+02		23.58%	3.924E+00
786	(787.10)	0.012000	0.01240	0.250	1.683E+03		46.24%	6.709E+00
806	(806.30)	0.015000	0.01215	0.252	1.381E+03		38.34%	5.505E+00
934	(934.80)	0.030000	0.01072	0.651	2.023E+03		27.44%	8.063E+00
1120	(1120.40)	0.170000	0.00916	1.218	7.822E+02		12.32%	3.117E+00
1239	(1238.30)	0.060000	0.00838	0.853	1.698E+03		26.23%	6.766E+00
1281	(1281.30)	0.017000	0.00813	0.263	1.904E+03		32.45%	7.589E+00
1380	(1379.00)	0.050000	0.00761	0.388	1.020E+03		40.66%	4.064E+00
1509	(1509.00)	0.020000	0.00701	0.400	2.857E+03		28.38%	1.139E+01
1764	(1764.00)	0.170000	0.00607	1.117	1.082E+03		10.34%	4.313E+00
Pb214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 23G			
242	(241.90)	0.076000	0.03128	2.383	1.002E+03		8.82%	3.996E+00
295	(295.20)	0.190000	0.02693	5.176	1.012E+03		5.83%	4.032E+00
352	(352.00)	0.360000	0.02351	7.696	9.094E+02	s	4.33%	3.625E+00
768	(768.40)	0.000800	0.01265	0.623	6.152E+04		23.58%	2.452E+02
786	(785.90)	0.008600	0.01242	0.250	2.346E+03		46.24%	9.349E+00
Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00 48G			
186	(186.10)	0.040000	0.03787	1.222	8.065E+02	s	23.29%	3.215E+00
242	(242.00)	0.078000	0.03127	2.383	9.771E+02		8.82%	3.894E+00
295	(295.20)	0.201000	0.02693	5.176	9.562E+02		5.83%	3.811E+00
352	(351.96)	0.393000	0.02351	7.696	8.330E+02	s	4.33%	3.320E+00
609	(609.32)	0.484000	0.01529	5.684	7.683E+02	s	4.63%	3.062E+00
768	(768.40)	0.053200	0.01265	0.623	9.251E+02		23.58%	3.687E+00
786	(785.80)	0.012100	0.01242	0.250	1.667E+03		46.24%	6.644E+00
806	(806.20)	0.013100	0.01215	0.252	1.581E+03		38.34%	6.303E+00
934	(934.10)	0.033400	0.01073	0.651	1.816E+03		27.44%	7.238E+00
.20	(1120.30)	0.160000	0.00916	1.218	8.310E+02		12.32%	3.312E+00
1239	(1238.10)	0.062000	0.00838	0.853	1.643E+03		26.23%	6.547E+00
1281	(1281.00)	0.015600	0.00813	0.263	2.075E+03		32.45%	8.269E+00
1509	(1509.20)	0.023000	0.00701	0.400	2.484E+03		28.38%	9.902E+00
1730	(1729.60)	0.030700	0.00618	0.399	2.103E+03		25.08%	8.382E+00
1764	(1764.50)	0.166000	0.00607	1.117	1.109E+03		10.34%	4.418E+00
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 9.975E-01 48G			
****	(49.80)	0.087000	0.05585	0.491	1.010E+02	s	<	4.035E-01
****	(79.70)	0.018000	0.05957	0.622	5.802E+02	s	<	2.318E+00
****	(94.00)	0.013500	0.05657	0.619	8.103E+02	s	<r	3.238E+00
****	(210.60)	0.012600	0.03464	0.590	1.353E+03	s	<	5.404E+00
****	(236.00)	0.115000	0.03186	0.603	1.646E+02	s	<	6.576E-01
****	(254.70)	0.009100	0.03010	0.545	1.988E+03	s	<	7.944E+00
****	(256.20)	0.063000	0.02997	0.514	2.724E+02	s	<	1.088E+00
****	(285.60)	0.016500	0.02761	0.511	1.123E+03	s	<	4.486E+00
295	(296.60)	0.003900	0.02683	5.176	4.946E+04		5.83%	1.976E+02
****	(300.00)	0.018900	0.02660	0.469	9.335E+02	s	<	3.730E+00
****	(304.40)	0.013500	0.02631	0.488	1.373E+03	s	<	5.488E+00
****	(329.90)	0.029000	0.02472	0.478	6.669E+02	s	<	2.665E+00
****	(334.40)	0.011500	0.02446	0.490	1.740E+03	s	<	6.953E+00
352	(350.50)	0.000800	0.02359	7.696	4.079E+05		4.33%	1.630E+03
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 41G			
****	(911.10)	0.250000	0.01096	0.359	1.311E+02	s	<r	5.227E-01
i230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00 8G			
****	(68.00)	0.005900	0.06080	0.570	1.590E+03	s	<	6.338E+00
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00 42G			
****	(911.10)	0.250000	0.01096	0.359	1.311E+02	s	<r	5.227E-01
****	(968.90)	0.150000	0.01040	0.344	2.208E+02	s	<r	8.800E-01
****	(63.81)	0.010101	0.	7	9.728E+02	s	<r	3.877E+00

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Th234    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 10G
**** (  92.30)   0.999999     0.05697       0.585   1.027E+01 s       <r 4.092E-02

 234m  1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 48G
 786 ( 786.27)   0.000345     0.01241       0.250   5.850E+04   46.24%  2.331E+02
**** (1001.03)   0.006000     0.01012       0.305   5.030E+03 s       <  2.005E+01

U 235    2.571E+11 DAYS      LAMBDA= 2.696E-12     DECAY= 1.000E+00 34G
  73 (  72.81)   0.004000     0.06051       4.361   1.802E+04    6.95%  7.180E+01
  86 (  84.24)   0.051000     0.05873       4.074   1.360E+03    7.84%  5.422E+00
**** ( 143.78)   0.132600     0.04511       0.605   1.012E+02 s       <  4.032E-01
 186 ( 185.72)   0.540000     0.03792       1.222   5.966E+01 s23.29%  2.378E-01

Am241    1.582E+05 DAYS      LAMBDA= 4.381E-06     DECAY= 9.999E-01 41G
**** (  59.54)   0.359000     0.06016       0.548   2.539E+01 s       <  1.012E-01
```

8811 GLS 2 G-6 JR 297.654 7 295.95 MIN 113.02000 GR 670

' IBR=TTIH REF TIME= 268.891 7 100 mLs in JAR

Group	8811	Time of count	297.654 2007
Sample	2	Reference GMT	268.891 2007
Element		Elapsed Live Tm	295.95
Type code	GLS	Dead Time Pct	0.033778
ID	S 021-233-SL-0025	Background GMT	293.973 2007
Geometry, detector	JR-6	Standard GMT	296.660 2007
Aliquot	113.02	Days since T0	28.76367
Unit of Aliquot	GRAM	Time on	8:41 PDT 24-OCT
Data Sheet Units	PCI /GRAM	Time off	13:38 PDT 24-OCT
Library	TTIH	Calc Time	14:00 24-OCT-07
Slope	0.993171	Width slope	0.017551
Intercept	1.648023	Width offset	0.0
X**2 TERM	-0.15901592E-05	Sensitivity	4.

NP: [7,67]670.GSP 34 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	3	23.1	20	9	60	3.80	388	21.6	1.31E+00	5.70	.098	0	186.00
2	3	26.7	20	9	927	3.80	421	25.3	1.42E+00	13.00	.153	0	0.00
3	0	33.7	31	4	789	1.85	66	32.3	2.24E-01	61.90	.306	0	0.00
4	0	46.6	42	6	1365	1.88	470	45.3	1.59E+00	13.40	.811	0	0.00
5	0	63.2	60	7	2183	1.91	122	62.0	4.11E-01	64.8	6.06	0	0.00
6	10	72.8	68	13	1930	2.00	1291	71.6	4.36E+00	7.0	6.04	0	77.70
7	10	75.1	68	13	1887	2.00	2972	74.0	1.00E+01	3.2	6.01	0	0.00
8	0	85.7	81	8	2591	3.85	1206	84.7	4.07E+00	7.8	5.83	0	0.00
9	0	92.7	90	6	1638	1.50	191	91.7	6.47E-01	34.7	5.68	0	0.00
10	0	186.1	182	8	2003	1.76	513	185.7	1.73E+00	16.0	3.79	0	0.00
11	2	239.4	237	12	1030	2.34	267	239.4	9.02E-01	19.2	3.16	0	10.90
12	2	242.5	237	12	1169	2.06	705	242.6	2.38E+00	8.8	3.13	0	0.00
13	0	295.3	291	11	1534	2.17	1683	295.8	5.69E+00	5.1	2.70	0	0.00
14	0	351.9	348	11	1262	2.04	2603	352.9	8.80E+00	3.3	2.40	0	0.00
15	0	511.1	506	14	861	3.51	855	513.4	2.89E+00	8.3	1.77	0	0.00
16	0	582.7	581	9	477	2.55	249	585.6	8.41E-01	17.5	1.60	0	0.00
17	0	609.4	606	12	608	2.67	2058	612.5	6.95E+00	3.4	1.55	0	0.00
18	0	768.4	768	11	404	2.59	184	773.0	6.23E-01	23.6	1.28	0	0.00
19	0	786.1	787	9	326	1.92	74	790.8	2.50E-01	46.2	1.25	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	805.8	807	7	249	2.44	75	810.7	2.52E-01	38.3	1.23	0	0.00
21	0	910.5	912	11	395	3.45	139	916.5	4.71E-01	28.7	1.11	0	0.00
22	0	933.6	933	16	455	3.56	193	939.8	6.51E-01	27.4	1.08	0	0.00
23	0	969.9	974	6	199	1.65	73	976.5	2.46E-01	34.3	1.04	0	0.00
24	0	1120.2	1123	11	289	3.74	493	1128.2	1.67E+00	8.60	.926	0	0.00
25	0	1157.4	1160	11	239	5.21	73	1165.8	2.48E-01	44.90	.900	0	0.00
26	0	1239.2	1238	24	438	5.35	309	1248.5	1.04E+00	21.10	.847	0	0.00
27	0	1281.2	1287	9	145	3.77	78	1291.0	2.63E-01	32.40	.821	0	0.00
28	0	1379.9	1382	21	30110	.13	115	1390.8	3.88E-01	40.70	.762	0	0.00
29	0	1461.2	1462	18	169	4.76	1090	1473.0	3.68E+00	4.40	.726	0	0.00
30	0	1509.4	1512	17	128	4.87	119	1521.8	4.00E-01	28.40	.708	0	0.00
31	0	1730.5	1735	22	75	5.67	153	1745.6	5.16E-01	18.90	.627	0	0.00
32	0	1748.6	1757	14	31	3.06	65	1763.9	2.19E-01	24.70	.621	0	0.00
33	0	1764.4	1771	21	48	5.04	466	1780.0	1.57E+00	6.50	.616	0	0.00
34	0	1844.2	1852	22	83	5.05	92	1860.8	3.10E-01	33.20	.590	0	0.00

FWHM=SQRT(3.12166E+00 + 1.50327E-02 *E)

BACKGROUND INFO 8811 GLS 2 297.654 7 G- 6 BG DATE 293.973 7

v--------PEAK---------v			v------BACKGROUND------v			v-------NET----v	
NERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
63.25	0.4114	64.77	62.00	0.4703	18.88	-0.0589	476.82R
92.70	0.6468	34.73	92.00	0.8386	13.26	-0.1918	130.67R
186.07	1.7325	15.98	186.00	0.5109	12.90	1.2216	23.29
239.35	0.9023	19.17	238.60	1.3239	20.54	-0.4216	76.44R
295.29	5.6853	5.07	295.20	0.5092	17.50	5.1761	5.83
351.92	8.7953	3.32	351.90	1.0994	14.60	7.6959	4.33
511.12	2.8880	8.27	511.00	2.7531	5.13	0.1349	205.77R
582.72	0.8414	17.48	583.10	0.6798	19.34	0.1615	122.14R
609.36	6.9547	3.37	609.30	1.2711	9.44	5.6836	4.63
910.53	0.4706	28.65	911.10	0.5607	10.95	-0.0901	164.47R
969.94	0.2462	34.26	968.90	0.4928	12.54	-0.2466	42.40R
1120.16	1.6650	8.56	1120.30	0.4474	10.44	1.2177	12.32
1239.18	1.0450	21.05	1238.10	0.1917	21.55	0.8533	26.23
1461.18	3.6831	4.37	1461.00	4.0878	9.04	-0.4047	99.58R
1730.48	0.5161	18.90	1729.60	0.1171	19.14	0.3990	25.08
1764.44	1.5748	6.53	1764.50	0.4580	11.46	1.1168	10.34

8 PEAKS REJECTED BY BACKGROUND

INTERFERING ISOTOPE ANALYSIS 8811 GLS 2 297.654 7 G- 6

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 2 GLS RUN AT 297.654/2007

BACKGROUND FOR GELI DETECTOR 6 OF 293.973/2007 2375.3 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4703	18.88	511.0	2.7531	5.13	1120.3	0.4474	10.44
92.0	0.8386	13.26	583.1	0.6798	19.34	1173.2	0.0379	0.00
143.0	0.1882	0.00	609.3	1.2711	9.44	1238.1	0.1917	21.55
186.0	0.5109	12.90	661.6	0.1491	57.09	1332.5	0.0658	8.97
198.0	0.1669	0.00	727.2	0.1624	18.65	1337.7	0.0000	0.00
238.6	1.3239	20.54	846.0	0.0507	0.00	1461.0	4.0878	9.04
279.0	0.1161	0.00	860.4	0.1069	25.62	1586.0	0.0773	0.00
295.2	0.5092	17.50	911.1	0.5607	10.95	1591.0	0.1828	22.75
338.4	0.2610	21.49	968.9	0.4928	12.54	1729.6	0.1171	19.14
351.9	1.0994	14.60	1001.0	0.0936	0.00	1764.5	0.4580	11.46

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 10/24/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
223.821	7	0.9971	14.563	22.
230.795	7	1.0016	13.550	25.
237.814	7	1.0021	13.672	25.
244.906	7	0.9920	12.742	24.
258.758	7	0.9774	13.193	24.
265.838	7	1.0076	13.473	34.
272.710	7	0.9943	13.548	26.
279.758	7	0.9902	15.691	21.
16.761	7	0.9816	13.627	22.
293.712	7	0.9749	14.993	21.
AVERAGE		0.9919	0.011	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
69.906	7	1.3635	14.524	20.
76.810	7	1.3438	13.154	35.
81.696	7	1.3658	13.879	25.
104.028	7	1.3821	15.760	22.
110.905	7	0.9898	14.446	38. *
124.980	7	0.9907	14.749	36. *
133.855	7	0.9852	15.294	24. *
154.043	7	0.9860	15.339	32. *
216.995	7	1.0022	16.665	21. *
296.660	7	0.9851	15.434	21. *
AVERAGE		0.9898	0.007	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 296.660 7
ENERGY= 1.648023 + 0.9931715*CH + -1.590159E-06*CH**2
FWHM =SQRT(-2.1716 + 0.017551*ENERGY) (CO60= 4.606)

EFFICIENCIES FOR GEOMETRY JR 6 CALIBRATED 29.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.652300	100.0	5.512700	300.0	2.660400	0.0	0.000000
55.0	5.891700	110.0	5.268400	500.0	1.792700	0.0	0.000000
60.0	6.024200	130.0	4.801100	700.0	1.368100	0.0	0.000000
65.0	6.077200	150.0	4.388400	1000.0	1.012600	0.0	0.000000
70.0	6.072400	170.0	4.034000	1400.0	0.750900		
80.0	5.951400	190.0	3.731100	2000.0	0.541800		
90.0	5.748900	250.0	3.052100	3000.0	0.379700		

8811 2 GLS GSTOR 670

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	23.1	1.31	5.7		
	2	26.7	1.42	13.0	NO GEN.	
	3	33.7	0.22	61.9		
	4	46.6	1.59	13.4		Pb210s
	6	72.8	4.36	7.0		
	7	75.1	10.04	3.2		
	8	85.7	4.07	7.8		Cs136
b	10	186.1	1.22	23.3		Cs136 U 235s Ra226s
	12	242.5	2.38	8.8	Ra226	La140
b	13	295.3	5.18	5.8	Ra226	Ru103
b	14	351.9	7.70	4.3		Ra226s Pb214s
b	17	609.4	5.68	4.6		Ru103 Ra226s Bi214s
	18	768.4	0.62	23.6	Ra226	
	19	786.1	0.25	46.2	Ra226 Th228	
	20	805.8	0.25	38.3	Ra226	
	22	933.6	0.65	27.4	Ra226	
b	24	1120.2	1.22	12.3	Ra226 NO GEN.	Sc 46s
	25	1157.4	0.25	44.9		
b	26	1239.2	0.85	26.2	Ra226	
	27	1281.2	0.26	32.4	Ra226	
	28	1379.9	0.39	40.7		
	30	1509.4	0.40	28.4	Ra226	
b	31	1730.5	0.40	25.1	Ra226 NO GEN.	
	32	1748.6	0.22	24.7		
	33	1764.4	1.12	10.3	Ra226	
	34	1844.2	0.31	33.2		
			REJECTED PEAKS			
B	5	63.2	-0.06	99.9		Th232s
B	9	92.7	-0.19	99.9		Th234s Th227s
B	11	239.4	-0.42	76.4	Th228	Pb212s
B	15	511.1	0.13	99.9	Th228	La140 Ru106 Na 22
B	16	582.7	0.16	99.9	Th228	Tl208s
B	21	910.5	-0.09	99.9		Th232s Ac228s
B	23	969.9	-0.25	42.4	Ac228	Th232s
B	29	1461.2	-0.40	99.6		K 40s

B811 GLS 3 G-7 JR 297.656 7 292.93 MIN 163.71001 GR 671

IBR=TTIH REF TIME= 268.896 7 100 mLs in Parkway Jar

LW 10-24-07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G		
1461 (1460.85)	0.110000	0.00609	0.129	1.920E+02 s	36.35%	5.282E-01
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 7.883E-01 3G		
**** (889.26)	1.000000	0.01014	0.133	1.315E+01 s	<	4.590E-02
1120 (1120.52)	1.000000	0.00806	0.937	1.163E+02 s	9.11%	4.059E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.897E-01 4G		
**** (1173.21)	0.999200	0.00768	0.126	1.641E+01 s	<	4.562E-02
**** (1332.48)	1.000000	0.00672	0.130	1.938E+01 s	<	5.387E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 7.181E-01 16G		
**** (1691.00)	0.457000	0.00518	0.099	4.194E+01 s	<	1.607E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.982E-01 3G		
**** (661.64)	0.851000	0.01334	0.170	1.494E+01 s	<	4.118E-02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.959E-01 48G		
*** (121.78)	0.254000	0.04799	0.388	3.187E+01 s	<	8.805E-02
295 (295.97)	0.004000	0.02578	3.932	3.814E+04	4.73%	1.054E+02
**** (344.31)	0.245000	0.02289	0.257	4.588E+01 s	<	1.268E-01
768 (768.90)	0.000800	0.01164	0.374	4.017E+04	20.51%	1.110E+02
**** (963.36)	0.132000	0.00939	0.140	1.132E+02 s	<	3.126E-01
**** (1112.04)	0.124000	0.00812	0.128	1.272E+02 s	<	3.514E-01
1409 (1408.02)	0.198000	0.00634	0.154	1.224E+02 s	33.92%	3.383E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.936E-01 48G		
**** (123.07)	0.390000	0.04770	0.377	2.026E+01 s	<	5.611E-02
**** (723.26)	0.202000	0.01233	0.167	6.719E+01 s	<	1.861E-01
**** (1004.75)	0.170000	0.00901	0.155	1.011E+02 s	<	2.800E-01
**** (1274.49)	0.336000	0.00704	0.118	4.991E+01 s	<	1.382E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 7.639E-01 22G		
295 (295.95)	0.290900	0.02578	3.936	5.248E+02	4.73%	1.890E+00
**** (316.50)	0.830700	0.02447	0.269	1.321E+01 s	<	4.759E-02
**** (468.06)	0.476000	0.01791	0.197	2.314E+01 s	<	8.336E-02
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 19G		
**** (583.14)	0.860000	0.01489	0.222	1.736E+01 s	<	4.777E-02
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 1G		
47 (46.50)	0.040000	0.04040	1.150	7.113E+02 s	16.42%	1.957E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 22G		
295 (295.10)	0.000240	0.02584	3.932	6.341E+05	4.73%	1.745E+03
*** (727.17)	0.066500	0.01226	0.162	1.991E+02 s	<	5.479E-01
786 (785.42)	0.011200	0.01142	0.231	1.807E+03	31.64%	4.971E+00
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 4G		
**** (238.63)	0.431000	0.03035	0.424	3.239E+01 s	<	8.911E-02
Bi214 1.633E+12 DAYS		LAM		DECAY= 1.000E+00 48G		

609 (609.30)	0.470000	0.01434	4.965	7.369E+02	s	3.37%	2.028E+00
665 (666.00)	0.020000	0.01327	0.175	6.587E+02		45.01%	1.812E+00
768 (768.70)	0.050000	0.01165	0.374	6.426E+02		20.51%	1.768E+00
786 (787.10)	0.012000	0.01139	0.231	1.690E+03		31.64%	4.649E+00
934 (934.80)	0.030000	0.00967	0.208	7.181E+02		30.27%	1.976E+00
1120 (1120.40)	0.170000	0.00806	0.936	6.833E+02		9.11%	1.880E+00
1156 (1155.40)	0.018000	0.00781	0.184	1.312E+03		30.48%	3.611E+00
1239 (1238.30)	0.060000	0.00726	0.281	6.455E+02		25.20%	1.776E+00
1281 (1281.30)	0.017000	0.00700	0.095	7.957E+02		52.16%	2.189E+00
1378 (1379.00)	0.050000	0.00648	0.202	6.247E+02		30.86%	1.719E+00
1409 (1408.00)	0.025000	0.00634	0.154	9.697E+02		33.92%	2.668E+00
1765 (1764.00)	0.170000	0.00494	0.818	9.745E+02		7.70%	2.681E+00
1847 (1848.00)	0.020000	0.00469	0.092	9.783E+02		40.92%	2.692E+00

Pb214 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 23G

242 (241.90)	0.076000	0.03005	1.900	8.320E+02		6.52%	2.289E+00
259 (258.80)	0.008000	0.02855	0.261	1.143E+03		45.35%	3.144E+00
295 (295.20)	0.190000	0.02583	3.932	8.012E+02		4.73%	2.205E+00
352 (352.00)	0.360000	0.02249	7.013	8.660E+02	s	2.90%	2.383E+00
768 (768.40)	0.000800	0.01165	0.374	4.015E+04		20.51%	1.105E+02
786 (785.90)	0.008600	0.01141	0.231	2.354E+03		31.64%	6.478E+00

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 1.000E+00 48G

186 (186.10)	0.040000	0.03642	1.719	1.180E+03	s	12.17%	3.247E+00
242 (242.00)	0.078000	0.03004	1.900	8.109E+02		6.52%	2.231E+00
259 (259.00)	0.005800	0.02854	0.261	1.577E+03		45.35%	4.339E+00
295 (295.20)	0.201000	0.02583	3.932	7.574E+02		4.73%	2.084E+00
352 (351.96)	0.393000	0.02250	7.013	7.932E+02	s	2.90%	2.183E+00
609 (609.32)	0.484000	0.01434	4.965	7.156E+02	s	3.37%	1.969E+00
665 (665.40)	0.016500	0.01328	0.175	7.978E+02		45.01%	2.195E+00
768 (768.40)	0.053200	0.01165	0.374	6.037E+02		20.51%	1.661E+00
786 (785.80)	0.012100	0.01141	0.231	1.673E+03		31.64%	4.604E+00
934 (934.10)	0.033400	0.00967	0.208	6.445E+02		30.27%	1.773E+00
1120 (1120.30)	0.160000	0.00806	0.936	7.260E+02		9.11%	1.998E+00
1156 (1155.20)	0.018200	0.00781	0.184	1.298E+03		30.48%	3.571E+00
1239 (1238.10)	0.062000	0.00726	0.281	6.246E+02		25.20%	1.719E+00
1281 (1281.00)	0.015600	0.00701	0.095	8.669E+02		52.16%	2.385E+00
1378 (1377.60)	0.041800	0.00649	0.202	7.464E+02		30.86%	2.054E+00
1409 (1408.00)	0.026000	0.00634	0.154	9.324E+02		33.92%	2.566E+00
1511 (1509.20)	0.023000	0.00587	0.158	1.168E+03		35.87%	3.213E+00
1730 (1729.60)	0.030700	0.00505	0.169	1.090E+03		27.93%	2.998E+00
1765 (1764.50)	0.166000	0.00494	0.818	9.983E+02		7.70%	2.747E+00
1847 (1847.40)	0.022000	0.00469	0.092	8.890E+02		40.92%	2.446E+00

Th227 7.951E+03 DAYS LAMBDA= 8.718E-05 DECAY= 9.975E-01 48G

**** (49.80)	0.087000	0.04963	0.399	9.247E+01	s	<	2.551E-01
80 (79.70)	0.018000	0.05657	1.033	1.014E+03	s	27.36%	2.797E+00
**** (94.00)	0.013500	0.05416	0.431	5.894E+02	s	<	1.626E+00
**** (210.60)	0.012600	0.03330	0.345	8.232E+02	s	<	2.271E+00
**** (236.00)	0.115000	0.03061	0.329	9.355E+01	s	<	2.580E-01
**** (254.70)	0.009100	0.02890	0.312	1.186E+03	s	<	3.271E+00
**** (256.20)	0.063000	0.02877	0.294	1.621E+02	s	<	4.471E-01
**** (285.60)	0.016500	0.02649	0.305	6.971E+02	s	<	1.923E+00
295 (296.60)	0.003900	0.02574	3.932	3.918E+04		4.73%	1.081E+02
**** (300.00)	0.018900	0.02551	0.288	5.982E+02	s	<	1.650E+00
**** (304.40)	0.013500	0.02522	0.247	7.268E+02	s	<	2.005E+00
**** (329.90)	0.029000	0.02368	0.275	4.012E+02	s	<	1.107E+00
**** (334.40)	0.011500	0.02343	0.247	9.186E+02	s	<	2.534E+00

Ac228 5.133E+12 DAYS LAMBDA= 1.350E-13 DECAY= 1.000E+00 41G

**** (911.10)	0.250000	0.00991	0.190	7.654E+01	s	<	2.106E-01

Th230 2.512E+07 DAYS LAM 191 DECAY= 1.000E+00 8G

****	(68.00)	0.005900	0.05696	0.477	1.418E+03 s	<	3.902E+00
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00 42G		
911	(911.10)	0.250000	0.00991	0.217	8.765E+01 s	34.70%	2.412E-01
***	(968.90)	0.150000	0.00934	0.164	1.172E+02 s	<	3.223E-01
****	(63.81)	0.010101	0.05644	0.458	8.042E+02 s	<T	2.213E+00
Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 10G		
****	(92.30)	0.999999	0.05450	0.466	8.555E+00 s	<T	2.354E-02
Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
259	(257.90)	0.000480	0.02863	0.261	1.899E+04	45.35%	5.226E+01
786	(786.27)	0.000345	0.01140	0.231	5.871E+04	31.64%	1.616E+02
****	(1001.03)	0.006000	0.00904	0.141	2.602E+03 s	<	7.160E+00
U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00 34G		
80	(81.20)	0.006500	0.05639	1.033	2.817E+03	27.36%	7.752E+00
****	(143.78)	0.132600	0.04342	0.393	6.827E+01 s	<	1.879E-01
186	(185.72)	0.540000	0.03647	1.719	8.730E+01 s	12.17%	2.402E-01
242	(240.93)	0.000700	0.03014	1.900	9.006E+04	6.52%	2.478E+02
Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.999E-01 41G		
****	(59.54)	0.359000	0.05537	0.414	2.084E+01 s	<	5.734E-02

8811 GLS 3 G-7 JR 297.656 7 292.93 MIN 163.71001 GR 671

' IBR=TTIH REF TIME= 268.896 7 100 mLs in Parkway Jar

* Group	8811	* Time of count	297.656 2007 *
* Sample	3	* Reference GMT	268.896 2007 *
* Element		* Elapsed Live Tm	292.9333 *
* Type code	GLS	* Dead Time Pct	0.022753 *
* ID N	021-233-SL-001N	* Background GMT	293.973 2007 *
* Geometry, detector	JR-7	* Standard GMT	297.640 2007 *
* Aliquot	163.71	* Days since TO	28.76035 *
* Unit of Aliquot	GRAM	* Time on	8:44 PDT 24-OCT *
* Data Sheet Units	PCI /GRAM	* Time off	13:36 PDT 24-OCT *
* Library	TTIH	* Calc Time	13:20 24-OCT-07 *
* Slope	1.00527	* Width slope	0.003299 *
* Intercept	2.851349	* Width offset	1.920348 *
* X**2 TERM	-0.11550892E-05	* Sensitivity	4. *

NP:[7,67]671.GSP 35 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	27.1	21	8	420	3.13	325	24.1	1.11E+00	12.7	0.159	0	0.00
2	0	32.8	29	6	688	1.55	27	29.8	9.37E-02	151.6	0.282	0	0.00
3	0	46.5	40	8	920	1.94	337	43.4	1.15E+00	16.4	0.806	0	0.00
4	0	63.3	59	5	695	1.56	105	60.1	3.60E-01	39.3	5.63	0	0.00
5	7	70.9	64	19	965	3.02	443	67.7	1.51E+00	13.6	5.70	0	63.50
6	7	75.3	64	19	1296	3.02	1272	72.1	4.34E+00	6.6	5.68	0	0.00
7	7	80.0	64	19	1345	3.02	302	76.8	1.03E+00	27.4	5.65	0	0.00
8	0	88.0	82	6	925	1.71	269	84.7	9.17E-01	19.1	5.53	0	0.00
9	0	92.4	88	6	757	1.79	87	89.1	2.97E-01	53.0	5.44	0	0.00
10	0	169.3	162	8	789	1.14	117	165.6	3.98E-01	43.1	3.89	0	0.00
11	0	186.0	178	9	882	2.04	597	182.2	2.04E+00	10.1	3.65	0	0.00
12	3	238.8	232	11	279	1.48	117	234.8	3.99E-01	22.3	3.04	0	0.77
13	3	242.0	232	11	345	1.64	557	238.0	1.90E+00	6.5	3.01	0	0.00
14	0	258.9	252	7	388	2.66	76	254.7	2.61E-01	45.3	2.86	0	0.00
15	0	295.4	287	9	539	1.68	1177	291.1	4.02E+00	4.5	2.58	0	0.00
16	0	352.0	344	9	358	2.10	2091	347.5	7.14E+00	2.8	2.30	0	0.00
17	0	441.1	432	7	193	2.68	20	436.2	6.75E-02	123.8	1.92	0	0.00
18	0	511.6	500	13	303	3.06	315	506.3	1.07E+00	12.7	1.67	0	0.00
19	0	609.4	598	11	185	1.87	1486	603.8	5.07E+00	3.2	1.45	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	664.6	655	9	141	2.18	51	658.8	1.75E-01	45.0	1.34	0	0.00
21	0	768.4	758	9	117	2.61	110	762.2	3.74E-01	20.5	1.18	0	0.00
22	0	786.4	776	10	103	2.44	68	780.2	2.31E-01	31.6	1.15	0	0.00
23	0	911.5	901	10	80	4.58	82	904.8	2.80E-01	25.1	1.00	0	0.00
24	0	934.4	924	8	88	2.15	61	927.6	2.08E-01	30.3	0.975	0	0.00
25	0	1120.4	1108	11	91	2.62	283	1113.1	9.65E-01	8.7	0.815	0	0.00
26	0	1156.4	1145	9	45	5.08	54	1149.0	1.84E-01	30.5	0.789	0	0.00
27	0	1238.6	1226	13	79	2.66	88	1231.0	3.01E-01	23.6	0.734	0	0.00
28	0	1280.7	1270	9	50	2.23	28	1273.0	9.48E-02	52.2	0.708	0	0.00
29	0	1378.1	1364	11	71	2.80	67	1370.2	2.28E-01	27.4	0.650	0	0.00
30	0	1408.7	1397	8	48	3.04	45	1400.8	1.54E-01	33.9	0.634	0	0.00
31	0	1461.5	1450	9	40	1.99	56	1453.4	1.90E-01	24.2	0.612	0	0.00
32	0	1510.5	1496	11	47	3.60	46	1502.4	1.58E-01	35.9	0.593	0	0.00
33	0	1730.2	1717	11	32	2.63	53	1721.7	1.80E-01	26.1	0.513	0	0.00
34	0	1764.6	1749	14	17	2.60	246	1756.0	8.39E-01	7.5	0.502	0	0.00
35	0	1846.9	1831	12	22	3.05	27	1838.2	9.18E-02	40.9	0.475	0	0.00

FWHM=SQRT(4.92814E+00 + 2.89000E-03 *E)

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BACKGROUND INFO 8811    GLS    3        297.656   7 G- 7      BG DATE 293.973   7
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PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
63.31	0.3600	39.28	62.00	0.4556	28.67	-0.0956	201.41R
92.38	0.2966	52.98	92.00	0.6088	7.38	-0.3122	52.36R
185.98	2.0371	10.06	186.00	0.3178	13.15	1.7194	12.17
238.78	0.3989	22.27	238.50	0.3161	14.40	0.0828	120.53R
295.36	4.0194	4.53	295.20	0.0874	42.58	3.9320	4.73
352.02	7.1377	2.78	351.90	0.1251	35.64	7.0125	2.90
511.56	1.0747	12.67	511.00	0.9979	5.07	0.0768	189.00R
609.44	5.0735	3.20	609.30	0.1082	37.04	4.9653	3.37
911.49	0.2799	25.13	911.10	0.0628	43.00	0.2171	34.70
1120.42	0.9652	8.72	1120.30	0.0290	47.58	0.9362	9.11
1238.60	0.3007	23.57	1238.10	0.0195	0.00	0.2812	25.20
1378.12	0.2277	27.43	1377.70	0.0253	0.00	0.2024	30.86
1461.46	0.1901	24.23	1461.00	0.0616	12.67	0.1285	36.35
1730.15	0.1805	26.13	1729.60	0.0116	0.00	0.1689	27.93
1764.57	0.8388	7.47	1764.50	0.0206	33.53	0.8182	7.70

4 PEAKS REJECTED BY BACKGROUND

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INTERFERING ISOTOPE ANALYSIS 8811    GLS    3        297.656   7 G- 7
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SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 8811 3 GLS RUN AT 297.656/2007

BACKGROUND FOR GELI DETECTOR 7 OF 293.973/2007 2375.4 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4556	28.67	511.0	0.9979	5.07	1120.3	0.0290	47.58
92.0	0.6088	7.38	583.1	0.0813	22.99	1173.2	0.0387	23.52
143.0	0.0548	35.22	609.3	0.1082	37.04	1238.1	0.0195	0.00
186.0	0.3178	13.15	661.6	0.0377	20.70	1332.5	0.0309	26.53
198.0	0.0611	25.20	727.2	0.0256	0.00	1377.7	0.0253	0.00
238.5	0.3161	14.40	846.0	0.0559	23.98	1461.0	0.0616	12.67
279.0	0.0000	0.00	860.4	0.0351	0.00	1586.0	0.0000	0.00
295.2	0.0874	42.58	911.1	0.0628	43.00	1591.0	0.0333	0.00
338.4	0.0809	31.15	968.9	0.0398	64.25	1729.6	0.0116	0.00
351.9	0.1251	35.64	1001.0	0.0417	34.54	1764.5	0.0206	33.53

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 7 ON 10/24/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
71.872	7	1.0395	11.486	39.
103.898	7	0.8806	8.120	30.
109.825	7	1.0019	9.030	22.
114.670	7	0.9891	8.186	29.
127.663	7	0.9841	7.790	44.
133.833	7	0.9924	7.542	27.
150.885	7	0.8859	11.264	14.
154.032	7	0.9734	5.981	22.
173.704	7	0.9383	4.693	21.
175.828	7	0.9978	8.266	38.
AVERAGE		0.9683	0.051	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
244.938	7	1.0507	12.319	35.
258.777	7	1.0466	12.929	31.
265.711	7	1.0175	9.504	24.
265.864	7	0.8918	13.018	40.
265.918	7	1.0084	7.775	28.
272.730	7	0.9982	8.611	25.
279.799	7	0.9945	7.713	22.
286.935	7	0.9403	6.326	24.
293.728	7	1.0060	8.861	22.
297.640	7	0.9180	8.162	21.
AVERAGE		1.0174	0.023	

CALIBRATION LINE FROM STANDARD FOR G- 7 OF 297.640 7
ENERGY= 2.851349 + 1.0052698*CH + -1.155089E-06*CH**2
FWHM =SQRT(1.9203 + 0.003300*ENERGY) (CO60= 2.513)

EFFICIENCIES FOR GEOMETRY JR 7 CALIBRATED 50.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.023100	100.0	5.287100	300.0	2.551200	0.0	0.000000
55.0	5.347200	110.0	5.062500	500.0	1.699100	0.0	0.000000
60.0	5.551400	130.0	4.620300	700.0	1.270100	0.0	0.000000
65.0	5.663400	150.0	4.223800	1000.0	0.905100	0.0	0.000000
70.0	5.706100	170.0	3.881400	1400.0	0.637600		
80.0	5.653400	190.0	3.588400	2000.0	0.429900		
90.0	5.494600	250.0	2.931100	3000.0	0.279600		

0811 3 GLS GSTOR 671

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	27.1	1.11	12.7		
	2	32.8	0.09	99.9		
	3	46.5	1.15	16.4	NO GEN.	Pb210s
	5	70.9	1.51	13.6		
	6	75.3	4.34	6.6		
	7	80.0	1.03	27.4		Ce144 I 131 Th227s
	8	88.0	0.92	19.1		Cd109
	10	169.3	0.40	43.1		
b	11	186.0	1.72	12.2		Cs136 U 235s Ra226s
	13	242.0	1.90	6.5	Ra226 Th228	La140
	14	258.9	0.26	45.3	Ra226	Ag110
b	15	295.4	3.93	4.7	Ra226	Ru103
b	16	352.0	7.01	2.9	NO GEN.	Ra226s Pb214s
	17	441.1	0.07	99.9		
b	19	609.4	4.97	3.4		Ru103 Ra226s Bi214s
	20	664.6	0.17	45.0	Ra226	
	21	768.4	0.37	20.5	Ra226	
	22	786.4	0.23	31.6	Ra226 Th228	
b	23	911.5	0.22	34.7		Th232s Ac228s
	24	934.4	0.21	30.3	Ra226	
b	25	1120.4	0.94	9.1	Ra226	Sc 46s
	26	1156.4	0.18	30.5	Ra226	
b	27	1238.6	0.28	25.2	Ra226	
	28	1280.7	0.09	52.2	Ra226	
b	29	1378.1	0.20	30.9	Ra226	
	30	1408.7	0.15	33.9	Ra226	Eu152s
b	31	1461.5	0.13	36.4		K 40s
	32	1510.5	0.16	35.9	Ra226	
b	33	1730.2	0.17	27.9	Ra226	
b	34	1764.6	0.82	7.7	Ra226	
	35	1846.9	0.09	40.9	Ra226	
			REJECTED PEAKS			
B	4	63.3	-0.10	99.9		Th232s
B	9	92.4	-0.31	52.4		Th234s
B	12	238.8	0.08	99.9	Th228	Pb212s
B	18	511.6	0.08	99.9	Th228	La140 Ru106 Na 22

9811 GLS 4 G-1 JR 297.657 7 292.48 MIN 44.60000 GR 668

IBR=TTIH REF TIME= 269.649 7 100 mL in Parkway Jar

10.2407

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G		
1461 (1460.85)	0.110000	0.00644	0.129	1.821E+02 s	44.38%	1.839E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 7.932E-01 3G		
**** (889.26)	1.000000	0.00984	0.154	1.569E+01 s	<	1.998E-01
**** (1120.52)	1.000000	0.00810	0.136	1.675E+01 s	<	2.132E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.899E-01 4G		
**** (1173.21)	0.999200	0.00779	0.101	1.294E+01 s	<	1.320E-01
**** (1332.48)	1.000000	0.00698	0.114	1.627E+01 s	<	1.660E-01
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 7.243E-01 16G		
**** (1691.00)	0.457000	0.00566	0.071	2.741E+01 s	<	3.822E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.982E-01 3G		
**** (661.64)	0.851000	0.01252	0.172	1.617E+01 s	<	1.636E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.960E-01 48G		
**** (121.78)	0.254000	0.04322	0.334	3.047E+01 s	<	3.090E-01
*** (344.31)	0.245000	0.02075	0.201	3.963E+01 s	<	4.019E-01
**** (963.36)	0.132000	0.00921	0.126	1.038E+02 s	<	1.053E+00
**** (1112.04)	0.124000	0.00815	0.131	1.300E+02 s	<	1.319E+00
**** (1408.02)	0.198000	0.00666	0.103	7.842E+01 s	<	7.952E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.938E-01 48G		
**** (123.07)	0.390000	0.04295	0.298	1.781E+01 s	<	1.810E-01
583 (582.03)	0.008000	0.01385	0.105	9.435E+02	81.90%	9.589E+00
**** (723.26)	0.202000	0.01166	0.152	6.472E+01 s	<	6.577E-01
**** (1004.75)	0.170000	0.00889	0.201	1.328E+02 s	<	1.350E+00
**** (1274.49)	0.336000	0.00725	0.106	4.352E+01 s	<	4.423E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 7.693E-01 22G		
**** (316.50)	0.830700	0.02213	0.232	1.260E+01 s	<	1.654E-01
**** (468.06)	0.476000	0.01642	0.196	2.504E+01 s	<	3.287E-01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 19G		
583 (583.14)	0.860000	0.01383	0.105	8.790E+00 s	81.90%	8.877E-02
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 1G		
47 (46.50)	0.040000	0.05556	0.745	3.353E+02 s	22.21%	3.386E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 22G		
583 (583.14)	0.310000	0.01383	0.105	2.438E+01	81.90%	2.463E-01
**** (727.17)	0.066500	0.01161	0.171	2.211E+02 s	<	2.233E+00
b212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 4G		
239 (238.63)	0.431000	0.02731	0.159	1.349E+01 s	81.71%	1.363E-01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
**** (609.30)	0.470000	0.01335	0.224	3.576E+01 s	<	3.612E-01
Th214 1.633E+12 DAYS		LAM		DECAY= 1.000E+00 23G		

352	(352.00)	0.360000	0.02040	0.177	2.405E+01 s	65.78%	2.429E-01
767	(768.40)	0.000800	0.01109	0.323	3.641E+04	24.76%	3.678E+02

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 1.000E+00 48G

.86	(186.10)	0.040000	0.03266	1.922	1.471E+03 s	9.80%	1.485E+01
352	(351.96)	0.393000	0.02040	0.177	2.203E+01 s	65.78%	2.225E-01
****	(609.32)	0.484000	0.01335	0.224	3.473E+01 s	<T	3.507E-01
767	(768.40)	0.053200	0.01109	0.323	5.476E+02	24.76%	5.531E+00

Th227 7.951E+03 DAYS LAMBDA= 8.718E-05 DECAY= 9.976E-01 48G

****	(49.80)	0.087000	0.05556	0.404	8.353E+01 s	<	8.457E-01
64	(62.50)	0.002500	0.05620	9.210	6.555E+04	3.27%	6.637E+02
****	(79.70)	0.018000	0.05314	0.481	5.033E+02 s	<	5.095E+00
93	(94.00)	0.013500	0.04967	14.831	2.212E+04 s	2.38%	2.239E+02
112	(113.10)	0.005400	0.04512	1.249	5.126E+03	17.05%	5.190E+01
204	(204.20)	0.002300	0.03058	0.332	4.719E+03	40.06%	4.777E+01
****	(210.60)	0.012600	0.02990	0.275	7.310E+02 s	<	7.401E+00
****	(236.00)	0.115000	0.02753	0.269	8.488E+01 s	<	8.593E-01
****	(254.70)	0.009100	0.02603	0.255	1.075E+03 s	<	1.089E+01
****	(256.20)	0.063000	0.02591	0.244	1.492E+02 s	<	1.511E+00
****	(285.60)	0.016500	0.02391	0.250	6.338E+02 s	<	6.416E+00
****	(300.00)	0.018900	0.02305	0.240	5.505E+02 s	<	5.573E+00
****	(304.40)	0.013500	0.02279	0.243	7.880E+02 s	<	7.979E+00
****	(329.90)	0.029000	0.02144	0.223	3.581E+02 s	<	3.626E+00
****	(334.40)	0.011500	0.02122	0.222	9.101E+02 s	<	9.214E+00
352	(350.50)	0.000800	0.02047	0.177	1.079E+04	65.78%	1.092E+02

Ac228 5.133E+12 DAYS LAMBDA= 1.350E-13 DECAY= 1.000E+00 41G

****	(911.10)	0.250000	0.00964	0.163	6.749E+01 s	<T	6.816E-01

i230 2.812E+07 DAYS LAMBDA= 2.465E-08 DECAY= 1.000E+00 8G

****	(68.00)	0.005900	0.05550	0.523	1.597E+03 s	<	1.613E+01

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 42G

99	(99.50)	0.012000	0.04831	0.601	1.037E+03	25.40%	1.048E+01
****	(911.10)	0.250000	0.00964	0.163	6.749E+01 s	<T	6.816E-01
****	(968.90)	0.150000	0.00916	0.138	1.000E+02 s	<	1.010E+00
1461	(1459.20)	0.009000	0.00645	0.129	2.224E+03	44.38%	2.246E+01
****	(63.81)	0.010101	0.05607	0.975	1.722E+03 s	<	1.739E+01

Th234 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 10G

****	(92.30)	0.999999	0.05009	1.170	2.336E+01 s	<	2.360E-01

Pa234m 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 48G

767	(766.36)	0.002060	0.01112	0.323	1.411E+04	24.76%	1.425E+02
1001	(1001.03)	0.006000	0.00892	0.471	8.793E+03 s	15.27%	8.881E+01

U 235 2.571E+11 DAYS LAMBDA= 2.696E-12 DECAY= 1.000E+00 34G

145	(143.78)	0.132600	0.03894	0.286	5.537E+01 s	57.79%	5.592E-01
186	(185.72)	0.540000	0.03271	1.922	1.088E+02 s	9.80%	1.099E+00
239	(240.93)	0.000700	0.02711	0.159	8.365E+03	81.71%	8.449E+01

Am241 1.582E+05 DAYS LAMBDA= 4.381E-06 DECAY= 9.999E-01 41G

****	(59.54)	0.359000	0.05639	0.464	2.293E+01 s	<	2.316E-01
99	(99.00)	0.000202	0.04844	0.601	6.148E+04	25.40%	6.210E+02

8811 GLS 4 G-1 JR 297.657 7 292.48 MIN 44.6000 GR 668

LIBR=TTIH REF TIME= 269.649 7 100 mL in Parkway Jar

Group	8811	Time of count	297.657 2007
Sample	4	Reference GMT	269.649 2007
Element		Elapsed Live Tm	292.4833
Type code	GLS	Dead Time Pct	0.028483
ID	021-121-SL-005	Background GMT	293.973 2007
Geometry, detector	JR-1	Standard GMT	297.640 2007
Aliquot	44.6	Days since TO	28.00754
Unit of Aliquot	GRAM	Time on	8:46 PDT 24-OCT
Data Sheet Units	PCI /GRAM	Time off	13:38 PDT 24-OCT
Library	TTIH	Calc Time	13:17 24-OCT-07
Slope	1.004033	Width slope	0.005318
Intercept	1.981581	Width offset	1.263706
X**2 TERM	-0.16470993E-05	Sensitivity	4.

NP: [7,67]668.GSP 24 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	10	26.4	21	17	69	4.01	643	24.3	2.20E+00	5.00	.147	0	162.00
2	10	30.5	21	17	487	4.01	292	28.4	9.97E-01	20.00	.226	0	0.00
3	0	46.7	41	6	829	1.27	218	44.6	7.45E-01	22.20	.816	0	0.00
4	0	63.5	59	6	1127	1.91	2919	61.3	9.98E+00	2.6	5.61	0	0.00
5	0	70.1	66	7	1505	1.53	151	67.8	5.16E-01	42.3	5.51	0	0.00
6	0	92.8	85	10	1525	2.03	4665	90.4	1.60E+01	2.2	5.00	0	0.00
7	0	98.7	95	6	646	1.67	176	96.3	6.01E-01	25.4	4.85	0	0.00
8	0	112.3	105	10	978	2.23	365	109.9	1.25E+00	17.1	4.53	0	0.00
9	0	144.6	138	9	681	1.93	113	142.1	3.87E-01	41.9	3.88	0	0.00
10	0	185.7	178	10	605	1.84	707	183.1	2.42E+00	7.7	3.27	0	0.00
11	0	203.8	197	8	435	2.75	97	201.0	3.32E-01	40.1	3.08	0	0.00
12	0	239.4	233	8	395	1.37	192	236.6	6.58E-01	19.0	2.73	0	0.00
13	0	295.1	289	6	214	1.61	61	292.1	2.08E-01	41.8	2.34	0	0.00
14	0	352.0	345	9	266	2.13	119	348.8	4.06E-01	27.0	2.08	0	0.00
15	0	511.3	502	12	213	2.66	424	507.7	1.45E+00	8.5	1.54	0	0.00
16	0	583.3	575	9	155	1.62	76	579.5	2.58E-01	31.9	1.40	0	0.00
17	0	608.8	602	7	141	1.21	65	605.0	2.21E-01	31.6	1.35	0	0.00
18	0	744.8	736	13	126	8.00	52	740.7	1.79E-01	49.3	1.15	0	0.00
19	0	767.2	758	11	120	2.05	95	763.1	3.23E-01	24.8	1.12	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	912.2	904	11	83	2.66	43	907.9	1.46E-01	46.70	.973	0	0.00
21	0	1001.5	991	10	57	2.46	150	997.1	5.12E-01	13.70	.892	0	0.00
22	0	1460.5	1449	13	35	2.68	58	1456.2	1.98E-01	27.30	.648	0	0.00
23	0	1763.6	1752	14	38	3.30	26	1759.6	8.93E-02	50.60	.554	0	0.00
24	0	1948.2	1941	9	12	6.68	10	1944.6	3.58E-02	69.10	.503	0	0.00

FWHM=SQRT(4.11996E+00 + 1.07288E-02 *E)

BACKGROUND INFO 8811 GLS 4 297.657 7 G- 1 BG DATE 293.973 7

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
63.52	9.9786	2.63	62.00	0.7691	19.00	9.2094	3.27
92.77	15.9507	2.19	92.00	1.1197	3.76	14.8310	2.38
144.60	0.3873	41.94	143.00	0.1014	29.77	0.2859	57.79
[illegible]	2.4159	7.71			5.48	1.9216	9.80

239.45	0.6576	19.00	238.60	0.4988	7.02	0.1588	81.71	
295.08	0.2075	41.81	295.20	0.1002	28.95	0.1073	85.23	R
351.99	0.4061	26.99	351.90	0.2295	16.78	0.1766	65.78	
511.26	1.4490	8.55	511.00	1.3486	5.18	0.1004	141.61	R
583.26	0.2584	31.87	583.10	0.1539	15.14	0.1045	81.90	
608.82	0.2205	31.55	609.30	0.1774	14.83	0.0431	172.41	R
912.20	0.1461	46.71	911.10	0.0864	19.10	0.0597	117.62	R
1001.48	0.5124	13.67	1001.00	0.0418	38.80	0.4707	15.27	
1460.53	0.1983	27.34	1461.00	0.0692	26.73	0.1291	44.38	
1763.59	0.0893	50.56	1764.50	0.0367	40.35	0.0526	90.32	R

5 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 8811 GLS 4 297.657 7 G- 1

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SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 4 GLS RUN AT 297.657/2007

BACKGROUND FOR GELI DETECTOR 1 OF 293.973/2007 2375.0 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.7691	19.00	511.0	1.3486	5.18	1120.3	0.0499	25.85
92.0	1.1197	3.76	583.1	0.1539	15.14	1173.2	0.0272	0.00
143.0	0.1014	29.77	609.3	0.1774	14.83	1238.1	0.0296	5.06
186.0	0.4943	5.48	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0730	18.07	727.2	0.0396	22.73	1377.7	0.0319	0.00
238.6	0.4988	7.02	846.0	0.0735	45.34	1461.0	0.0692	26.73
279.0	0.0000	0.00	860.4	0.0438	0.00	1586.0	0.0000	0.00
295.2	0.1002	28.95	911.1	0.0864	19.10	1591.0	0.0620	0.00
338.4	0.0534	31.62	968.9	0.0484	34.12	1729.6	0.0061	0.00
351.9	0.2295	16.78	1001.0	0.0418	38.80	1764.5	0.0367	40.35

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 10/24/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
258.777	7	1.7442	14.353	29.
265.711	7	1.7599	15.213	22.
265.864	7	1.5439	11.619	38. NG
265.918	7	1.5464	12.253	26. NG
266.063	7	1.5169	11.690	20. NG
272.730	7	1.5111	11.869	23. NG
278.691	7	1.6797	13.907	20. NG
286.721	7	1.7356	13.726	26.
73.746	7	1.7304	13.746	26.
297.640	7	1.7282	15.739	20.
AVERAGE		1.7397	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.856	7	1.0713	7.228	30.
81.670	7	1.0534	5.600	25.
103.972	7	0.8203	15.248	21.
192.664	7	0.9760	34.750	25.
197.727	7	2.1369	18.219	45.
205.876	7	0.9740	30.810	21.
216.753	7	0.9677	15.266	24.
272.776	7	0.8535	10.320	20.
278.874	7	0.9541	14.321	20.
279.774	7	0.9550	14.786	35.
AVERAGE		0.9931	0.048	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 297.640 7
ENERGY= 1.981581 + 1.0040334*CH + -1.647099E-06*CH**2
FWHM =SQRT(1.2637 + 0.005318*ENERGY) (CO60= 2.890)

EFFICIENCIES FOR GEOMETRY JR 1 CALIBRATED 207.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.555600	100.0	4.819200	300.0	2.304700	0.0	0.000000
55.0	5.631600	110.0	4.582500	500.0	1.562100	0.0	0.000000
60.0	5.636600	130.0	4.152700	700.0	1.197600	0.0	0.000000
65.0	5.592800	150.0	3.787300	1000.0	0.892900	0.0	0.000000
70.0	5.516200	170.0	3.479400	1400.0	0.669100		
80.0	5.307100	190.0	3.218900	2000.0	0.489700		
90.0	5.065700	250.0	2.638800	3000.0	0.348600		

0811 4 GLS GSTOR 668

	PK	ENERGY	CPM	%ERR		
	1	26.4	2.20	5.0		
	2	30.5	1.00	20.0		
	3	46.7	0.75	22.2		Pb210s
b	4	63.5	9.21	3.3		Th232s
	5	70.1	0.52	42.3		
b	6	92.8	14.83	2.4		Th234s Th227s
	7	98.7	0.60	25.4	Ac228	
	8	112.3	1.25	17.1		
b	9	144.6	0.29	57.8		Ce141 U 235s
b	10	185.7	1.92	9.8		Cs137c U 235s Ra226s
	11	203.8	0.33	40.1		Sb125
b	12	239.4	0.16	81.7	Th228 Th228	Pb212s
b	14	352.0	0.18	65.8		Ra226s Pb214s
b	16	583.3	0.10	81.9	Th228	T1208s
	18	744.8	0.18	49.3		Ag110
	19	767.2	0.32	24.8	Ra226	Nb 95
b	21	1001.5	0.47	15.3		Pa234s
b	22	1460.5	0.13	44.4	Ac228	K 40s
	24	1948.2	0.04	69.1		
			REJECTED PEAKS			
B	13	295.1	0.11	85.2	Ra226	Ru103
B	15	511.3	0.10	99.9	Th228	La140 Ru106 Na 22
B	17	608.8	0.04	99.9		Ru103 Ra226s Bi214s
B	20	912.2	0.06	99.9		Th232s Ac228s
B	23	1763.6	0.05	90.3	Ra226	

8811 GLS 5 G-5 JR 297.670 7 273.13 MIN 38.07000 GR 669

LIBR=TTIH REF TIME= 268.657 7 100 mL in Jar (temp)

10.2+07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
1461 (1460.85)	0.110000	0.00507	0.139	2.493E+02 s	42.51%		2.950E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 7.866E-01	3G		
**** (889.26)	1.000000	0.00818	0.124	1.520E+01 s		<	2.287E-01
**** (1120.52)	1.000000	0.00659	0.116	1.766E+01 s		<	2.656E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.896E-01	4G		
**** (1173.21)	0.999200	0.00630	0.108	1.711E+01 s		<	2.046E-01
**** (1332.48)	1.000000	0.00556	0.092	1.647E+01 s		<	1.970E-01
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 7.160E-01	16G		
**** (1691.00)	0.457000	0.00434	0.084	4.245E+01 s		<	7.014E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.982E-01	3G		
**** (661.64)	0.851000	0.01067	0.143	1.574E+01 s		<	1.866E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.958E-01	48G		
**** (121.78)	0.254000	0.04080	0.258	2.489E+01 s		<	2.957E-01
*** (344.31)	0.245000	0.01949	0.178	3.721E+01 s		<	4.421E-01
**** (963.36)	0.132000	0.00761	0.118	1.172E+02 s		<	1.393E+00
**** (1112.04)	0.124000	0.00664	0.103	1.254E+02 s		<	1.490E+00
**** (1408.02)	0.198000	0.00526	0.074	7.067E+01 s		<	8.397E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.935E-01	48G		
**** (123.07)	0.390000	0.04082	0.264	1.657E+01 s		<	1.973E-01
**** (723.26)	0.202000	0.00987	0.118	5.903E+01 s		<	7.030E-01
**** (1004.75)	0.170000	0.00732	0.105	8.419E+01 s		<	1.003E+00
**** (1274.49)	0.336000	0.00581	0.078	3.998E+01 s		<	4.761E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 7.621E-01	22G		
**** (316.50)	0.830700	0.02115	0.217	1.233E+01 s		<	1.915E-01
**** (468.06)	0.476000	0.01459	0.161	2.325E+01 s		<	3.610E-01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
**** (583.14)	0.860000	0.01193	0.158	1.544E+01 s		<	1.827E-01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
**** (46.50)	0.040000	0.00393	0.206	1.309E+03 s		<	1.548E+01
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
**** (727.17)	0.066500	0.00982	0.139	2.122E+02 s		<	2.510E+00
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
**** (238.63)	0.431000	0.02769	0.275	2.308E+01 s		<r	2.731E-01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G		
**** (609.30)	0.470000	0.01147	0.174	3.231E+01 s		<r	3.823E-01
1402 (1402.00)	0.017000	0.00529	0.042	4.684E+02	40.61%		5.543E+00
Pb214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	23G		
**** (352.00)	0.360000	0.	)	3.058E+01 s		<r	3.618E-01

Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00		48G	
****	(186.10)	0.040000	0.03417	0.326	2.384E+02	s	<T	2.821E+00
****	(351.96)	0.393000	0.01908	0.220	2.933E+01	s	<T	3.470E-01
***	(609.32)	0.484000	0.01147	0.174	3.138E+01	s	<T	3.713E-01
1402	(1401.40)	0.014400	0.00529	0.042	5.528E+02	40.61%		6.541E+00
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 9.975E-01		48G	
****	(49.80)	0.087000	0.00483	0.237	5.649E+02	s	<	6.701E+00
****	(79.70)	0.018000	0.02807	0.262	5.185E+02	s	<	6.150E+00
93	(94.00)	0.013500	0.03576	0.166	3.429E+02	s81.28%		4.067E+00
****	(210.60)	0.012600	0.03095	0.258	6.613E+02	s	<	7.845E+00
****	(236.00)	0.115000	0.02797	0.255	7.927E+01	s	<	9.403E-01
****	(254.70)	0.009100	0.02604	0.233	9.818E+02	s	<	1.165E+01
****	(256.20)	0.063000	0.02590	0.232	1.422E+02	s	<	1.687E+00
****	(285.60)	0.016500	0.02336	0.231	6.003E+02	s	<	7.120E+00
****	(300.00)	0.018900	0.02227	0.227	5.387E+02	s	<	6.390E+00
****	(304.40)	0.013500	0.02196	0.195	6.577E+02	s	<	7.801E+00
****	(329.90)	0.029000	0.02031	0.179	3.031E+02	s	<	3.595E+00
****	(334.40)	0.011500	0.02005	0.189	8.179E+02	s	<	9.702E+00
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00		41G	
****	(911.10)	0.250000	0.00800	0.135	6.756E+01	s	<T	7.994E-01
Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00		8G	
****	(68.00)	0.005900	0.01898	0.263	2.345E+03	s	<	2.774E+01
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00		42G	
****	(911.10)	0.250000	0.00800	0.135	6.756E+01	s	<T	7.994E-01
****	(968.90)	0.150000	0.00757	0.120	1.060E+02	s	<	1.254E+00
***	(63.81)	0.010101	0.01539	0.270	1.736E+03	s	<	2.054E+01
Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00		10G	
****	(92.30)	0.999999	0.03506	0.338	9.653E+00	s	<	1.142E-01
Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00		48G	
****	(1001.03)	0.006000	0.00735	0.108	2.445E+03	s	<	2.893E+01
U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00		34G	
****	(143.78)	0.132600	0.03968	0.324	6.167E+01	s	<	7.297E-01
****	(185.72)	0.540000	0.03422	0.326	1.763E+01	s	<T	2.086E-01
Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.999E-01		41G	
****	(59.54)	0.359000	0.01179	0.238	5.636E+01	s	<	6.669E-01

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8811   GLS  5      G-5 JR 297.670  7  273.13 MIN    38.07000 GR      669
 IBR=TTIH  REF TIME= 268.657  7        100 mL in Jar (temp)
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Group	8811	Time of count	297.670 2007
Sample	5	Reference GMT	268.657 2007
Element		Elapsed Live Tm	273.1333
Type code	GLS	Dead Time Pct	0.012202
ID	8:45 26-SEP-07	Background GMT	293.973 2007
Geometry, detector	JR-5	Standard GMT	297.655 2007
Aliquot	38.07	Days since TO	29.01306
Unit of Aliquot	GRAM	Time on	9:04 PDT 24-OCT
Data Sheet Units	PCI /GRAM	Time off	13:38 PDT 24-OCT
Library	TTIH	Calc Time	13:18 24-OCT-07
Slope	1.003417	Width slope	0.007905
Intercept	2.21714	Width offset	0.402820
X**2 TERM	-0.16101316E-05	Sensitivity	4.

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 NP:[7,67]669.GSP                  10 PEAKS
```

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	27.7	22	8	236	2.87	162	25.4	5.93E-01	19.00.	169	0	0.00
2	0	92.6	87	7	398	1.50	142	90.1	5.18E-01	25.2	3.50	0	0.00
3	0	185.7	181	6	301	1.44	93	182.9	3.40E-01	32.1	3.42	0	0.00
4	0	239.7	233	7	286	1.24	36	236.8	1.31E-01	78.8	2.76	0	0.00
5	0	351.7	346	7	136	2.61	34	348.5	1.24E-01	61.6	1.97	0	0.00
6	0	511.6	504	11	111	3.27	175	508.1	6.42E-01	14.8	1.35	0	0.00
7	0	609.4	602	9	100	1.65	29	605.7	1.05E-01	65.2	1.17	0	0.00
8	0	911.4	903	9	25	1.94	34	907.4	1.25E-01	35.90.	809	0	0.00
9	0	1402.5	1396	5	2	1.61	12	1398.6	4.21E-02	40.60.	529	0	0.00
10	0	1461.2	1448	18	14	3.79	105	1457.4	3.86E-01	14.70.	510	0	0.00

```
FWHM=SQRT( 3.87077E+00 +  2.82275E-03 *E)

BACKGROUND INFO 8811    GLS   5        297.670  7 G- 5     BG DATE 293.973  7
```

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
92.61	0.5185	25.21	92.00	0.3529	9.04	0.1656	81.28
185.70	0.3397	32.13	186.00	0.2475	14.47	0.0922	124.54R
239.73	0.1313	78.83	238.60	0.2828	16.55	-0.1515	75.01R
351.70	0.1242	61.60	351.90	0.0608	60.18	0.0633	133.86R
511.62	0.6422	14.78	511.00	0.6150	5.89	0.0272	373.27R
609.43	0.1053	65.20	609.30	0.0543	25.41	0.0510	137.27R
911.37	0.1250	35.89	911.10	0.0760	32.12	0.0490	104.17R
1461.18	0.3860	14.71	1460.80	0.2470	6.60	0.1389	42.51

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    6 PEAKS REJECTED BY BACKGROUND

INTERFERING ISOTOPE ANALYSIS 8811    GLS   5        297.670  7 G- 5
PANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 8811 5 GLS RUN AT 297.670/2007

BACKGROUND FOR GELI DETECTOR 5 OF 293.973/2007 2375.1 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0435	35.85	511.0	0.6150	5.89	1120.3	0.0189	7.93
92.0	0.3529	9.04	583.1	0.0844	22.15	1173.2	0.0204	0.00
143.0	0.0872	0.00	609.3	0.0543	25.41	1238.1	0.0123	0.00
186.0	0.2475	14.47	661.6	0.0238	0.00	1332.5	0.0196	0.00
198.0	0.0979	42.81	727.2	0.0233	0.00	1377.7	0.0257	0.00
238.6	0.2828	16.55	846.0	0.0366	39.32	1460.8	0.2470	6.60
279.0	0.0510	0.00	860.4	0.0351	0.00	1586.0	0.0565	0.00
295.2	0.0708	0.00	911.1	0.0760	32.12	1591.3	0.0321	0.00
338.4	0.0661	22.23	968.9	0.0464	38.18	1729.6	0.0145	0.00
351.9	0.0608	60.18	1001.0	0.0429	0.00	1764.5	0.0322	40.99

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 10/24/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
237.835	7	0.7685	9.509	32. NG
237.932	7	1.0341	2.167	32.
244.938	7	0.9271	3.606	33.
247.727	7	0.9096	5.110	24.
258.802	7	0.8496	4.322	24. NG
272.749	7	1.0075	4.369	28.
279.774	7	0.9970	2.523	33.
286.742	7	1.0010	3.162	24.
293.728	7	0.9885	1.743	21.
77.655	7	1.0132	2.694	18.
AVERAGE		0.9848	0.043	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
130.842	6	1.0028	5.576	21.
92.687	7	0.9684	5.181	32.
96.820	7	0.9834	2.940	21.
133.833	7	0.9676	3.554	28.
154.021	7	0.9495	3.720	30.
237.968	7	0.9561	5.349	22.
247.756	7	0.9184	1.921	33.
256.871	7	0.9518	4.083	37. NG
258.825	7	0.9210	4.231	27.
265.838	7	0.9645	5.696	35.
AVERAGE		0.9584	0.026	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 297.655 7
ENERGY= 2.217140 + 1.0034167*CH + -1.610132E-06*CH**2
FWHM =SQRT(0.4028 + 0.007905*ENERGY) (CO60= 3.307)

EFFICIENCIES FOR GEOMETRY JR 5 CALIBRATED 50.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.488400	100.0	3.779100	300.0	2.226900	0.0	0.000000
55.0	0.821500	110.0	3.988900	500.0	1.374900	0.0	0.000000
60.0	1.216500	130.0	4.066100	700.0	1.016600	0.0	0.000000
65.0	1.641400	150.0	3.898500	1000.0	0.735300	0.0	0.000000
70.0	2.065800	170.0	3.639600	1400.0	0.529500		
80.0	2.827400	190.0	3.362900	2000.0	0.363500		
90.0	3.401900	250.0	2.649600	3000.0	0.240400		

8811 5 GLS GSTOR 669

	PK	ENERGY	CPM	%ERR	COMMENT
	1	27.7	0.59	19.0	
p	2	92.6	0.17	81.3	Th234s Th227s
	9	1402.5	0.04	40.6	Ra226
b	10	1461.2	0.14	42.5	K 40s
			REJECTED PEAKS		
B	3	185.7	0.09	99.9	Cs137c U 235s Ra226s
B	4	239.7	-0.15	75.0	Th228 Th228 Pb212s
B	5	351.7	0.06	99.9	Ra226s Pb214s
B	6	511.6	0.03	99.9	Th228 La140 Ru106 Na 22
B	7	609.4	0.05	99.9	Ru103 Ra226s Bi214s
B	8	911.4	0.05	99.9	Th232s Ac228s

8811 GLS 6 G-6 JR 297.863 7 197.47 MIN 61.44000 GR 309

LIBR=TTIH REF TIME= 269.941 7 100 mLs in JAR

Dw 10-24-97

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00722	0.622	7.833E+02 s		<r	5.743E+00
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 7.938E-01	3G		
**** (889.26)	1.000000	0.01119	0.279	2.498E+01 s		<	2.307E-01
**** (1120.52)	1.000000	0.00916	0.360	3.934E+01 s		<r	3.633E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.900E-01	4G		
**** (1173.21)	0.999200	0.00879	0.314	3.571E+01 s		<	2.644E-01
**** (1332.48)	1.000000	0.00785	0.271	3.450E+01 s		<	2.555E-01
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 7.251E-01	16G		
**** (1691.00)	0.457000	0.00631	0.172	5.961E+01 s		<	6.028E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.982E-01	3G		
**** (661.64)	0.851000	0.01431	0.373	3.066E+01 s		<	2.252E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.960E-01	48G		
**** (121.78)	0.254000	0.04988	0.638	5.035E+01 s		<	3.706E-01
295 (295.97)	0.004000	0.02688	0.523	4.862E+03	44.56%		3.579E+01
*** (344.31)	0.245000	0.02391	0.481	8.206E+01 s		<	6.040E-01
*** (963.36)	0.132000	0.01045	0.326	2.365E+02 s		<	1.741E+00
**** (1112.04)	0.124000	0.00922	0.307	2.686E+02 s		<	1.977E+00
**** (1408.02)	0.198000	0.00747	0.226	1.526E+02 s		<	1.124E+00
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.938E-01	48G		
**** (123.07)	0.390000	0.04958	0.632	3.269E+01 s		<	2.412E-01
**** (723.26)	0.202000	0.01331	0.354	1.315E+02 s		<	9.698E-01
**** (1004.75)	0.170000	0.01008	0.314	1.829E+02 s		<	1.350E+00
**** (1274.49)	0.336000	0.00816	0.243	8.871E+01 s		<	6.545E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 7.699E-01	22G		
295 (295.95)	0.290900	0.02688	0.523	6.689E+01	44.56%		6.370E-01
**** (316.50)	0.830700	0.02553	0.505	2.381E+01 s		<	2.267E-01
**** (468.06)	0.476000	0.01885	0.394	4.389E+01 s		<	4.179E-01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
**** (583.14)	0.860000	0.01583	0.468	3.433E+01 s		<r	2.517E-01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
47 (46.50)	0.040000	0.04546	1.705	9.376E+02 s	16.29%		6.874E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
295 (295.10)	0.000240	0.02694	0.523	8.085E+04	44.56%		5.928E+02
**** (727.17)	0.066500	0.01325	0.356	4.039E+02 s		<r	2.961E+00
212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
*** (238.63)	0.431000	0.03160	0.714	5.242E+01 s		<r	3.843E-01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G		
**** (609.30)	0.470000	0.01528	0.508	7.070E+01 s		<r	5.183E-01

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Pb214    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 23G
  53 (  53.20)    0.022000    0.05819        0.319  2.490E+02   59.54%  1.826E+00
 295 ( 295.20)    0.190000    0.02693        0.523  1.022E+02   44.56%  7.489E-01
**** ( 352.00)    0.360000    0.02351        0.598  7.072E+01 s      <r 5.185E-01

Ra226    5.851E+05 DAYS      LAMBDA= 1.185E-06     DECAY= 1.000E+00 48G
**** ( 186.10)    0.040000    0.03787        0.698  4.610E+02 s      <  3.380E+00
 295 ( 295.20)    0.201000    0.02693        0.523  9.656E+01   44.56%  7.080E-01
**** ( 351.96)    0.393000    0.02351        0.598  6.478E+01 s      <r 4.749E-01
**** ( 609.32)    0.484000    0.01529        0.508  6.866E+01 s      <r 5.034E-01

Th227    7.951E+03 DAYS      LAMBDA= 8.718E-05     DECAY= 9.976E-01 48G
**** (  49.80)    0.087000    0.05585        0.510  1.049E+02 s      <  7.708E-01
  63 (  62.50)    0.002500    0.06059        0.510  3.367E+03   49.76%  2.475E+01
**** (  79.70)    0.018000    0.05957        0.578  5.388E+02 s      <  3.960E+00
**** (  94.00)    0.013500    0.05657        0.697  9.126E+02 s      <  6.707E+00
**** ( 210.60)    0.012600    0.03464        0.607  1.392E+03 s      <  1.023E+01
**** ( 236.00)    0.115000    0.03186        0.695  1.898E+02 s      <  1.395E+00
**** ( 254.70)    0.009100    0.03010        0.598  2.182E+03 s      <  1.603E+01
**** ( 256.20)    0.063000    0.02997        0.553  2.930E+02 s      <  2.153E+00
**** ( 285.60)    0.016500    0.02761        0.532  1.167E+03 s      <  8.575E+00
**** ( 300.00)    0.018900    0.02660        0.485  9.644E+02 s      <  7.088E+00
**** ( 304.40)    0.013500    0.02631        0.505  1.422E+03 s      <  1.045E+01
**** ( 329.90)    0.029000    0.02472        0.518  7.224E+02 s      <  5.309E+00
**** ( 334.40)    0.011500    0.02446        0.515  1.831E+03 s      <  1.346E+01

Ac228    5.133E+12 DAYS      LAMBDA= 1.350E-13     DECAY= 1.000E+00 41G
**** ( 911.10)    0.250000    0.01096        0.391  1.426E+02 s      <r 1.046E+00

Th230    2.812E+07 DAYS      LAMBDA= 2.465E-08     DECAY= 1.000E+00  8G
**** (  68.00)    0.005900    0.06080        0.621  1.731E+03 s      <  1.269E+01

Th232    5.113E+12 DAYS      LAMBDA= 1.356E-13     DECAY= 1.000E+00 42G
**** ( 911.10)    0.250000    0.01096        0.391  1.426E+02 s      <r 1.046E+00
**** ( 968.90)    0.150000    0.01040        0.349  2.240E+02 s      <r 1.642E+00
**** (  63.81)    0.010101    0.06071        0.646  1.053E+03 s      <  7.723E+00

Th234    1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 10G
**** (  92.30)    0.999999    0.05697        0.653  1.147E+01 s      <  8.408E-02

Pa234m   1.633E+12 DAYS      LAMBDA= 4.245E-13     DECAY= 1.000E+00 48G
**** (1001.03)    0.006000    0.01012        0.341  5.618E+03 s      <  4.119E+01

U 235    2.571E+11 DAYS      LAMBDA= 2.696E-12     DECAY= 1.000E+00 34G
  73 (  72.81)    0.004000    0.06051        3.734  1.543E+04    8.37%  1.131E+02
  85 (  84.24)    0.051000    0.05873        3.806  1.271E+03    8.42%  9.316E+00
**** ( 143.78)    0.132600    0.04511        0.633  1.058E+02 s      <  7.754E-01
**** ( 185.72)    0.540000    0.03792        0.698  3.410E+01 s      <  2.500E-01

Am241    1.582E+05 DAYS      LAMBDA= 4.381E-06     DECAY= 9.999E-01 41G
**** (  59.54)    0.359000    0.06016        0.571  2.645E+01 s      <  1.940E-01
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8811    GLS   6        G-6 JR 297.863  7  197.47 MIN    61.4400 GR        309
LIBR=TTIH   REF TIME= 269.941   7        100 mLs in JAR
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* Group	8811	* Time of count	297.863 2007 *
* Sample	6	* Reference GMT	269.941 2007 *
* Element		* Elapsed Live Tm	197.4667 *
* Type code	GLS	* Dead Time Pct	0.033749 *
* ID	021-344-CL-001	* Background GMT	293.973 2007 *
* Geometry, detector	JR-6	* Standard GMT	296.660 2007 *
* Aliquot	61.44	* Days since TO	27.92209 *
* Unit of Aliquot	GRAM	* Time on	13:42 PDT 24-OCT *
* Data Sheet Units	PCI /GRAM	* Time off	17:00 PDT 24-OCT *
* Library	TTIH	* Calc Time	10:58 25-OCT-07 *
* Slope	0.993171	* Width slope	0.017551 *
* Intercept	1.648023	* Width offset	0.0 *
* X**2 TERM	-0.15901592E-05	* Sensitivity	4. *

NP: [7,67]309.GSP 22 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	6	23.0	20	8	23	2.12	162	21.5	8.20E-01	7.10.	097	0	27.90
2	6	26.0	20	8	298	2.12	164	24.5	8.29E-01	20.30.	141	0	0.00
3	0	31.7	28	5	472	1.98	66	30.2	3.34E-01	52.50.	254	0	0.00
4	0	46.6	41	8	843	2.08	337	45.3	1.71E+00	16.30.	811	0	0.00
5	0	52.8	50	5	601	1.78	63	51.6	3.19E-01	59.5	5.84	0	0.00
6	4	63.2	58	22	792	1.93	194	62.0	9.80E-01	24.3	6.06	0	10.80
7	4	72.7	58	22	790	1.92	737	71.5	3.73E+00	8.4	6.04	0	0.00
8	4	75.0	58	22	790	1.83	1395	73.8	7.06E+00	4.5	6.01	0	0.00
9	8	84.8	80	16	1040	2.66	751	83.7	3.81E+00	8.4	5.85	0	16.60
10	8	90.3	80	16	1026	2.66	168	89.3	8.52E-01	36.4	5.74	0	0.00
11	0	239.4	235	10	963	1.82	338	239.4	1.71E+00	18.2	3.16	0	0.00
12	0	295.0	292	8	474	2.49	204	295.5	1.03E+00	20.9	2.70	0	0.00
13	0	352.0	349	9	510	1.83	224	353.0	1.13E+00	19.2	2.40	0	0.00
14	0	511.0	507	13	373	3.01	541	513.3	2.74E+00	8.8	1.77	0	0.00
15	0	582.0	578	13	355	2.98	136	584.9	6.90E-01	29.9	1.60	0	0.00
16	0	609.1	609	7	139	3.11	282	612.3	1.43E+00	9.5	1.55	0	0.00
17	0	727.1	729	5	84	1.08	50	731.3	2.52E-01	32.0	1.33	0	0.00
18	0	911.9	911	14	204	3.49	116	917.9	5.89E-01	29.0	1.11	0	0.00
19	0	969.3	969	15	189	2.76	90	975.8	4.54E-01	35.0	1.04	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1120.4	1122	13	146	3.55	91	1128.5	4.63E-01	31.50.	925	0	0.00
21	0	1461.3	1466	18	57	4.70	638	1473.1	3.23E+00	5.20.	726	0	0.00
22	0	1763.7	1770	17	37	6.77	93	1779.2	4.70E-01	21.10.	616	0	0.00

FWHM=SQRT(1.51820E+00 + 1.52317E-02 *E)

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BACKGROUND INFO 8811    GLS   6        297.863  7 G- 6      BG DATE 293.973  7
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PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
63.19	0.9804	24.25	62.00	0.4703	18.88	0.5101	49.76
90.30	0.8519	36.37	92.00	0.8386	13.26	0.0133	******R
239.37	1.7097	18.19	238.60	1.3239	20.54	0.3857	107.08R
295.04	1.0319	20.86	295.20	0.5092	17.50	0.5227	44.56
352.03	1.1319	19.18	351.90	1.0994	14.60	0.0324	832.12R
511.04	2.7385	8.80			5.13	-0.0146	******R

```
 582.03     0.6902 29.93        583.10   0.6798 19.34          0.0104******R
 609.12     1.4266  9.51        609.30   1.2711  9.44          0.1555116.46R
 727.11     0.2524 32.00        727.20   0.1624 18.65          0.0899 95.91R
 911.91     0.5890 29.04        911.10   0.5607 10.95          0.0283642.24R
 969.26     0.4538 34.97        968.90   0.4928 12.54         -0.0389437.60R
1120.37     0.4628 31.49       1120.30   0.4474 10.44          0.0155990.13R
1461.26     3.2297  5.25       1461.00   4.0878  9.04         -0.8581 47.36R
1763.66     0.4699 21.09       1764.50   0.4580 11.46          0.0119946.28R
   12 PEAKS REJECTED BY BACKGROUND

*************************************************************************************
BACKGROUND INFO 8811    GLS   6        297.863  7 G- 6     BG DATE 293.973  7
*************************************************************************************

v--------PEAK---------v     v------BACKGROUND------v     v-------NET----v
ENERGY       CPM  %ERROR     ENERGY       CPM  %ERROR        CPM  %ERROR

  63.19     0.9804 24.25        62.00   0.4703 18.88          0.5101 49.76
  90.30     0.8519 36.37        92.00   0.8386 13.26          0.0133******R
 239.37     1.7097 18.19       238.60   1.3239 20.54          0.3857107.08R
 295.04     1.0319 20.86       295.20   0.5092 17.50          0.5227 44.56
 352.03     1.1319 19.18       351.90   1.0994 14.60          0.0324832.12R
 511.04     2.7385  8.80       511.00   2.7531  5.13         -0.0146******R
 582.03     0.6902 29.93       583.10   0.6798 19.34          0.0104******R
 609.12     1.4266  9.51       609.30   1.2711  9.44          0.1555116.46R
 727.11     0.2524 32.00       727.20   0.1624 18.65          0.0899 95.91R
 911.91     0.5890 29.04       911.10   0.5607 10.95          0.0283642.24R
 969.26     0.4538 34.97       968.90   0.4928 12.54         -0.0389437.60R
1120.37     0.4628 31.49      1120.30   0.4474 10.44          0.0155990.13R
1461.26     3.2297  5.25      1461.00   4.0878  9.04         -0.8581 47.36R
1763.66     0.4699 21.09      1764.50   0.4580 11.46          0.0119946.28R
   12 PEAKS REJECTED BY BACKGROUND

*************************************************************************************
INTERFERING ISOTOPE ANALYSIS 8811    GLS   6        297.863  7 G- 6
*************************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 8811 6 GLS RUN AT 297.863/2007

BACKGROUND FOR GELI DETECTOR 6 OF 293.973/2007 2375.3 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4703	18.88	511.0	2.7531	5.13	1120.3	0.4474	10.44
92.0	0.8386	13.26	583.1	0.6798	19.34	1173.2	0.0379	0.00
143.0	0.1882	0.00	609.3	1.2711	9.44	1238.1	0.1917	21.55
186.0	0.5109	12.90	661.6	0.1491	57.09	1332.5	0.0658	8.97
198.0	0.1669	0.00	727.2	0.1624	18.65	1337.7	0.0000	0.00
238.6	1.3239	20.54	846.0	0.0507	0.00	1461.0	4.0878	9.04
279.0	0.1161	0.00	860.4	0.1069	25.62	1586.0	0.0773	0.00
295.2	0.5092	17.50	911.1	0.5607	10.95	1591.0	0.1828	22.75
338.4	0.2610	21.49	968.9	0.4928	12.54	1729.6	0.1171	19.14
351.9	1.0994	14.60	1001.0	0.0936	0.00	1764.5	0.4580	11.46

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 10/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
223.821	7	0.9971	14.563	22.
230.795	7	1.0016	13.550	25.
237.814	7	1.0021	13.672	25.
244.906	7	0.9920	12.742	24.
258.758	7	0.9774	13.193	24.
265.838	7	1.0076	13.473	34.
272.710	7	0.9943	13.548	26.
79.758	7	0.9902	15.691	21.
36.761	7	0.9816	13.627	22.
93.712	7	0.9749	14.993	21.
AVERAGE		0.9919	0.011	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
69.906	7	1.3635	14.524	20.
76.810	7	1.3438	13.154	35.
81.696	7	1.3658	13.879	25.
104.028	7	1.3821	15.760	22.
110.905	7	0.9898	14.446	38. *
124.980	7	0.9907	14.749	36. *
133.855	7	0.9852	15.294	24. *
154.043	7	0.9860	15.339	32. *
216.995	7	1.0022	16.665	21. *
296.660	7	0.9851	15.434	21. *
AVERAGE		0.9898	0.007	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 296.660 7
ENERGY= 1.648023 + 0.9931715*CH + -1.590159E-06*CH**2
FWHM =SQRT(-2.1716 + 0.017551*ENERGY) (C060= 4.606)

EFFICIENCIES FOR GEOMETRY JR 6 CALIBRATED 29.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.652300	100.0	5.512700	300.0	2.660400	0.0	0.000000
55.0	5.891700	110.0	5.268400	500.0	1.792700	0.0	0.000000
60.0	6.024200	130.0	4.801100	700.0	1.368100	0.0	0.000000
65.0	6.077200	150.0	4.388400	1000.0	1.012600	0.0	0.000000
70.0	6.072400	170.0	4.034000	1400.0	0.750900		
80.0	5.951400	190.0	3.731100	2000.0	0.541800		
90.0	5.748900	250.0	3.052100	3000.0	0.379700		

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	23.0	0.82	7.1		
	2	26.0	0.83	20.3		
	3	31.7	0.33	52.5		
	4	46.6	1.71	16.3		Pb210s
	5	52.8	0.32	59.5		
b	6	63.2	0.51	49.8		Th232s
	7	72.7	3.73	8.4		
	8	75.0	7.06	4.5		
	9	84.8	3.81	8.4		
b	12	295.0	0.52	44.6	Ra226	Ru103
			REJECTED PEAKS			
B	10	90.3	0.01	99.9		
B	11	239.4	0.39	99.9	Th228	Pb212s
B	13	352.0	0.03	99.9		Ra226s Pb214s
B	14	511.0	-0.01	99.9	Ac228 Th228	La140 Ru106 Na 22
B	15	582.0	0.01	99.9	Th228	Tl208s
B	16	609.1	0.16	99.9		Ru103 Ra226s Bi214s
B	17	727.1	0.09	95.9	Ac228 Th228	Bi212s
B	18	911.9	0.03	99.9		Th232s Ac228s
B	19	969.3	-0.04	99.9	Ac228	Sb124 Th232s
B	20	1120.4	0.02	99.9	Ra226	Sc 46s
B	21	1461.3	-0.86	47.4		K 40s
B	22	1763.7	0.01	99.9	Ra226	

8811 GLS 7 G-7 JR 297.863 7 197.63 MIN 1.00000 SM 310

IBR=TTIH REF TIME= 297.863 7 100 mLs in Parkway Jar

CN 10-24-07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G		
**** (1460.85)	0.110000	0.00609	0.138	2.066E+02 s	<	9.304E+01
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 1.000E+00 3G		
**** (889.26)	1.000000	0.01014	0.288	2.843E+01 s	<	1.281E+01
**** (1120.52)	1.000000	0.00806	0.257	3.194E+01 s	<	1.439E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 1.000E+00 4G		
1173 (1173.21)	0.999200	0.00768	8.606	1.121E+03 s 2.69%		5.050E+02
1333 (1332.48)	1.000000	0.00672	7.613	1.133E+03 s 2.70%		5.103E+02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 1.000E+00 16G		
**** (1691.00)	0.457000	0.00518	0.105	4.437E+01 s	<	1.999E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 1.000E+00 3G		
662 (661.64)	0.851000	0.01334	13.298	1.171E+03 s 2.26%		5.275E+02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 1.000E+00 48G		
*** (121.78)	0.254000	0.04799	0.463	3.797E+01 s	<	1.710E+01
*** (344.31)	0.245000	0.02289	0.363	6.470E+01 s	<	2.914E+01
*** (963.36)	0.132000	0.00939	0.308	2.483E+02 s	<	1.119E+02
**** (1112.04)	0.124000	0.00812	0.265	2.632E+02 s	<	1.186E+02
**** (1408.02)	0.198000	0.00634	0.124	9.894E+01 s	<	4.457E+01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 1.000E+00 48G		
**** (123.07)	0.390000	0.04770	0.462	2.484E+01 s	<	1.119E+01
**** (723.26)	0.202000	0.01233	0.267	1.073E+02 s	<	4.835E+01
**** (1004.75)	0.170000	0.00901	0.285	1.862E+02 s	<	8.389E+01
**** (1274.49)	0.336000	0.00704	0.129	5.452E+01 s	<	2.456E+01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 1.000E+00 22G		
**** (316.50)	0.830700	0.02447	0.367	1.806E+01 s	<	8.135E+00
**** (468.06)	0.476000	0.01791	0.376	4.405E+01 s	<	1.984E+01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 19G		
**** (583.14)	0.860000	0.01489	0.326	2.546E+01 s	<	1.147E+01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 1G		
**** (46.50)	0.040000	0.04040	0.720	4.452E+02 s	<	2.005E+02
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 22G		
**** (727.17)	0.066500	0.01226	0.279	3.421E+02 s	<	1.541E+02
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 4G		
*** (238.63)	0.431000	0.03035	0.500	3.819E+01 s	<	1.720E+01
i214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G		
609 (609.30)	0.470000	0.01434	0.428	6.352E+01 s37.79%		2.861E+01
Pb214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 23G		
352 (352.00)	0.360000	0.02249	0.377	4.659E+01 s47.52%		2.099E+01

Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00 48G			
****	(186.10)	0.040000	0.03642	0.490	3.362E+02 s		<	1.514E+02
352	(351.96)	0.393000	0.02250	0.377	4.268E+01 s	47.52%		1.922E+01
609	(609.32)	0.484000	0.01434	0.428	6.168E+01 s	37.79%		2.778E+01
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 1.000E+00 48G			
49	(49.80)	0.087000	0.04963	1.477	3.422E+02 s	26.84%		1.541E+02
****	(79.70)	0.018000	0.05657	0.513	5.033E+02 s		<	2.267E+02
****	(94.00)	0.013500	0.05416	0.523	7.153E+02 s		<	3.222E+02
****	(210.60)	0.012600	0.03330	0.460	1.097E+03 s		<	4.942E+02
****	(236.00)	0.115000	0.03061	0.461	1.310E+02 s		<	5.900E+01
****	(254.70)	0.009100	0.02890	0.476	1.808E+03 s		<	8.146E+02
****	(256.20)	0.063000	0.02877	0.432	2.384E+02 s		<	1.074E+02
****	(285.60)	0.016500	0.02649	0.455	1.042E+03 s		<	4.693E+02
****	(300.00)	0.018900	0.02551	0.432	8.949E+02 s		<	4.031E+02
****	(304.40)	0.013500	0.02522	0.413	1.211E+03 s		<	5.457E+02
****	(329.90)	0.029000	0.02368	0.397	5.780E+02 s		<	2.604E+02
****	(334.40)	0.011500	0.02343	0.371	1.376E+03 s		<	6.198E+02
352	(350.50)	0.000800	0.02257	0.377	2.090E+04	47.52%		9.412E+03
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00 41G			
****	(911.10)	0.250000	0.00991	0.339	1.369E+02 s		<	6.164E+01
Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00 8G			
****	(68.00)	0.005900	0.05696	0.532	1.583E+03 s		<	7.132E+02
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00 42G			
****	(911.10)	0.250000	0.00991	0.339	1.369E+02 s		<	6.164E+01
****	(968.90)	0.150000	0.00934	0.308	2.198E+02 s		<	9.899E+01
***	(63.81)	0.010101	0.05644	0.521	9.145E+02 s		<	4.119E+02
Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 10G			
****	(92.30)	0.999999	0.05450	0.542	9.939E+00 s		<r	4.477E+00
Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00 48G			
****	(1001.03)	0.006000	0.00904	0.278	5.124E+03 s		<	2.308E+03
U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00 34G			
60	(58.60)	0.001000	0.05505	23.862	4.335E+05	1.97%		1.953E+05
****	(143.78)	0.132600	0.04342	0.423	7.356E+01 s		<	3.313E+01
****	(185.72)	0.540000	0.03647	0.490	2.487E+01 s		<	1.120E+01
Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00 41G			
60	(59.54)	0.359000	0.05537	23.862	1.200E+03 s	1.97%		5.407E+02

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8811    GLS   7        G-7 JR 297.863  7  197.63 MIN     1.00000 SM       310
 IBR=TTIH  REF TIME= 297.863  7       100 mLs in Parkway Jar
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* Group.......................... 8811 * Time of count          297.863 2007 *
* Sample.......................... 7 * Reference GMT........ 297.863 2007 *
* Element.......................... * Elapsed Live Tm.......... 197.6333 *
* Type code...................... GLS * Dead Time Pct............ 0.016863 *
* ID.................. QC-LCS #62969 * Background GMT....... 293.973 2007 *
* Geometry, detector........... JR-7 * Standard GMT......... 297.640 2007 *
* Aliquot.......................... 1. * Days since TO.................. 0.0 *
* Unit of Aliquot.............. SMPL * Time on.......... 13:42 PDT 24-OCT *
* Data Sheet Units........ PCI /SMPL * Time off......... 17:00 PDT 24-OCT *
* Library....................... TTIH * Calc Time......... 10:34 25-OCT-07 *
*****************************************************************************
* Slope...................... 1.00527 * Width slope.............. 0.003299 *
* Intercept................ 2.851349 * Width offset............. 1.920348 *
* X**2 TERM......... -0.11550892E-05 * Sensitivity.................... 4. *
  NP:[7,67]310.GSP                  14 PEAKS

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 PK  IT   ENRG  LEFT  WD  BKGND  FWHM   AREA   CHAN       CPM   ERR   EFF   K   FIT
  1   4   26.8    20  13    119  1.94    518   23.8  2.62E+00  7.30.154   0  20.50
  2   4   32.0    20  13    492  1.94    771   29.0  3.90E+00  6.00.263   0   0.00
  3   0   36.5    33   5    581  2.57     78   33.5  3.96E-01 48.00.389   0   0.00
  4   0   49.5    42   9   1915  2.37    292   46.4  1.48E+00 26.80.970   0   0.00
  5   0   59.6    53   8   1272  1.88   4716   56.5  2.39E+01  2.0 5.54   0   0.00
  6   0   70.1    64   7    587  2.32    130   66.9  6.59E-01 32.5 5.71   0   0.00
  7   0   92.5    86   8    559  1.84    154   89.2  7.81E-01 28.2 5.44   0   0.00
  8   0  351.5   344   8    343  2.73     99  347.0  5.02E-01 34.6 2.30   0   0.00
  9   0  510.5   499  12    345  2.67    245  505.3  1.24E+00 16.6 1.67   0   0.00
 10   0  609.0   598  11    210  5.40    106  603.4  5.36E-01 29.2 1.45   0   0.00
 11   0  661.7   650  12    215  1.96   2636  655.9  1.33E+01  2.3 1.34   0   0.00
 12   0 1173.3  1160  12     99  2.57   1708 1165.9  8.64E+00  2.70.778   0   0.00
 13   0 1230.5  1220   7     12  2.20     20 1222.9  9.87E-02 39.50.740   0   0.00
 14   0 1332.5  1318  12     27  2.55   1511 1324.7  7.64E+00  2.70.676   0   0.00
FWHM=SQRT( 5.95019E+00 +  2.29294E-03 *E)

*****************************************************************************
BACKGROUND INFO 8811    GLS   7        297.863  7 G- 7     BG DATE 293.973  7
*****************************************************************************

v---------PEAK---------v     v------BACKGROUND------v     v------NET----v
ENERGY       CPM  %ERROR       ENERGY       CPM  %ERROR          CPM  %ERROR

  92.48    0.7812 28.24         92.00  0.6088  7.38          0.1724130.60R
 351.50    0.5024 34.57        351.90  0.1251 35.64          0.3773 47.52
 510.52    1.2393 16.64        511.00  0.9979  5.07          0.2414 87.96R
 609.00    0.5362 29.22        609.30  0.1082 37.04          0.4280 37.79
 661.71   13.3359  2.25        661.60  0.0377 20.70         13.2982  2.26
1173.29    8.6446  2.67       1173.20  0.0387 23.52          8.6059  2.69
1332.54    7.6437  2.69       1332.50  0.0309 26.53          7.6128  2.70
    2 PEAKS REJECTED BY BACKGROUND

*****************************************************************************
INTERFERING ISOTOPE ANALYSIS 8811    GLS   7        297.863  7 G- 7
*****************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 8811 7 GLS RUN AT 297.863/2007

BACKGROUND FOR GELI DETECTOR 7 OF 293.973/2007 2375.4 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4556	28.67	511.0	0.9979	5.07	1120.3	0.0290	47.58
92.0	0.6088	7.38	583.1	0.0813	22.99	1173.2	0.0387	23.52
143.0	0.0548	35.22	609.3	0.1082	37.04	1238.1	0.0195	0.00
186.0	0.3178	13.15	661.6	0.0377	20.70	1332.5	0.0309	26.53
198.0	0.0611	25.20	727.2	0.0256	0.00	1377.7	0.0253	0.00
238.5	0.3161	14.40	846.0	0.0559	23.98	1461.0	0.0616	12.67
279.0	0.0000	0.00	860.4	0.0351	0.00	1586.0	0.0000	0.00
295.2	0.0874	42.58	911.1	0.0628	43.00	1591.0	0.0333	0.00
338.4	0.0809	31.15	968.9	0.0398	64.25	1729.6	0.0116	0.00
351.9	0.1251	35.64	1001.0	0.0417	34.54	1764.5	0.0206	33.53

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 7 ON 10/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
71.872	7	1.0395	11.486	39.
103.898	7	0.8806	8.120	30.
109.825	7	1.0019	9.030	22.
114.670	7	0.9891	8.186	29.
127.663	7	0.9841	7.790	44.
133.833	7	0.9924	7.542	27.
150.885	7	0.8859	11.264	14.
54.032	7	0.9734	5.981	22.
73.704	7	0.9383	4.693	21.
175.828	7	0.9978	8.266	38.
AVERAGE		0.9683	0.051	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
244.938	7	1.0507	12.319	35.
258.777	7	1.0466	12.929	31.
265.711	7	1.0175	9.504	24.
265.864	7	0.8918	13.018	40.
265.918	7	1.0084	7.775	28.
272.730	7	0.9982	8.611	25.
279.799	7	0.9945	7.713	22.
286.935	7	0.9403	6.326	24.
293.728	7	1.0060	8.861	22.
297.640	7	0.9180	8.162	21.
AVERAGE		1.0174	0.023	

CALIBRATION LINE FROM STANDARD FOR G- 7 OF 297.640 7
ENERGY= 2.851349 + 1.0052698*CH + -1.155089E-06*CH**2
FWHM =SQRT(1.9203 + 0.003300*ENERGY) (CO60= 2.513)

EFFICIENCIES FOR GEOMETRY JR 7 CALIBRATED 50.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.023100	100.0	5.287100	300.0	2.551200	0.0	0.000000
55.0	5.347200	110.0	5.062500	500.0	1.699100	0.0	0.000000
60.0	5.551400	130.0	4.620300	700.0	1.270100	0.0	0.000000
65.0	5.663400	150.0	4.223800	1000.0	0.905100	0.0	0.000000
70.0	5.706100	170.0	3.881400	1400.0	0.637600		
80.0	5.653400	190.0	3.588400	2000.0	0.429900		
90.0	5.494600	250.0	2.931100	3000.0	0.279600		

8811 7 GLS GSTOR 310

	PK	ENERGY	CPM	%ERR	COMMENT
	1	26.8	2.62	7.3	
	2	32.0	3.90	6.0	
	3	36.5	0.40	48.0	
	4	49.5	1.48	26.8	Th227s
	5	59.6	23.86	2.0	Am241s
	6	70.1	0.66	32.5	
b	8	351.5	0.38	47.5	Ra226s Pb214s
b	10	609.0	0.43	37.8	Ru103 Ra226s Bi214s
b	11	661.7	13.30	2.3	Cs137s
b	12	1173.3	8.61	2.7	Cs134+ Co 60s
	13	1230.5	0.10	39.5	
b	14	1332.5	7.61	2.7	Co 60s
			REJECTED PEAKS		
B	7	92.5	0.17	99.9	Th234s
B	9	510.5	0.24	88.0	Ac228 Th228 La140 Ru106 Na 22

8811 GLS 8 G-8 JR 297.863 7 197.73 MIN 1.00000 SM 311

IBR=TTIH REF TIME= 297.863 7 100ML IN PARKWAY JAR

10-24-07

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00870	0.591	6.169E+02 s		<T	2.779E+02
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 1.000E+00	3G		
**** (889.26)	1.000000	0.01312	0.279	2.127E+01 s		<	9.579E+00
**** (1120.52)	1.000000	0.01092	0.322	2.945E+01 s		<T	1.326E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 1.000E+00	4G		
1173 (1173.21)	0.999200	0.01051	0.281	2.677E+01 s	46.09%		1.206E+01
1333 (1332.48)	1.000000	0.00943	0.166	1.758E+01 s	53.42%		7.918E+00
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 1.000E+00	16G		
**** (1691.00)	0.457000	0.00763	0.153	4.388E+01 s		<	1.977E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 1.000E+00	3G		
661 (661.64)	0.851000	0.01635	0.240	1.725E+01 s	66.25%		7.770E+00
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 1.000E+00	48G		
**** (121.78)	0.254000	0.04555	0.621	5.370E+01 s		<	2.419E+01
*** (344.31)	0.245000	0.02585	0.451	7.127E+01 s		<	3.210E+01
**** (963.36)	0.132000	0.01234	0.299	1.836E+02 s		<	8.268E+01
**** (1112.04)	0.124000	0.01099	0.257	1.887E+02 s		<	8.498E+01
**** (1408.02)	0.198000	0.00899	0.225	1.266E+02 s		<	5.704E+01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 1.000E+00	48G		
**** (123.07)	0.390000	0.04559	0.608	3.417E+01 s		<	1.539E+01
**** (723.26)	0.202000	0.01534	0.304	9.806E+01 s		<	4.417E+01
**** (1004.75)	0.170000	0.01194	0.267	1.316E+02 s		<	5.926E+01
**** (1274.49)	0.336000	0.00980	0.220	6.688E+01 s		<	3.013E+01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 1.000E+00	22G		
**** (316.50)	0.830700	0.02768	0.471	2.051E+01 s		<	9.237E+00
**** (468.06)	0.476000	0.02081	0.399	4.029E+01 s		<	1.815E+01
Tl208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
**** (583.14)	0.860000	0.01788	0.419	2.722E+01 s		<T	1.226E+01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
**** (46.50)	0.040000	0.00599	0.559	2.332E+03 s		<	1.050E+03
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
**** (727.17)	0.066500	0.01527	0.317	3.119E+02 s		<	1.405E+02
1513 (1512.75)	0.003200	0.00844	0.130	4.828E+03		70.63%	2.175E+03
Pb212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
239 (238.63)	0.431000	0.03495	0.525	3.487E+01 s		60.13%	1.571E+01
Bi214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G		
**** (609.30)	0.470000	0.01732	0.458	5.620E+01 s		<T	2.532E+01
Pb214 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	23G		
352 (352.00)	0.360000	0.	3	3.531E+01 s		72.42%	1.591E+01

Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00		48G
****	(186.10)	0.040000	0.04006	0.686	4.280E+02 s		<T 1.928E+02
352	(351.96)	0.393000	0.02541	0.323	3.234E+01 s	72.42%	1.457E+01
***	(609.32)	0.484000	0.01732	0.458	5.458E+01 s		<T 2.458E+01
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 1.000E+00		48G
****	(49.80)	0.087000	0.00736	0.564	8.813E+02 s		< 3.970E+02
****	(79.70)	0.018000	0.03292	0.593	1.001E+03 s		< 4.511E+02
****	(94.00)	0.013500	0.04048	0.659	1.206E+03 s		<T 5.431E+02
****	(210.60)	0.012600	0.03749	0.617	1.307E+03 s		< 5.886E+02
****	(236.00)	0.115000	0.03519	0.657	1.624E+02 s		< 7.316E+01
****	(254.70)	0.009100	0.03346	0.535	1.756E+03 s		< 7.908E+02
****	(256.20)	0.063000	0.03331	0.535	2.548E+02 s		< 1.148E+02
****	(285.60)	0.016500	0.03034	0.508	1.015E+03 s		< 4.574E+02
****	(300.00)	0.018900	0.02895	0.496	9.073E+02 s		< 4.087E+02
****	(304.40)	0.013500	0.02860	0.490	1.270E+03 s		< 5.719E+02
****	(329.90)	0.029000	0.02675	0.452	5.826E+02 s		< 2.624E+02
****	(334.40)	0.011500	0.02646	0.449	1.475E+03 s		< 6.644E+02
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00		41G
****	(911.10)	0.250000	0.01288	0.335	1.039E+02 s		<T 4.681E+01
Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00		8G
****	(68.00)	0.005900	0.02362	0.610	4.376E+03 s		< 1.971E+03
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00		42G
****	(911.10)	0.250000	0.01288	0.335	1.039E+02 s		<T 4.681E+01
****	(968.90)	0.150000	0.01229	0.308	1.669E+02 s		<T 7.518E+01
***	(63.81)	0.010101	0.01977	0.603	3.018E+03 s		< 1.360E+03
Th234	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00		10G
****	(92.30)	0.999999	0.03980	0.618	1.553E+01 s		<T 6.997E+00
Pa234m	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00		48G
****	(1001.03)	0.006000	0.01198	0.266	3.701E+03 s		< 1.667E+03
U 235	2.571E+11 DAYS		LAMBDA= 2.696E-12		DECAY= 1.000E+00		34G
85	(84.24)	0.051000	0.03580	1.453	7.960E+02	13.98%	3.586E+02
****	(143.78)	0.132600	0.04479	0.634	1.067E+02 s		< 4.808E+01
****	(185.72)	0.540000	0.04011	0.641	2.958E+01 s		<T 1.332E+01
239	(240.93)	0.000700	0.03475	0.525	2.160E+04	60.13%	9.728E+03
Am241	1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 1.000E+00		41G
****	(59.54)	0.359000	0.01576	0.567	1.003E+02 s		< 4.518E+01

8811 GLS 8 G-8 JR 297.863 7 197.73 MIN 1.00000 SM 311

IBR=TTIH REF TIME= 297.863 7 100ML IN PARKWAY JAR

Group	8811	Time of count	297.863 2007
Sample	8	Reference GMT	297.863 2007
Element		Elapsed Live Tm	197.7333
Type code	GLS	Dead Time Pct	0.033704
ID	0 QC-BLANK #62970	Background GMT	293.842 2007
Geometry, detector	JR-8	Standard GMT	296.660 2007
Aliquot	1.	Days since TO	0.0
Unit of Aliquot	SMPL	Time on	13:42 PDT 24-OCT
Data Sheet Units	PCI /SMPL	Time off	17:00 PDT 24-OCT
Library	TTIH	Calc Time	10:34 25-OCT-07
Slope	0.981682	Width slope	0.006348
Intercept	0.265868	Width offset	1.937622
X**2 TERM	-0.13233024E-05	Sensitivity	4.

NP: [7,67]311.GSP 26 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	3	25.5	22	23	66	3.44	571	25.7	2.89E+00	6.20.	133	0	130.00
2	3	30.8	22	23	442	3.44	317	31.1	1.60E+00	17.30.	234	0	0.00
3	3	34.5	22	23	544	2.82	208	34.9	1.05E+00	22.30.	329	0	0.00
4	3	37.7	22	23	676	2.82	136	38.1	6.85E-01	33.90.	427	0	0.00
5	3	40.5	22	23	623	2.82	67	41.0	3.39E-01	55.90.	533	0	0.00
6	0	74.6	70	13	1511	3.46	896	75.7	4.53E+00	9.8	2.87	0	0.00
7	3	84.9	83	9	553	1.57	287	86.2	1.45E+00	14.0	3.58	0	1.02
8	3	87.4	83	9	445	1.47	85	88.8	4.30E-01	38.9	3.72	0	0.00
9	0	93.2	93	7	731	1.56	110	94.7	5.56E-01	42.7	3.99	0	0.00
10	0	185.6	186	7	797	1.59	113	188.8	5.73E-01	43.7	4.01	0	0.00
11	0	239.5	240	9	821	1.65	268	243.7	1.35E+00	20.8	3.49	0	0.00
12	0	295.3	298	5	325	1.23	85	300.6	4.29E-01	32.9	2.94	0	0.00
13	0	352.4	355	9	442	2.08	187	358.9	9.45E-01	22.6	2.63	0	0.00
14	0	511.0	513	15	446	3.03	566	520.7	2.86E+00	9.1	1.97	0	0.00
15	0	582.9	588	12	321	2.37	111	594.0	5.62E-01	34.4	1.81	0	0.00
16	0	609.5	617	8	197	2.15	181	621.1	9.18E-01	15.7	1.75	0	0.00
17	0	661.0	669	10	204	2.34	103	673.7	5.21E-01	28.8	1.65	0	0.00
18	0	911.1	923	13	190	2.18	99	929.0	5.02E-01	30.1	1.30	0	0.00
19	0	968.9	982	11	156	2.09	63	988.1	3.16E-01	42.6	1.23	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1119.8	1139	9	117	1.71	62	1142.1	3.14E-01	36.2	1.10	0	0.00
21	0	1173.2	1191	13	134	2.33	73	1196.8	3.68E-01	34.8	1.06	0	0.00
22	0	1239.6	1260	12	128	2.69	44	1264.6	2.24E-01	54.7	1.01	0	0.00
23	0	1332.7	1357	8	61	2.14	50	1359.8	2.51E-01	33.70.	948	0	0.00
24	0	1461.3	1483	17	64	3.62	590	1491.3	2.99E+00	5.40.	875	0	0.00
25	0	1513.3	1538	14	48	9.39	26	1544.4	1.30E-01	70.60.	851	0	0.00
26	0	1763.4	1793	15	48	3.57	94	1800.4	4.74E-01	20.50.	745	0	0.00

FWHM=SQRT(3.16171E+00 + 1.06062E-02 *E)

BACKGROUND INFO 8811 GLS 8 297.863 7 G- 8 BG DATE 293.842 7

PEAK			BACKGROUND			NET	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
93.20	0.5563	42.74	92.00	0.4490	12.08	-0.0927270.05R	
95.56	0.5735	43.68	221	3.88		0.0387658.41R	

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  239.45     1.3547  20.85        238.50   0.8294  17.05          0.5253  60.13
  295.25     0.4291  32.86        295.20   0.3006  21.09          0.1285120.34R
  352.43     0.9449  22.60        351.90   0.6220  15.32          0.3229  72.42
  511.04     2.8624   9.11        511.00   2.6304   3.55          0.2320119.37R
  582.95     0.5623  34.45        583.10   0.5114  17.64          0.0510419.26R
  609.49     0.9176  15.69        609.30   0.8336  14.55          0.0840224.10R
  661.02     0.5208  28.84        661.60   0.2809  18.55          0.2399  66.25
  911.09     0.5024  30.05        911.10   0.4992  11.98          0.0031******R
  968.93     0.3162  42.63        968.90   0.3292  25.73         -0.0130******R
 1119.76     0.3136  36.17       1120.30   0.3527  12.70         -0.0392311.36R
 1173.22     0.3675  34.81       1173.20   0.0865  23.36          0.2811  46.09
 1239.55     0.2239  54.68       1238.10   0.1429  27.44          0.0810158.65R
 1332.71     0.2508  33.68       1332.50   0.0850  31.28          0.1658  53.42
 1461.32     2.9857   5.40       1460.80   3.1818   9.03         -0.1961168.00R
 1763.37     0.4737  20.45       1764.50   0.3667   9.63          0.1071  96.30R
    12 PEAKS REJECTED BY BACKGROUND

**********************************************************************************
INTERFERING ISOTOPE ANALYSIS 8811    GLS   8        297.863  7 G- 8
**********************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 8811 8 GLS RUN AT 297.863/2007

BACKGROUND FOR GELI DETECTOR 8 OF 293.842/2007 2563.2 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.1894	26.82	511.0	2.6304	3.55	1173.2	0.0865	23.36
92.0	0.6490	12.08	583.1	0.5114	17.64	1238.1	0.1429	27.44
143.0	0.1599	0.00	609.3	0.8336	14.55	1332.5	0.0850	31.28
186.0	0.5348	8.88	661.6	0.2809	18.55	1377.7	0.0911	24.91
198.0	0.1406	36.78	727.2	0.1464	25.76	1460.8	3.1818	9.03
238.5	0.8294	17.05	860.0	0.0834	16.18	1586.0	0.1222	0.00
279.0	0.1577	0.00	911.1	0.4992	11.98	1591.0	0.1235	37.00
295.2	0.3006	21.09	968.9	0.3292	25.73	1729.6	0.0765	28.64
338.4	0.2006	33.75	1001.0	0.0552	17.04	1764.5	0.3667	9.63
351.9	0.6220	15.32	1120.3	0.3527	12.70	0.0	0.0000	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 8 ON 10/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
322.789	5	0.8727	17.160	43.*
322.825	5	0.8755	17.370	41.*
352.103	5	0.8703	18.548	21.*
355.939	5	0.8663	19.048	20.*
58.691	6	0.9079	17.307	83.*
312.732	6	0.8798	18.209	22.*
146.689	7	0.9437	22.807	27.
53.871	7	0.9404	23.280	21.
72.776	7	1.0035	20.890	19.
296.660	7	1.0166	22.559	17.
AVERAGE		0.9761	0.040	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
230.814	7	1.0609	16.105	21.
235.924	7	1.0859	16.521	23.
237.814	7	1.0688	16.230	26.
244.906	7	1.0631	16.854	25.
258.758	7	1.0718	16.115	25.
265.894	7	1.0763	16.178	23.
272.710	7	1.1426	21.341	27. NG
279.758	7	1.0651	17.056	22. NG
286.721	7	1.0649	16.828	28.
293.712	7	1.0683	16.355	22.
AVERAGE		1.0694	0.008	

CALIBRATION LINE FROM STANDARD FOR G- 8 OF 296.660 7
ENERGY= 0.265868 + 0.9816827*CH + -1.323302E-06*CH**2
FWHM =SQRT(1.9376 + 0.006348*ENERGY) (CO60= 3.224)

EFFICIENCIES FOR GEOMETRY JR 8 CALIBRATED 155.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.745100	100.0	4.245900	300.0	2.895100	0.0	0.000000
55.0	1.159800	110.0	4.454100	500.0	1.999200	0.0	0.000000
60.0	1.619100	130.0	4.554100	700.0	1.571400	0.0	0.000000
65.0	2.087900	150.0	4.421700	1000.0	1.198900	0.0	0.000000
70.0	2.537700	170.0	4.201800	1400.0	0.903800		
80.0	3.312100	190.0	3.958600	2000.0	0.656700		
90.0	3.878100	250.0	3.393800	3000.0	0.478800		

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	25.5	2.89	6.2		
	2	30.8	1.60	17.3	NO GEN.	
	3	34.5	1.05	22.3		
	4	37.7	0.69	33.9		
	5	40.5	0.34	55.9		Ru103
	6	74.6	4.53	9.8		
	7	84.9	1.45	14.0		Cs136
	8	87.4	0.43	38.9		Cs136 Cd109
b	11	239.5	0.53	60.1	Th228 Th228	Pb212s
b	13	352.4	0.32	72.4		Ra226s Pb214s
b	17	661.0	0.24	66.3		Cs137s
b	21	1173.2	0.28	46.1		Cs134+ Co 60s
b	23	1332.7	0.17	53.4		Ag110 Co 60s
	25	1513.3	0.13	70.6	Th228	
			REJECTED PEAKS			
B	9	93.2	-0.09	99.9		Th234s Th227s
B	10	185.6	0.04	99.9		Cs137c U 235s Ra226s
B	12	295.3	0.13	99.9	Ra226	Ru103
B	14	511.0	0.23	99.9	Ac228 Th228	La140 Ru106 Na 22
B	15	582.9	0.05	99.9	Th228	Tl208s
B	16	609.5	0.08	99.9		Ru103 Ra226s Bi214s
B	18	911.1	0.00	99.9		Th232s Ac228s
B	19	968.9	-0.01	99.9	Ac228	Sb124 Th232s
B	20	1119.8	-0.04	99.9	Ra226	Sc 46s
	22	1239.6	0.08	99.9	Ra226	
	24	1461.3	-0.20	99.9		K 40s
	26	1763.4	0.11	96.3	Ra226	

8811 GLS 9 G-1 JR 297.863 7 197.28 MIN 163.71001 GR 002

IBR=TTIH REF TIME= 268.896 7 100 mL in Parkway Jar

PW 10-2407

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00644	0.205	2.896E+02 s		<	7.970E-01
Sc 46 8.380E+01 DAYS		LAMBDA= 8.271E-03		DECAY= 7.869E-01	3G		
**** (889.26)	1.000000	0.00984	0.227	2.312E+01 s		<	8.084E-02
1120 (1120.52)	1.000000	0.00810	0.990	1.223E+02 s	12.11%		4.274E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.896E-01	4G		
**** (1173.21)	0.999200	0.00779	0.177	2.277E+01 s		<	6.330E-02
**** (1332.48)	1.000000	0.00698	0.149	2.138E+01 s		<	5.944E-02
Sb124 6.020E+01 DAYS		LAMBDA= 1.151E-02		DECAY= 7.164E-01	16G		
**** (1691.00)	0.457000	0.00566	0.124	4.808E+01 s		<	1.847E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.982E-01	3G		
**** (661.64)	0.851000	0.01252	0.236	2.218E+01 s		<	6.113E-02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.958E-01	48G		
*** (121.78)	0.254000	0.04322	0.468	4.263E+01 s		<	1.178E-01
295 (295.97)	0.004000	0.02328	3.878	4.164E+04	5.51%		1.151E+02
**** (344.31)	0.245000	0.02075	0.318	6.247E+01 s		<	1.726E-01
502 (503.50)	0.001000	0.01553	0.130	8.385E+03	72.32%		2.317E+01
768 (768.90)	0.000800	0.01109	0.544	6.136E+04	20.83%		1.695E+02
**** (963.36)	0.132000	0.00921	0.237	1.954E+02 s		<	5.398E-01
**** (1112.04)	0.124000	0.00815	0.174	1.718E+02 s		<	4.747E-01
**** (1408.02)	0.198000	0.00666	0.175	1.331E+02 s		<	3.677E-01
Eu154 3.105E+03 DAYS		LAMBDA= 2.232E-04		DECAY= 9.936E-01	48G		
**** (123.07)	0.390000	0.04295	0.421	2.513E+01 s		<	6.958E-02
648 (649.80)	0.000900	0.01269	0.112	9.761E+03	76.45%		2.703E+01
**** (723.26)	0.202000	0.01166	0.241	1.024E+02 s		<	2.836E-01
**** (1004.75)	0.170000	0.00889	0.185	1.226E+02 s		<	3.397E-01
**** (1274.49)	0.336000	0.00725	0.163	6.685E+01 s		<	1.851E-01
Ir192 7.402E+01 DAYS		LAMBDA= 9.364E-03		DECAY= 7.624E-01	22G		
295 (295.95)	0.290900	0.02328	3.880	5.729E+02	5.51%		2.068E+00
**** (316.50)	0.830700	0.02213	0.385	2.092E+01 s		<	7.551E-02
**** (468.06)	0.476000	0.01642	0.290	3.710E+01 s		<	1.339E-01
590 (588.57)	0.044400	0.01372	0.166	2.718E+02	60.25%		9.808E-01
T1208 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	19G		
584 (583.14)	0.860000	0.01383	0.110	9.269E+00 s	79.75%		2.550E-02
1281 (1282.70)	0.000500	0.00721	0.107	2.976E+04	55.69%		8.189E+01
Pb210 1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	1G		
47 (46.50)	0.040000	0.05556	1.734	7.805E+02 s	14.11%		2.147E+00
Bi212 5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	22G		
295 (295.10)	0.000240	0.02333	3.878	6.925E+05	5.51%		1.905E+03
584 (583.14)	0.310000	0.01383	0.110	2.571E+01	79.75%		7.075E-02
**** (727.17)	0.066500	0.01141	0.245	3.171E+02 s		<	8.725E-01

Pb212	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	4G		
239	(238.63)	0.431000	0.02731	0.455	3.866E+01	s32.34%	1.064E-01	
Bi214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	48G		
609	(609.30)	0.470000	0.01335	4.736	7.545E+02	s 4.35%	2.076E+00	
768	(768.70)	0.050000	0.01109	0.544	9.816E+02	20.83%	2.701E+00	
935	(934.80)	0.030000	0.00944	0.267	9.423E+02	40.47%	2.593E+00	
1120	(1120.40)	0.170000	0.00810	0.990	7.187E+02	12.11%	1.977E+00	
1239	(1238.30)	0.060000	0.00743	0.316	7.075E+02	25.13%	1.947E+00	
1281	(1281.30)	0.017000	0.00722	0.107	8.745E+02	55.69%	2.406E+00	
1378	(1379.00)	0.050000	0.00678	0.411	1.212E+03	23.93%	3.335E+00	
1729	(1728.00)	0.030000	0.00556	0.278	1.666E+03	23.60%	4.585E+00	
1765	(1764.00)	0.170000	0.00546	0.715	7.708E+02	13.56%	2.121E+00	
1847	(1848.00)	0.020000	0.00524	0.155	1.477E+03	36.23%	4.065E+00	
Pb214	1.633E+12 DAYS		LAMBDA= 4.245E-13		DECAY= 1.000E+00	23G		
242	(241.90)	0.076000	0.02703	1.984	9.655E+02	8.98%	2.657E+00	
295	(295.20)	0.190000	0.02332	3.878	8.750E+02	5.51%	2.407E+00	
352	(352.00)	0.360000	0.02040	6.901	9.396E+02	s 3.64%	2.585E+00	
768	(768.40)	0.000800	0.01109	0.544	6.133E+04	20.83%	1.688E+02	
Ra226	5.851E+05 DAYS		LAMBDA= 1.185E-06		DECAY= 1.000E+00	48G		
186	(186.10)	0.040000	0.03266	1.464	1.120E+03	s17.33%	3.083E+00	
242	(242.00)	0.078000	0.02703	1.984	9.411E+02	8.98%	2.589E+00	
295	(295.20)	0.201000	0.02332	3.878	8.271E+02	5.51%	2.276E+00	
352	(351.96)	0.393000	0.02040	6.901	8.607E+02	s 3.64%	2.368E+00	
609	(609.32)	0.484000	0.01335	4.736	7.327E+02	s 4.35%	2.016E+00	
768	(768.40)	0.053200	0.01109	0.544	9.223E+02	20.83%	2.538E+00	
935	(934.10)	0.033400	0.00944	0.267	8.459E+02	40.47%	2.327E+00	
1120	(1120.30)	0.160000	0.00810	0.990	7.635E+02	12.11%	2.101E+00	
1239	(1238.10)	0.062000	0.00743	0.316	6.846E+02	25.13%	1.884E+00	
1281	(1281.00)	0.015600	0.00722	0.107	9.528E+02	55.69%	2.622E+00	
1378	(1377.60)	0.041800	0.00678	0.411	1.448E+03	23.93%	3.985E+00	
1386	(1385.30)	0.008600	0.00675	0.300	5.159E+03	32.19%	1.420E+01	
1729	(1729.60)	0.030700	0.00555	0.278	1.630E+03	23.60%	4.484E+00	
1765	(1764.50)	0.166000	0.00546	0.715	7.895E+02	13.56%	2.173E+00	
1847	(1847.40)	0.022000	0.00524	0.155	1.343E+03	36.23%	3.694E+00	
Th227	7.951E+03 DAYS		LAMBDA= 8.718E-05		DECAY= 9.975E-01	48G		
****	(49.80)	0.087000	0.05556	0.445	9.201E+01	s	< 2.538E-01	
80	(79.70)	0.018000	0.05314	1.127	1.179E+03	s29.45%	3.251E+00	
****	(94.00)	0.013500	0.04967	0.568	8.468E+02	s	<r 2.336E+00	
****	(210.60)	0.012600	0.02990	0.417	1.108E+03	s	< 3.056E+00	
****	(236.00)	0.115000	0.02753	0.422	1.334E+02	s	< 3.679E-01	
****	(254.70)	0.009100	0.02603	0.398	1.679E+03	s	< 4.631E+00	
****	(256.20)	0.063000	0.02591	0.390	2.391E+02	s	< 6.595E-01	
****	(285.60)	0.016500	0.02391	0.391	9.914E+02	s	< 2.735E+00	
295	(296.60)	0.003900	0.02324	3.878	4.278E+04	5.51%	1.180E+02	
****	(300.00)	0.018900	0.02305	0.337	7.738E+02	s	< 2.135E+00	
****	(304.40)	0.013500	0.02279	0.363	1.179E+03	s	< 3.251E+00	
****	(329.90)	0.029000	0.02144	0.333	5.352E+02	s	< 1.476E+00	
****	(334.40)	0.011500	0.02122	0.335	1.374E+03	s	< 3.791E+00	
352	(350.50)	0.000800	0.02047	6.901	4.215E+05	3.64%	1.163E+03	
Ac228	5.133E+12 DAYS		LAMBDA= 1.350E-13		DECAY= 1.000E+00	41G		
****	(911.10)	0.250000	0.00964	0.240	9.954E+01	s	< 2.739E-01	
Th230	2.812E+07 DAYS		LAMBDA= 2.465E-08		DECAY= 1.000E+00	8G		
****	(68.00)	0.005900	0.05550	0.655	2.001E+03	s	< 5.506E+00	
Th232	5.113E+12 DAYS		LAMBDA= 1.356E-13		DECAY= 1.000E+00	42G		
****	(911.10)	0.250000	0.00964	0.240	9.954E+01	s	< 2.739E-01	
****	(968.90)	0.150000	0.	4	1.556E+02	s	< 4.280E-01	

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**** (  63.81)   0.010101   0.05607      0.593  1.048E+03 s      <r 2.882E+00

Th234    1.633E+12 DAYS     LAMBDA= 4.245E-13    DECAY= 1.000E+00 10G
**** (  92.30)   0.999999   0.05009      0.646  1.290E+01 s      <r 3.549E-02

Pa234m   1.633E+12 DAYS     LAMBDA= 4.245E-13    DECAY= 1.000E+00 48G
 768 ( 766.36)   0.002060   0.01112      0.544  2.377E+04  20.83%  6.539E+01
**** (1001.03)   0.006000   0.00892      0.190  3.554E+03 s      <  9.778E+00

U 235    2.571E+11 DAYS     LAMBDA= 2.696E-12    DECAY= 1.000E+00 34G
  80 (  81.20)   0.006500   0.05279      1.127  3.285E+03  29.45%  9.040E+00
**** ( 143.78)   0.132600   0.03894      0.512  9.910E+01 s      <  2.727E-01
 186 ( 185.72)   0.540000   0.03271      1.464  8.286E+01 s17.33%  2.280E-01
 242 ( 240.93)   0.000700   0.02711      1.984  1.045E+05   8.98%  2.876E+02

Am241    1.582E+05 DAYS     LAMBDA= 4.381E-06    DECAY= 9.999E-01 41G
**** (  59.54)   0.359000   0.05639      0.484  2.389E+01 s      <  6.574E-02
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8811   GLS  9      G-1 JR 297.863  7  197.28 MIN  163.71001 GR      002
LIBR=TTIH  REF TIME= 268.896  7      100 mL in Parkway Jar
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* Group	8811	* Time of count	297.863 2007 *
* Sample	9	* Reference GMT	268.896 2007 *
* Element		* Elapsed Live Tm	197.2833 *
* Type code	GLS	* Dead Time Pct	0.025337 *
* ID	QC-DUP#3 62971	* Background GMT	293.973 2007 *
* Geometry, detector	JR-1	* Standard GMT	297.640 2007 *
* Aliquot	163.71	* Days since TO	28.96744 *
* Unit of Aliquot	GRAM	* Time on	13:42 PDT 24-OCT *
* Data Sheet Units	PCI /GRAM	* Time off	17:00 PDT 24-OCT *
* Library	TTIH	* Calc Time	10:31 25-OCT-07 *
* Slope	1.004033	* Width slope	0.005318 *
* Intercept	1.981581	* Width offset	1.263706 *
* X**2 TERM	-0.16470993E-05	* Sensitivity	4. *

NP: [7,67]002.GSP 31 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	4	26.5	21	11	166	2.55	255	24.4	1.29E+00	13.40.	148	0	8.45
2	4	30.5	21	11	319	3.25	100	28.4	5.09E-01	29.30.	227	0	0.00
3	0	35.0	32	5	380	2.82	14	32.9	7.10E-02	209.20.	344	0	0.00
4	0	46.8	41	8	645	1.77	342	44.6	1.73E+00	14.10.	820	0	0.00
5	0	63.5	59	5	526	1.72	172	61.3	8.72E-01	21.6	5.61	0	0.00
6	6	69.6	65	19	464	2.81	283	67.4	1.43E+00	12.4	5.52	0	38.80
7	6	75.3	65	19	884	2.81	815	73.0	4.13E+00	8.2	5.41	0	0.00
8	6	79.9	65	19	850	2.81	222	77.6	1.13E+00	29.4	5.31	0	0.00
9	0	87.8	83	6	660	1.10	182	85.5	9.23E-01	24.7	5.12	0	0.00
10	0	93.0	89	6	515	1.76	199	90.7	1.01E+00	20.2	4.99	0	0.00
11	0	186.1	179	9	633	1.96	386	183.5	1.96E+00	12.9	3.27	0	0.00
12	4	238.8	234	8	235	1.64	188	236.0	9.54E-01	15.0	2.74	0	5.16
13	4	242.1	234	8	266	1.85	391	239.2	1.98E+00	9.0	2.71	0	0.00
14	0	295.3	289	8	298	1.81	785	292.3	3.98E+00	5.3	2.33	0	0.00
15	0	351.8	344	9	299	1.71	1407	348.7	7.13E+00	3.5	2.08	0	0.00
16	0	502.4	495	7	105	1.42	26	498.8	1.30E-01	72.3	1.56	0	0.00
17	0	511.4	503	11	168	2.79	286	507.8	1.45E+00	11.0	1.54	0	0.00
18	5	583.6	573	20	74	2.10	52	579.9	2.64E-01	32.1	1.40	0	2.29
19	5	589.8	573	20	102	2.54	33	586.0	1.66E-01	60.2	1.39	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	609.4	600	12	157	2.14	969	605.6	4.91E+00	4.2	1.35	0	0.00
21	0	648.5	642	7	71	2.44	22	644.6	1.12E-01	76.4	1.28	0	0.00
22	0	767.8	759	10	106	2.39	107	763.7	5.44E-01	20.8	1.12	0	0.00
23	0	935.4	926	11	106	3.06	53	931.0	2.67E-01	40.50.	951	0	0.00
24	0	1120.4	1111	11	75	2.74	205	1116.0	1.04E+00	11.50.	819	0	0.00
25	0	1238.7	1230	9	50	1.97	68	1234.3	3.45E-01	23.00.	752	0	0.00
26	0	1281.2	1274	8	26	2.21	21	1276.8	1.07E-01	55.70.	729	0	0.00
27	8	1377.9	1365	43	31	5.42	87	1373.5	4.43E-01	22.20.	680	0	2.73
28	8	1386.5	1365	43	40	5.42	59	1382.1	3.00E-01	32.20.	676	0	0.00
29	0	1729.3	1717	17	21	3.33	56	1725.3	2.84E-01	23.10.	564	0	0.00
30	0	1764.9	1753	14	50	3.77	148	1760.9	7.52E-01	12.70.	553	0	0.00
31	0	1846.8	1839	14	18	6.36	31	1843.0	1.55E-01	36.20.	530	0	0.00

FWHM=SQRT(2.57797E+00 + 9.69978E-03 *E)

```
BACKGROUND INFO 8811    GLS   9       297.863  7 G- 1     BG DATE 293.973  7
```

PEAK			BACKGROUND			NET	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
63.55	0.8719	21.62	62.00	0.7691	19.00	0.1027	232.12R
92.99	1.0099	20.19	92.00	1.1197	3.76	-0.1097	189.75R
186.12	1.9580	12.88	186.00	0.4943	5.48	1.4637	17.33
238.80	0.9537	14.99	238.60	0.4988	7.02	0.4549	32.34
295.29	3.9778	5.33	295.20	0.1002	28.95	3.8776	5.51
351.84	7.1304	3.49	351.90	0.2295	16.78	6.9009	3.64
511.36	1.4493	10.97	511.00	1.3486	5.18	0.1007	172.38R
583.64	0.2641	32.08	583.10	0.1539	15.14	0.1102	79.75
609.43	4.9129	4.15	609.30	0.1774	14.83	4.7355	4.35
1120.41	1.0395	11.46	1120.30	0.0499	25.85	0.9896	12.11
1238.71	0.3452	22.97	1238.10	0.0296	5.06	0.3155	25.13
1377.92	0.4426	22.21	1377.70	0.0319	0.00	0.4107	23.93
1729.30	0.2839	23.10	1729.60	0.0061	0.00	0.2778	23.60
1764.88	0.7518	12.74	1764.50	0.0367	40.35	0.7151	13.56

3 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 8811 GLS 9 297.863 7 G- 1

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 8811 9 GLS RUN AT 297.863/2007

BACKGROUND FOR GELI DETECTOR 1 OF 293.973/2007 2375.0 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.7691	19.00	511.0	1.3486	5.18	1120.3	0.0499	25.85
92.0	1.1197	3.76	583.1	0.1539	15.14	1173.2	0.0272	0.00
143.0	0.1014	29.77	609.3	0.1774	14.83	1238.1	0.0296	5.06
186.0	0.4943	5.48	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0730	18.07	727.2	0.0396	22.73	1377.7	0.0319	0.00
238.6	0.4988	7.02	846.0	0.0735	45.34	1461.0	0.0692	26.73
279.0	0.0000	0.00	860.4	0.0438	0.00	1586.0	0.0000	0.00
295.2	0.1002	28.95	911.1	0.0864	19.10	1591.0	0.0620	0.00
338.4	0.0534	31.62	968.9	0.0484	34.12	1729.6	0.0061	0.00
351.9	0.2295	16.78	1001.0	0.0418	38.80	1764.5	0.0367	40.35

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 10/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
258.777	7	1.7442	14.353	29.
265.711	7	1.7599	15.213	22.
265.864	7	1.5439	11.619	38. NG
265.918	7	1.5464	12.253	26. NG
266.063	7	1.5169	11.690	20. NG
272.730	7	1.5111	11.869	23. NG
278.691	7	1.6797	13.907	20. NG
286.721	7	1.7356	13.726	26.
293.746	7	1.7304	13.746	26.
297.640	7	1.7282	15.739	20.
AVERAGE		1.7397	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.856	7	1.0713	7.228	30.
81.670	7	1.0534	5.600	25.
103.972	7	0.8203	15.248	21.
192.664	7	0.9760	34.750	25.
197.727	7	2.1369	18.219	45.
205.876	7	0.9740	30.810	21.
216.753	7	0.9677	15.266	24.
272.776	7	0.8535	10.320	20.
278.874	7	0.9541	14.321	20.
279.774	7	0.9550	14.786	35.
AVERAGE		0.9931	0.048	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 297.640 7
ENERGY= 1.981581 + 1.0040334*CH + -1.647099E-06*CH**2
FWHM =SQRT(1.2637 + 0.005318*ENERGY) (CO60= 2.890)

EFFICIENCIES FOR GEOMETRY JR 1 CALIBRATED 207.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	5.555600	100.0	4.819200	300.0	2.304700	0.0	0.000000
55.0	5.631600	110.0	4.582500	500.0	1.562100	0.0	0.000000
60.0	5.636600	130.0	4.152700	700.0	1.197600	0.0	0.000000
65.0	5.592800	150.0	3.787300	1000.0	0.892900	0.0	0.000000
70.0	5.516200	170.0	3.479400	1400.0	0.669100		
80.0	5.307100	190.0	3.218900	2000.0	0.489700		
90.0	5.065700	250.0	2.638800	3000.0	0.348600		

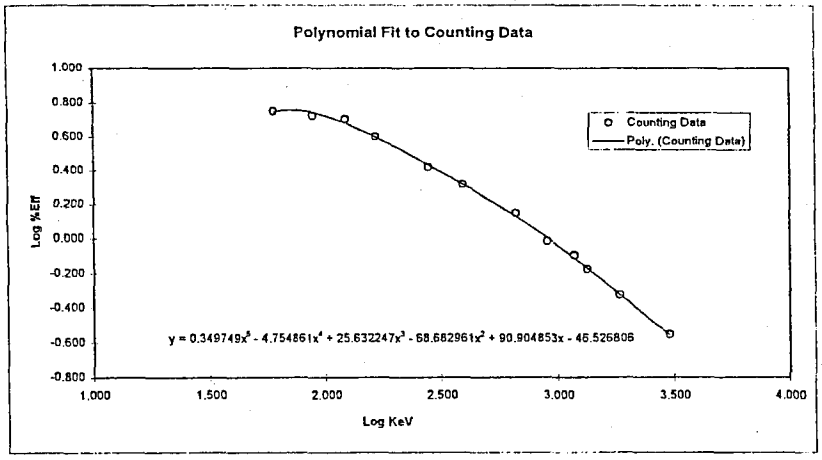
	PK	ENERGY	CPM	%ERR		
	1	26.5	1.29	13.4	COMMENT	
	2	30.5	0.51	29.3		
	3	35.0	0.07	99.9		
	4	46.8	1.73	14.1	NO GEN.	Pb210s
	6	69.6	1.43	12.4		
	7	75.3	4.13	8.2		
	8	79.9	1.13	29.4		Ce144 I 131 Th227s
	9	87.8	0.92	24.7		Cs136 Cd109
b	11	186.1	1.46	17.3		Cs136 U 235s Ra226s
b	12	238.8	0.45	32.3	Th228	Pb212s
	13	242.1	1.98	9.0	Ra226 Th228	La140
b	14	295.3	3.88	5.5	Ra226	Ru103
b	15	351.8	6.90	3.6		Ra226s Pb214s
	16	502.4	0.13	72.3		I 131
b	18	583.6	0.11	79.7	Th228	Tl208s
	19	589.8	0.17	60.2		
b	20	609.4	4.74	4.3		Ru103 Ra226s Bi214s
	21	648.5	0.11	76.4		
	22	767.8	0.54	20.8	Ra226	
	23	935.4	0.27	40.5	Ra226	
b	24	1120.4	0.99	12.1	Ra226	Sc 46s
b	25	1238.7	0.32	25.1	Ra226	
	26	1281.2	0.11	55.7	Ra226	
b	27	1377.9	0.41	23.9	Ra226	
	28	1386.5	0.30	32.2	Ra226	
	29	1729.3	0.28	23.6	Ra226	
	30	1764.9	0.72	13.6	Ra226	
	31	1846.8	0.15	36.2	Ra226	
			REJECTED PEAKS			
B	5	63.5	0.10	99.9		Th232s
B	10	93.0	-0.11	99.9		Th234s Th227s
B	17	511.4	0.10	99.9	Th228	La140 Ru106 Na 22

Section 7.0
Instrument Calibration

Detector	G7	100 mL Jar	
Geometry	JR	Shelf 0	EFF. DATE
Std I.D.	(GLY)1098-2		19-Feb-07
Filename	GELI07JR0.EFF		

Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	%Eff Avg	%SD of %Eff	LogKev	Log%Eff	%Dev from Spline
59.50	5.53881	5.54858	5.59369	1.14091	1.775	0.748	1
88.00	5.34271	5.21948	5.28109	1.64995	1.944	0.723	-5
122.10	5.09532	4.98894	5.04240	1.48615	2.087	0.703	5
165.90	3.99041	3.93256	3.96149	1.03264	2.220	0.598	0
279.20	2.62359	2.59658	2.61009	0.73179	2.446	0.417	-3
391.70	2.08794	2.04542	2.06668	1.45480	2.593	0.315	0
661.70	1.41228	1.37935	1.39605	1.69209	2.821	0.145	4
898.00	0.99661	0.92183	0.95922	5.51245	2.953	-0.018	-5
1173.20	0.82587	0.76850	0.79718	5.08882	3.069	-0.098	4
1332.50	0.71499	0.61818	0.66458	10.72671	3.125	-0.177	-1
1836.10	0.50611	0.43417	0.47014	10.81954	3.264	-0.328	-1
			#DIV/0!		#NUM!	#DIV/0!	#DIV/0!
3000	(artificial data)		0.28000		3.477	-0.553	0
				avg	#DIV/0!		

(shaded cells are manual entry, all others are calculated)

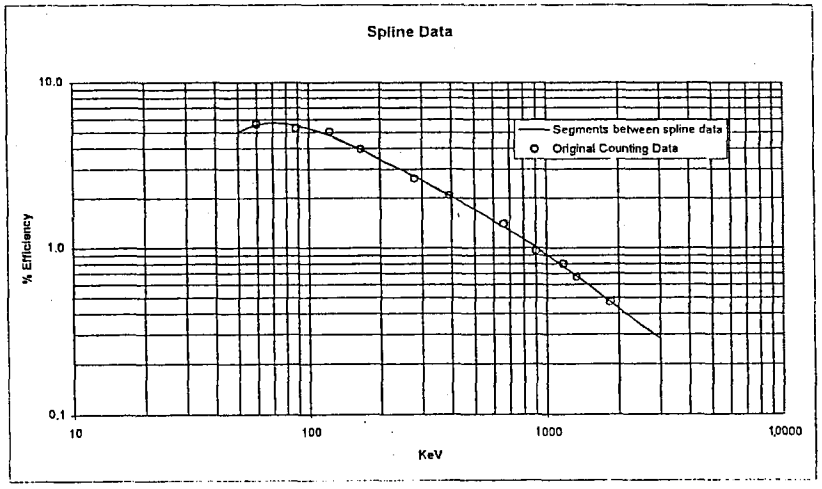


Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
50	5.02312	1.699	0.701		
55	5.34720	1.740	0.728		
60	5.55148	1.778	0.744		#DIV/0!
65	5.66344	1.813	0.753		
70	5.70619	1.845	0.756		
80	5.65344	1.903	0.752		
90	5.49462	1.954	0.740		
100	5.28718	2.000	0.723		#DIV/0!
110	5.06255	2.041	0.704		
130	4.62036	2.114	0.665		
150	4.22381	2.176	0.626		
170	3.88146	2.230	0.589		
190	3.58846	2.279	0.555		
250	2.93118	2.398	0.467		
300	2.55123	2.477	0.407		#DIV/0!
500	1.69916	2.699	0.230		
700	1.27081	2.845	0.104		
1000	0.90581	3.000	-0.043		#DIV/0!
1400	0.63765	3.146	-0.195		
2000	0.42991	3.301	-0.367		
3000	0.27964	3.477	-0.553		

Polynomial Coefficients

x5 =	0.349749
x4 =	-4.754861
x3 =	25.632247
x2 =	-68.682961
x1 =	90.904853
x0 =	-46.526806



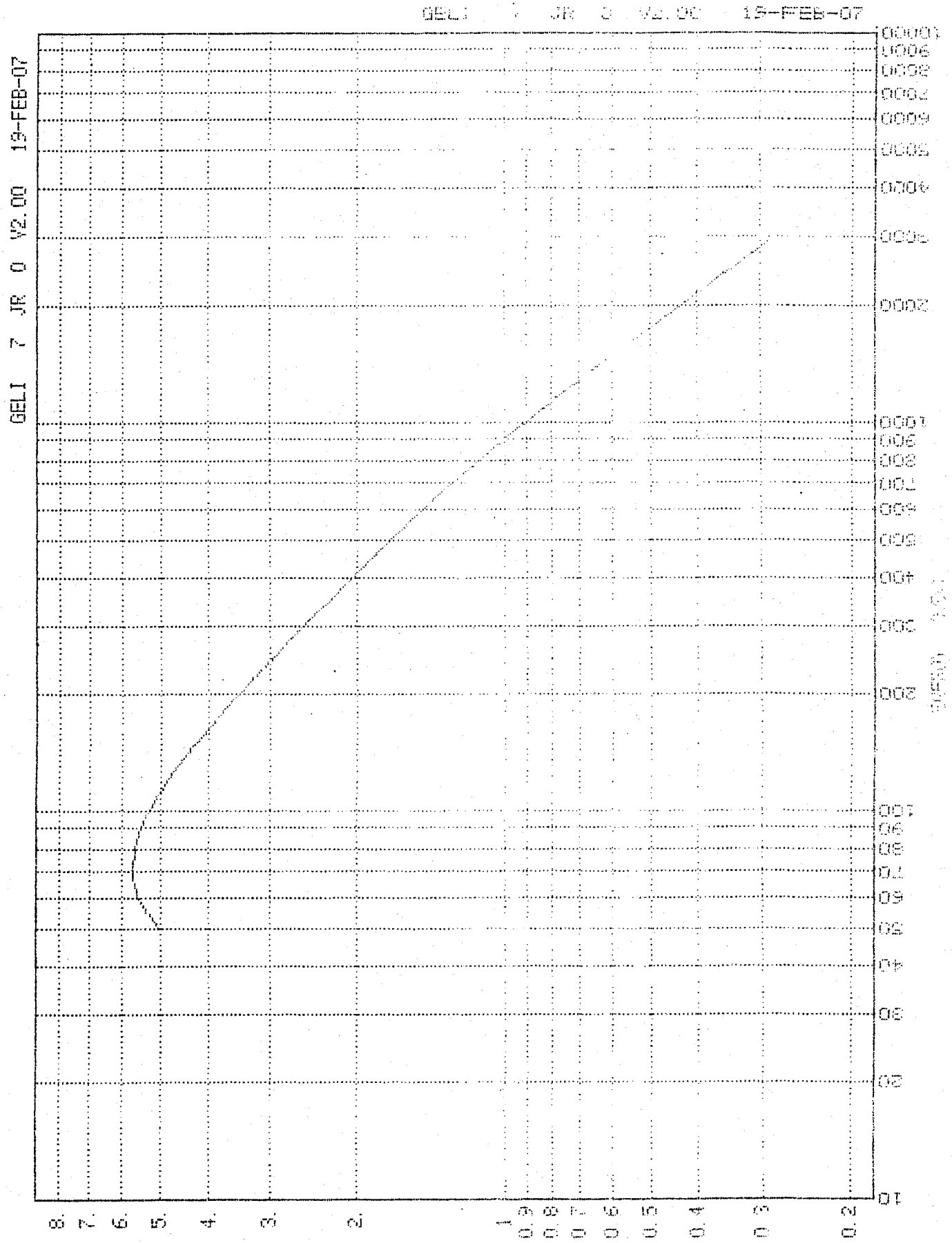
Date : 19-FEB-07

Version : E.00

File : ND:[35.43]GELI07JRO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
52	5.02312	108	4.11504	214	3.06479	324	2.39969	432	1.90874
54	5.08880	110	4.09255	216	3.04261	326	2.38797	434	1.90174
56	5.15403	112	4.01289	220	3.02085	328	2.37638	436	1.89480
58	5.21884	114	4.03108	222	3.00947	330	2.36491	438	1.88791
60	5.28322	116	4.01756	224	2.97835	332	2.35357	440	1.88108
62	5.34720	118	3.97179	226	2.95759	334	2.34235	442	1.87430
64	5.38888	120	3.92719	228	2.93715	336	2.33125	444	1.86758
66	5.43013	122	3.89274	230	2.91701	338	2.32027	446	1.86092
68	5.47098	124	3.84137	232	2.89718	340	2.30940	448	1.85430
70	5.51142	126	3.80004	234	2.87764	342	2.29865	450	1.84774
72	5.55148	128	3.75972	236	2.85839	344	2.28801	452	1.84123
74	5.57442	130	3.72036	238	2.83943	346	2.27748	454	1.83478
76	5.59707	132	3.67634	240	2.82073	348	2.26706	456	1.82837
78	5.61946	134	3.63339	242	2.80231	350	2.25675	458	1.82202
80	5.64158	136	3.59147	244	2.78415	352	2.24654	460	1.81571
82	5.66344	138	3.55054	246	2.76624	354	2.23643	462	1.80945
84	5.67222	140	3.51056	248	2.74859	356	2.22643	464	1.80325
86	5.68088	142	3.47150	250	2.73118	358	2.21653	466	1.79709
88	5.68943	144	3.43333	252	2.71345	360	2.20673	468	1.79097
90	5.69787	146	3.39601	254	2.69597	362	2.19702	470	1.78491
92	5.70619	148	3.35951	256	2.67872	364	2.18741	472	1.77889
94	5.70056	150	3.32381	258	2.66171	366	2.17790	474	1.77291
96	5.69502	152	3.28620	260	2.64494	368	2.16847	476	1.76698
98	5.68956	154	3.24941	262	2.62838	370	2.15914	478	1.76110
100	5.68418	156	3.21340	264	2.61205	372	2.14990	480	1.75526
102	5.67887	158	3.17817	266	2.59594	374	2.14075	482	1.74946
104	5.67365	160	3.14367	268	2.58004	376	2.13168	484	1.74370
106	5.66849	162	3.10989	270	2.56434	378	2.12270	486	1.73799
108	5.66340	164	3.07680	272	2.54885	380	2.11381	488	1.73232
110	5.65839	166	3.04438	274	2.53356	382	2.10500	490	1.72669
112	5.65344	168	3.01261	276	2.51846	384	2.09627	492	1.72111
114	5.63648	170	2.98146	278	2.50356	386	2.08762	494	1.71556
116	5.61977	172	2.94956	280	2.48884	388	2.07906	496	1.71005
118	5.60331	174	2.91829	282	2.47431	390	2.07057	498	1.70459
120	5.58710	176	2.88761	284	2.45996	392	2.06216	500	1.69916
122	5.57113	178	2.85752	286	2.44578	394	2.05383	502	1.69330
124	5.55539	180	2.82802	288	2.43178	396	2.04557	504	1.68749
126	5.52987	182	2.79909	290	2.41795	398	2.03739	506	1.68172
128	5.52457	184	2.77069	292	2.40428	400	2.02928	508	1.67599
130	5.50949	186	2.74279	294	2.39078	402	2.02124	510	1.67031
132	5.49462	188	2.71536	296	2.37744	404	2.01327	512	1.66467
134	5.47249	190	2.68841	298	2.36426	406	2.00538	514	1.65906
136	5.45069	192	2.66190	300	2.35123	408	1.99755	516	1.65350
138	5.42920	194	2.63577	302	2.33778	410	1.98980	518	1.64798
140	5.40804	196	2.60715	304	2.32448	412	1.98211	520	1.64250
142	5.38717	198	2.58190	306	2.31135	414	1.97449	522	1.63705
144	5.36661	200	2.55701	308	2.29836	416	1.96693	524	1.63165
146	5.34633	202	2.53247	310	2.28553	418	1.95944	526	1.62628
148	5.32634	204	2.50828	312	2.27285	420	1.95201	528	1.62095
150	5.30662	206	2.48443	314	2.26031	422	1.94465	530	1.61566
152	5.28718	208	2.46092	316	2.24791	424	1.93734	532	1.61041
154	5.23970	210	2.43773	318	2.23565	426	1.93010	534	1.60519
156	5.19356	212	2.41002	320	2.22353	428	1.92292	536	1.60001
158	5.14869	214	2.39718	322	2.21155	430	1.91580	538	1.59486

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
640	1.58975	660	1.33642	920	0.86577	1260	0.71158	1800	0.48300
642	1.58468	665	1.32775	925	0.86485	1270	0.70575	1810	0.48006
644	1.57964	670	1.31917	930	0.86377	1280	0.70001	1820	0.47714
646	1.57464	675	1.31076	945	0.85515	1290	0.69436	1830	0.47426
648	1.56966	680	1.30242	950	0.85037	1300	0.68880	1840	0.47141
650	1.56473	685	1.29420	955	0.84564	1310	0.68333	1850	0.46860
652	1.55982	690	1.28608	960	0.84097	1320	0.67794	1860	0.46581
654	1.55495	695	1.27808	965	0.83634	1330	0.67263	1870	0.46306
656	1.55011	700	1.27018	970	0.83175	1340	0.66741	1880	0.46034
658	1.54531	705	1.26162	975	0.82721	1350	0.66226	1890	0.45765
660	1.54053	710	1.25518	980	0.82272	1360	0.65719	1900	0.45499
662	1.53579	715	1.24806	985	0.81827	1370	0.65220	1925	0.44846
664	1.53108	720	1.23664	990	0.81386	1380	0.64728	1950	0.44211
666	1.52640	725	1.22854	995	0.80950	1390	0.64243	1975	0.43593
668	1.52175	730	1.22055	1000	0.80518	1400	0.63765	2000	0.42991
670	1.51713	735	1.21266	1005	0.80049	1410	0.63265	2025	0.42428
672	1.51255	740	1.20486	1010	0.79585	1420	0.62773	2050	0.41880
674	1.50799	745	1.19719	1015	0.79126	1430	0.62288	2075	0.41345
676	1.50346	750	1.18961	1020	0.78671	1440	0.61810	2100	0.40823
678	1.49896	755	1.18213	1025	0.78220	1450	0.61339	2125	0.40314
680	1.49449	760	1.17474	1030	0.77775	1460	0.60875	2150	0.39816
682	1.49004	765	1.16745	1035	0.77333	1470	0.60418	2175	0.39331
684	1.48563	770	1.16024	1040	0.76896	1480	0.59967	2200	0.38857
686	1.48125	775	1.15313	1045	0.76463	1490	0.59522	2225	0.38394
688	1.47689	780	1.14611	1050	0.76034	1500	0.59083	2250	0.37942
690	1.47256	785	1.13918	1055	0.75610	1510	0.58651	2275	0.37500
692	1.46825	790	1.13233	1060	0.75189	1520	0.58225	2300	0.37068
694	1.46398	795	1.12556	1065	0.74773	1530	0.57804	2325	0.36645
696	1.45973	800	1.11888	1070	0.74361	1540	0.57390	2350	0.36232
698	1.45551	805	1.11228	1075	0.73952	1550	0.56981	2375	0.35827
700	1.45131	810	1.10577	1080	0.73547	1560	0.56577	2400	0.35432
702	1.44714	815	1.09934	1085	0.73147	1570	0.56179	2425	0.35044
704	1.44299	820	1.09298	1090	0.72749	1580	0.55786	2450	0.34665
706	1.43887	825	1.08669	1095	0.72356	1590	0.55398	2475	0.34294
708	1.43478	830	1.08047	1100	0.71966	1600	0.55016	2500	0.33930
710	1.43071	835	1.07432	1105	0.71580	1610	0.54638	2525	0.33574
712	1.42667	840	1.06824	1110	0.71198	1620	0.54266	2550	0.33225
714	1.42265	845	1.06221	1115	0.70819	1630	0.53898	2575	0.32883
716	1.41865	850	1.05627	1120	0.70443	1640	0.53535	2600	0.32548
718	1.41468	855	1.05040	1125	0.70071	1650	0.53176	2625	0.32219
720	1.41073	860	1.04460	1130	0.69702	1660	0.52822	2650	0.31897
722	1.40681	865	1.03887	1135	0.69336	1670	0.52473	2675	0.31581
724	1.40291	870	1.03319	1140	0.68974	1680	0.52128	2700	0.31270
726	1.39903	875	1.02758	1150	0.68259	1690	0.51787	2725	0.30966
728	1.39518	880	1.02204	1160	0.67557	1700	0.51450	2750	0.30668
730	1.39135	885	1.01656	1170	0.66867	1710	0.51118	2775	0.30375
732	1.38754	890	1.01113	1180	0.66188	1720	0.50789	2800	0.30087
734	1.38375	895	1.00577	1190	0.65522	1730	0.50465	2825	0.29805
736	1.37999	900	1.00046	1200	0.64867	1740	0.50145	2850	0.29528
738	1.37625	905	0.99520	1210	0.64223	1750	0.49828	2875	0.29255
740	1.37253	910	0.99001	1220	0.63589	1760	0.49515	2900	0.28988
742	1.36885	915	0.98487	1230	0.62966	1770	0.49206	2925	0.28725
744	1.36518	920	0.97978	1240	0.62354	1780	0.48901	2950	0.28467
746	1.36153	925	0.97475	1250	0.61751	1790	0.48599	2975	0.28213


GELI 7 JR 0 V2.00 19-FEB-07

ANALYTICS
An Isotope Products Laboratories Company

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

Log 417 Recd 12/27/06 K Trenton

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

1098-2

LIBR= A782

74159-207
100 mL Solid in Wide Mouth PPi Parkway Jar

Customer: Eberline Services / Richmond, CA
P.O. No.: 00003890, Item 1
Calibration Date: 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01515

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1990.0	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	189000	2863.9	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	94570	1433.0	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	133800	2027.5	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	295300	4475	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	185600	2812.4	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	116700	1768.4	0.70	1.20	2.78	HPGe
Y-88	898.0	106.60	455400	6901	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	226900	3438	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	227000	3440	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	481200	7292	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
This standard will expire one year after the calibration date.

Source Prepared by: M. Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate

DEAD TIME = 6.43% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 0-7 XX 3.803 7 113.73 MIN 1.00000 SM 146

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.996E-01	41G		
59 (59.54)	1.990000	1.00000	6730.228	3.382E+03 s		0.19%	1.524E+03
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.683E-01	2G		
87 (88.03)	0.039000	1.00000	8081.575	2.072E+05 s		0.12%	1.075E+05
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.867E-01	10G		
121 (122.06)	1.433000	1.00000	3526.350	2.461E+03 s		0.28%	1.409E+03
136 (136.47)	0.000001	1.00000	445.374	4.454E+08 s		1.49%	2.550E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 6.225E-01	3G		
165 (165.80)	0.800000	1.00000	3162.030	3.953E+03 s		0.27%	2.860E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.468E-01	2G		
278 (279.21)	0.815000	1.00000	1987.267	2.438E+03 s		0.34%	4.451E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.674E-01	5G		
390 (391.40)	0.642000	1.00000	2110.526	3.287E+03 s		0.32%	2.610E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.941E-01	3G		
**** (661.64)	1.768400	1.00000	17.016	9.622E+00 s		<	4.360E+00
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.424E-01	8G		
**** (898.00)	0.920000	1.00000	17.005	1.848E+01 s		<	1.535E+01
**** (1836.10)	1.000000	1.00000	8.854	8.854E+00 s		<	7.354E+00
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.666E-01	5G		
**** (1173.21)	0.999200	1.00000	12.855	1.287E+01 s		<	5.995E+00
**** (1332.48)	1.000000	1.00000	11.399	1.140E+01 s		<	5.312E+00
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 4.006E-01	4G		
811 (810.76)	0.990000	1.00000	40.199	4.060E+01		6.86%	4.566E+01

DEAD TIME = 6.43% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

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1098 GLY 2 G-7 XX 3.803 7 113.73 MIN 1.00000 SM 146

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

Group	1098	Time of count	3.803 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	113.7333
Type code	GLY	Dead Time Pct	6.430824
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-7	Standard GMT	356.823 2006
Aliquot	1.	Days since TO	94.09453
Unit of Aliquot	SMPL	Time on	11:16 PST 3-JAN
Data Sheet Units	PCI /SMPL	Time off	13:10 PST 3-JAN
Library	A982	Calc Time	13:22 03-JAN-07
Slope	0.991512	Width slope	0.006379
Intercept	0.848181	Width offset	0.925840
X**2 TERM	-0.15603343E-05	Sensitivity	4.

NP: [7,67]146.GSP 41 PEAKS

****

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	25.8	21	19	115852	2.71	886992	25.2	7.80E+03	0.1	0.104	0	*******
2	5	32.8	21	19	356235	2.71	616862	32.2	5.42E+03	0.2	0.212	0	0.00
3	5	37.3	21	19	363399	2.71	136594	36.7	1.20E+03	0.7	0.311	0	0.00
4	0	42.5	40	5	299494	2.67	55062	42.1	4.84E+02	1.6	0.463	0	0.00
5	0	49.4	47	5	275031	2.00	15391	48.9	1.35E+02	5.2	0.723	0	0.00
6	0	58.9	54	9	423136	1.65	765451	58.5	6.73E+03	0.2	100.	0	0.00
7	3	66.5	63	12	268802	3.48	44231	66.2	3.89E+02	2.0	100.	0	*******
8	3	70.3	63	12	315316	2.68	76345	70.0	6.71E+02	1.4	100.	0	0.00
9	4	79.3	76	16	236319	1.96	13101	79.1	1.15E+02	5.7	100.	0	*******
10	4	82.3	76	16	306297	2.76	36552	82.1	3.21E+02	2.6	100.	0	0.00
11	4	87.4	76	16	162939	1.51	919086	87.3	8.08E+03	0.1	100.	0	0.00
12	0	101.5	100	6	146892	1.99	1591	101.6	1.40E+01	38.1	100.	0	0.00
13	0	108.7	107	5	116932	1.67	4475	108.8	3.93E+01	11.6	100.	0	0.00
14	0	121.3	116	11	221077	1.92	401020	121.5	3.53E+03	0.3	100.	0	0.00
15	0	135.6	132	9	161547	1.43	50648	135.9	4.45E+02	1.5	100.	0	0.00
16	0	142.8	141	6	101054	2.48	2817	143.2	2.48E+01	17.9	100.	0	0.00
17	0	164.9	160	11	161720	1.94	359552	165.5	3.16E+03	0.3	100.	0	0.00
18	0	186.3	185	6	72423	2.81	2404	187.1	2.11E+01	17.8	100.	0	0.00
19	4	195.3	193	14	70625	2.10	2978	196.2	2.62E+01	14.4	100.	0	5.98
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	4	198.1	193	14	58791	1.80	15690	199.0	1.38E+02	2.5	100.	0	0.00
21	4	202.7	193	14	70388	2.05	4381	203.6	3.85E+01	9.7	100.	0	0.00
22	0	232.5	232	5	55002	2.35	1340	233.7	1.18E+01	26.4	100.	0	0.00
23	0	253.9	252	8	71133	2.01	9761	255.3	8.58E+01	4.8	100.	0	0.00
24	0	277.9	274	12	96362	2.09	225877	279.5	1.99E+03	0.3	100.	0	0.00
25	0	299.4	299	6	40511	1.92	1257	301.3	1.11E+01	25.5	100.	0	0.00
26	0	308.7	309	6	37099	2.19	1046	310.7	9.19E+00	29.3	100.	0	0.00
27	0	390.0	386	14	80842	2.27	239976	392.8	2.11E+03	0.3	100.	0	0.00
28	0	411.2	411	7	37288	2.53	1429	414.1	1.26E+01	22.5	100.	0	0.00
29	0	508.9	508	10	41969	3.79	5555	512.9	4.88E+01	7.0	100.	0	0.00
30	3	659.2	657	38	44277	3.15	169572	664.7	1.49E+03	0.3	100.	0	33.50
31	3	680.2	657	38	63738	4.57	2857	685.9	2.51E+01	18.7	100.	0	0.00
32	0	810.6	813	10	26736	3.90	4570	817.7	4.02E+01	6.9	100.	0	0.00
33	5	894.7	895	35	39366	4.21	242882	898.8	2.37E+03	0.2	100.	0	167.00

```
 34   5   908.7   895 35 55737 5.95    7103   916.9  6.25E+01   7.9  100.   0   0.00
 35   5   915.3   895 35 37274 5.34    3306   923.6  2.91E+01  11.8  100.   0   0.00
 36   0  1169.0  1172 21 36017 5.03  187907  1180.4  1.65E+03   0.3  100.   0   0.00
 37   0  1189.8  1197 10 14339 4.66    1571  1201.4  1.38E+01  14.6  100.   0   0.00
 38   0  1327.7  1333 17 29332 5.68  162774  1341.0  1.43E+03   0.3  100.   0   0.00
 39   3  1828.2  1839 23  6728 4.65  103088  1848.4  9.06E+02   0.4  100.   0265.00
 PK IT    ENRG LEFT WD BKGND FWHM    AREA    CHAN       CPM   ERR   EFF   K   FIT
 40   3  1833.0  1839 23  7674 3.90   41731  1853.3  3.67E+02   0.9  100.   0   0.00
 41   0  1842.4  1861  8  5478 3.36     165  1862.8  1.45E+00  77.4  100.   0   0.00
FWHM=SQRT( 4.70167E+00 +  1.17078E-02 *E)

*****************************************************************************************
BACKGROUND INFO 1098    GLY   2          3.803  7 G- 7      BG DATE   1.811  7
*****************************************************************************************

v--------PEAK---------v      v------BACKGROUND------v      v-------NET----v
ENERGY       CPM   %ERROR      ENERGY       CPM   %ERROR         CPM   %ERROR

 142.84    24.7684 17.94        143.00  0.0670 20.30         24.7015 17.99
 186.31    21.1392 17.77        186.00  0.3104 11.02         20.8288 18.04
 198.07   137.9519  2.47        198.00  0.0516 28.12        137.9003  2.47
 277.90  1986.0198  0.34        279.00  0.0000  0.00       1986.0198  0.34
    0 PEAKS REJECTED BY BACKGROUND

*****************************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY   2          3.803  7 G- 7
*****************************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 3.803/2007

BACKGROUND FOR GELI DETECTOR 7 OF 1.811/2007 1109.9 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4061	14.31	511.0	1.0317	10.97	1120.3	0.0964	9.95
92.0	0.6932	8.24	583.1	0.1198	21.71	1173.2	0.0456	0.00
143.0	0.0670	20.30	609.3	0.2783	41.36	1238.1	0.0294	9.18
186.0	0.3104	11.02	661.6	0.0468	0.00	1332.5	0.0367	42.74
198.0	0.0516	28.12	727.2	0.0227	0.00	1377.7	0.0000	0.00
238.5	0.3591	18.29	846.0	0.0542	67.86	1461.0	0.0472	32.02
279.0	0.0000	0.00	860.4	0.0000	0.00	1586.0	0.0000	0.00
295.2	0.1706	41.84	911.1	0.0725	32.84	1591.0	0.0000	0.00
338.4	0.0785	27.52	968.9	0.0392	37.72	1729.6	0.0000	0.00
351.9	0.3282	38.52	1001.0	0.0285	0.00	1764.5	0.0388	66.47

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 7 ON 1/ 3/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
162.828	5	0.9029	10.177	23.
169.849	5	0.9205	10.183	22.
183.987	5	0.9095	10.702	26.
197.965	5	0.9078	9.941	23.
200.672	5	0.9031	10.264	29.
204.990	5	0.9034	10.175	27.
114.694	6	1.0727	13.035	31.
120.917	6	1.0739	12.608	21.
174.039	6	1.0089	14.185	11.
174.047	6	1.0130	14.270	13.
AVERAGE		0.9616	0.073	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
308.831	6	1.0108	9.106	32.
316.064	6	1.0011	9.753	21.
320.749	6	1.0520	12.685	42.
320.854	6	1.0496	10.625	61.
322.802	6	1.0135	9.347	25.
325.046	6	1.0085	7.842	42.
336.793	6	1.0304	10.592	25.
341.829	6	1.0122	8.732	12.
350.005	6	1.0063	8.133	24.
356.823	6	1.0105	9.296	16.
AVERAGE		1.0195	0.018	

CALIBRATION LINE FROM STANDARD FOR G- 7 OF 356.823 6
ENERGY= 0.848182 + 0.9915124*CH + -1.560334E-06*CH**2
FWHM =SQRT(0.9258 + 0.006380*ENERGY) (CO60= 3.070)

EFFICIENCIES FOR GEOMETRY XX 7 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

1098 2 GLY GSTOR 146

	PK	ENERGY	CPM	%ERR	COMMENT
	1	25.8	7798.87	0.1	
	2	32.8	5423.76	0.2	
	3	37.3	1201.00	0.7	
	4	42.5	484.13	1.6	NO GEN.
	5	49.4	135.32	5.2	
	6	58.9	6730.23	0.2	Am241s
	7	66.5	388.90	2.0	NO GEN. 33S
	8	70.3	671.27	1.4	
	9	79.3	115.19	5.7	Ce144 I 131
	10	82.3	321.39	2.6	
	11	87.4	8081.06	0.1	Cs136 Cd109s
	12	101.5	13.99	38.1	
	13	108.7	39.35	11.6	La140 Cs136 Sb125
	14	121.3	3525.97	0.3	Ag110 Co 57s
	15	135.6	445.33	1.5	Co 57s
b	16	142.8	24.70	18.0	Fe 59
	17	164.9	3161.36	0.3	Cs136 Ce139s
b	18	186.3	20.83	18.0	Ra226 Cs136
	19	195.3	26.19	14.4	
b	20	198.1	137.90	2.5	Ac228
	21	202.7	38.52	9.7	
	22	232.5	11.78	26.4	Th228
	23	253.9	85.82	4.8	Th228 Sn113
b	24	277.9	1986.02	0.3	Ac228 Th228 Hg203s
	25	299.4	11.06	25.5	Th228
	26	308.7	9.19	29.3	
	27	390.0	2109.99	0.3	Sn113s
	28	411.2	12.57	22.5	
	29	508.9	48.84	7.0	Ac228 NO GEN.
	30	659.2	1490.96	0.3	NO GEN. Ag110
	31	680.2	25.12	18.7	
	32	810.6	40.18	6.9	NO GEN. Co 58
	33	894.7	2372.94	0.2	Th228
	34	908.7	62.45	7.9	NO GEN.
	35	915.3	29.07	11.8	NO GEN.
	36	1169.0	1652.17	0.3	Cs134
	37	1189.8	13.82	14.6	NO GEN.
	38	1327.7	1431.19	0.3	NO GEN.
	39	1828.2	906.40	0.4	NO GEN.
	40	1833.0	366.92	0.9	
	41	1842.4	1.45	77.4	

DEAD TIME = 6.26% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-7 XX 2.645 7 68.62 MIN 1.00000 SM 541

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

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SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.996E-01	41G		
59 (59.54)	1.990000	1.00000	6622.539	3.328E+03 s		O.22%	1.500E+03
103 (103.00)	0.000195	1.00000	31.468	1.614E+05		33.31%	7.272E+04
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.698E-01	2G		
88 (88.03)	0.039000	1.00000	7908.887	2.028E+05 s		O.16%	1.050E+05
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.890E-01	10G		
122 (122.06)	1.433000	1.00000	3463.219	2.417E+03 s		O.31%	1.380E+03
136 (136.47)	0.000001	1.00000	436.081	4.361E+08 s		1.80%	2.490E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 6.262E-01	3G		
165 (165.80)	0.800000	1.00000	3134.418	3.918E+03 s		O.34%	2.819E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.511E-01	2G		
278 (279.21)	0.815000	1.00000	2000.970	2.455E+03 s		O.44%	4.405E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.714E-01	5G		
391 (391.40)	0.642000	1.00000	2082.015	3.243E+03 s		O.39%	2.557E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.942E-01	3G		
660 (661.64)	1.768400	1.00000	1455.810	8.232E+02 s		O.53%	3.730E+02
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.465E-01	8G		
**** (898.00)	0.920000	1.00000	26.033	2.830E+01 s			< 2.333E+01
**** (1836.10)	1.000000	1.00000	16.499	1.650E+01 s			< 1.360E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.670E-01	5G		
**** (1173.21)	0.999200	1.00000	21.325	2.134E+01 s			< 9.941E+00
**** (1332.48)	1.000000	1.00000	19.748	1.975E+01 s			< 9.199E+00
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 4.052E-01	4G		
812 (810.76)	0.990000	1.00000	32.680	3.301E+01		9.99%	3.670E+01

DEAD TIME = 6.26% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

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1098 GLY 2 G-7 XX 2.645 7 68.62 MIN 1.00000 SM 541

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

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Group	1098	Time of count	2.645 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	68.61667
Type code	GLY	Dead Time Pct	6.261384
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-7	Standard GMT	356.823 2006
Aliquot	1.	Days since TO	92.93659
Unit of Aliquot	SMPL	Time on	7:28 PST 2-JAN
Data Sheet Units	PCI /SMPL	Time off	8:37 PST 2-JAN
Library	A982	Calc Time	10:09 02-JAN-07
Slope	0.991512	Width slope	0.006379
Intercept	0.848181	Width offset	0.925840
X**2 TERM	-0.15603343E-05	Sensitivity	4.

NP: [7,67]541.GSP 34 PEAKS

****

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	26.0	21	19	76853	2.56	482795	25.4	7.04E+03	0.2	0.106	0	*******
2	5	33.2	21	19	223558	2.56	409981	32.6	5.97E+03	0.2	0.220	0	0.00
3	5	37.5	21	19	215601	2.56	77217	37.0	1.13E+03	0.9	0.317	0	0.00
4	0	42.9	40	6	211254	2.37	36195	42.4	5.27E+02	2.1	0.474	0	0.00
5	0	59.3	55	7	207871	1.30	454416	58.9	6.62E+03	0.2	100.	0	0.00
6	6	66.6	64	13	116294	2.99	21893	66.4	3.19E+02	2.5	100.	0	392.00
7	6	70.5	64	13	214703	2.99	47044	70.3	6.86E+02	1.9	100.	0	0.00
8	8	80.6	76	17	209700	3.53	17492	80.4	2.55E+02	4.6	100.	0	920.00
9	8	87.8	76	17	76109	1.38	542661	87.7	7.91E+03	0.2	100.	0	0.00
10	0	102.6	97	10	145270	3.30	2159	102.7	3.15E+01	33.3	100.	0	0.00
11	0	109.1	107	6	83826	2.50	3835	109.2	5.59E+01	12.1	100.	0	0.00
12	0	121.7	118	8	100638	1.38	237619	121.9	3.46E+03	0.3	100.	0	0.00
13	0	136.1	133	8	86634	1.97	29921	136.4	4.36E+02	1.8	100.	0	0.00
14	0	143.0	141	6	61288	3.17	1776	143.4	2.59E+01	22.2	100.	0	0.00
15	0	165.4	161	10	89950	1.47	215046	166.0	3.13E+03	0.3	100.	0	0.00
16	0	186.7	185	6	43453	3.44	1674	187.5	2.44E+01	19.8	100.	0	0.00
17	0	198.1	195	8	59468	2.09	9104	199.0	1.33E+02	4.8	100.	0	0.00
18	0	203.1	203	6	43371	1.78	1510	204.0	2.20E+01	22.0	100.	0	0.00
19	0	254.4	253	7	37200	1.62	6223	255.9	9.07E+01	5.3	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	278.4	274	12	58162	1.90	137248	280.1	2.00E+03	0.4	100.	0	0.00
21	0	299.5	299	7	28398	2.38	748	301.3	1.09E+01	37.5	100.	0	0.00
22	0	390.7	387	12	43494	2.10	142839	393.4	2.08E+03	0.4	100.	0	0.00
23	0	411.6	412	6	19278	3.45	768	414.6	1.12E+01	28.8	100.	0	0.00
24	0	510.2	510	10	24954	3.10	3525	514.1	5.14E+01	8.6	100.	0	0.00
25	0	660.2	659	14	40136	2.47	99896	665.7	1.46E+03	0.5	100.	0	0.00
26	0	812.0	815	9	14886	3.08	2242	819.1	3.27E+01	10.0	100.	0	0.00
27	0	896.0	897	15	34340	2.78	151744	904.1	2.21E+03	0.4	100.	0	0.00
28	0	910.7	916	8	17721	1.74	1066	918.9	1.55E+01	22.0	100.	0	0.00
29	0	1170.6	1174	15	21432	3.28	105535	1182.0	1.54E+03	0.4	100.	0	0.00
30	0	1191.8	1200	8	7068	3.65	660	1203.4	9.62E+00	22.5	100.	0	0.00
31	0	1330.0	1337	14	24157	3.36	84392	1343.4	1.23E+03	0.5	100.	0	0.00
32	0	1832.2	1845	16	14566	4.27	75519	1852.5	1.10E+03	0.5	100.	0	0.00
33	0	1847.0	1864	8	2779	4	244	5	7.25E+00	19.1	100.	0	0.00

```
 34   0 1854.1 1871   9   1775 3.04     434 1874.6   6.33E+00 19.9  100.    0   0.00
FWHM=SQRT( 5.33777E+00 +   4.68597E-03 *E)

*****************************************************************************************
BACKGROUND INFO 1098     GLY    2          2.645   7 G- 7      BG DATE    1.811   7
*****************************************************************************************

v---------PEAK----------v       v------BACKGROUND-------v       v-------NET-----v
ENERGY        CPM   %ERROR       ENERGY        CPM   %ERROR          CPM   %ERROR

 143.00    25.8834 22.17         143.00   0.0670 20.30         25.8164 22.23
 186.66    24.3957 19.82         186.00   0.3104 11.02         24.0852 20.08
 198.11   132.6757  4.79         198.00   0.0516 28.12        132.6241  4.79
 278.44  2000.2137  0.44         279.00   0.0000  0.00       2000.2137  0.44
 510.22    51.3762  8.58         511.00   1.0317 10.97         50.3445  8.75
 660.16  1455.8542  0.53         661.60   0.0468  0.00       1455.8075  0.53
 910.67    15.5423 21.99         911.10   0.0725 32.84         15.4698 22.10
    0 PEAKS REJECTED BY BACKGROUND

*****************************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098     GLY    2          2.645   7 G- 7
*****************************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

GC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 2.645/2007

BACKGROUND FOR GELI DETECTOR 7 OF 1.811/2007 1109.9 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.4061	14.31	511.0	1.0317	10.97	1120.3	0.0964	9.95
92.0	0.6932	8.24	583.1	0.1198	21.71	1173.2	0.0456	0.00
143.0	0.0670	20.30	609.3	0.2783	41.36	1238.1	0.0294	9.18
186.0	0.3104	11.02	661.6	0.0468	0.00	1332.5	0.0367	42.74
198.0	0.0516	28.12	727.2	0.0227	0.00	1377.7	0.0000	0.00
238.5	0.3591	18.29	846.0	0.0542	67.86	1461.0	0.0472	32.02
279.0	0.0000	0.00	860.4	0.0000	0.00	1586.0	0.0000	0.00
295.2	0.1706	41.84	911.1	0.0725	32.84	1591.0	0.0000	0.00
338.4	0.0785	27.52	968.9	0.0392	37.72	1729.6	0.0000	0.00
351.9	0.3282	38.52	1001.0	0.0285	0.00	1764.5	0.0388	66.47

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 7 ON 1/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
162.828	5	0.9029	10.177	23.
169.849	5	0.9205	10.183	22.
183.987	5	0.9095	10.702	26.
197.965	5	0.9078	9.941	23.
200.672	5	0.9031	10.264	29.
204.990	5	0.9034	10.175	27.
114.694	6	1.0727	13.035	31.
120.917	6	1.0739	12.608	21.
174.039	6	1.0089	14.185	11.
174.047	6	1.0130	14.270	13.
AVERAGE		0.9616	0.073	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH I' MINUTES
308.831	6	1.0108	9.106	32.
316.064	6	1.0011	9.753	21.
320.749	6	1.0520	12.685	42.
320.854	6	1.0496	10.625	61.
322.802	6	1.0135	9.347	25.
325.046	6	1.0085	7.842	42.
336.793	6	1.0304	10.592	25.
341.829	6	1.0122	8.732	12.
350.005	6	1.0063	8.133	24.
356.823	6	1.0105	9.296	16.
AVERAGE		1.0195	0.018	

CALIBRATION LINE FROM STANDARD FOR G- 7 OF 356.823 6
ENERGY= 0.848182 + 0.9915124*CH + -1.560334E-06*CH**2
FWHM =SQRT(0.9258 + 0.006380*ENERGY) (CO60= 3.070)

EFFICIENCIES FOR GEOMETRY XX 7 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

1098 2 GLY GSTOR 541

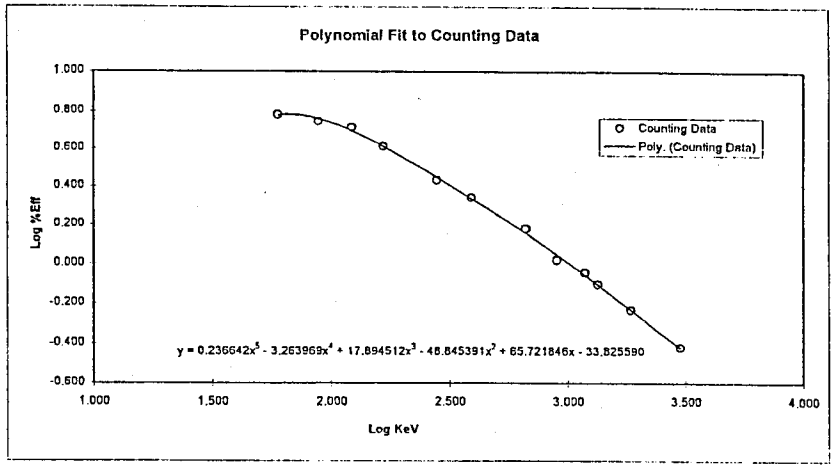
	PK	ENERGY	CPM	%ERR	COMMENT
	1	26.0	7036.11	0.2	
	2	33.2	5974.95	0.2	
	3	37.5	1125.34	0.9	
	4	42.9	527.50	2.1	
	5	59.3	6622.54	0.2	Am241s
	6	66.6	319.06	2.5	33S
	7	70.5	685.61	1.9	
	8	80.6	254.93	4.6	Ce144 I 131
	9	87.8	7908.59	0.2	Cs136 Cd109s
	10	102.6	31.47	33.3	
	11	109.1	55.89	12.1	La140 Cs136 Sb125
	12	121.7	3462.99	0.3	Co 57s
	13	136.1	436.05	1.8	Co 57s
b	14	143.0	25.82	22.2	Fe 59
	15	165.4	3134.02	0.3	Cs136 Cs136 Ce139s
b	16	186.7	24.09	20.1	Ra226 Cs136
b	17	198.1	132.62	4.8	Ac228
	18	203.1	22.01	22.0	Sb125
	19	254.4	90.70	5.3	Sn113
b	20	278.4	2000.21	0.4	Ac228 Th228 Hg203s
	21	299.5	10.90	37.5	Th228
	22	390.7	2081.70	0.4	Sn113s
	23	411.6	11.19	28.8	
b	24	510.2	50.34	8.8	Ac228 Th228 La140 Na 22
b	25	660.2	1455.81	0.5	Cs137s
	26	812.0	32.67	10.0	NO GEN. Co 58
	27	896.0	2211.48	0.4	
b	28	910.7	15.47	22.1	Ac228 NO GEN.
	29	1170.6	1538.04	0.4	NO GEN.
	30	1191.8	9.62	22.5	NO GEN.
	31	1330.0	1229.90	0.5	NO GEN.
	32	1832.2	1100.59	0.5	NO GEN.
	33	1847.0	7.25	19.1	Ra226
	34	1854.1	6.33	19.9	

Detector	G6 100 mL Jar
Geometry	JR Shelf 0 EFF. DATE
Std I.D.	(GLY)1098-2 29-Jan-07
Filename	GELI06JR0.EFF

Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	%Eff Avg	%SD	LogKev	Log%Eff	%Dev from Spline
59.50	6.03308	6.09401	6.06354		1.775	0.783	1
88.00	5.60035	5.59599	5.59617		1.944	0.748	-3
122.10	5.21735	5.19093	5.20414		2.087	0.716	4
165.90	4.10498	4.11136	4.10817		2.220	0.614	0
279.20	2.70281	2.70990	2.70636		2.446	0.432	-4
391.70	2.20505	2.18339	2.19422		2.593	0.341	1
661.70	1.51034	1.50213	1.50623		2.821	0.178	5
898.00	1.04667	1.04005	1.04336		2.953	0.018	-6
1173.20	0.90227	0.90318	0.90273		3.069	-0.044	3
1332.50	0.78609	0.78862	0.78736		3.125	-0.104	0
1836.10	0.58261	0.58654	0.58458		3.264	-0.233	0
			#DIV/0!		#NUM!	#DIV/0!	#DIV/0!
3000	(artificial data)		0.38000		3.477	-0.420	0

avg #DIV/0!

(shaded cells are manual entry, all others are calculated)

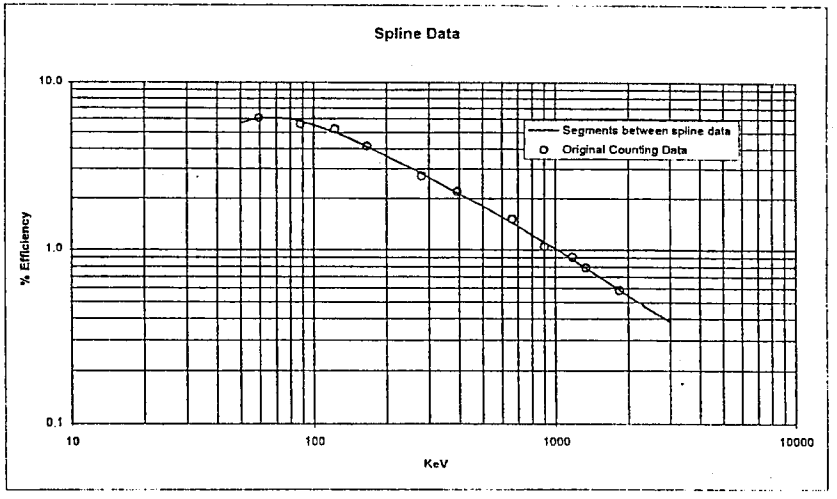


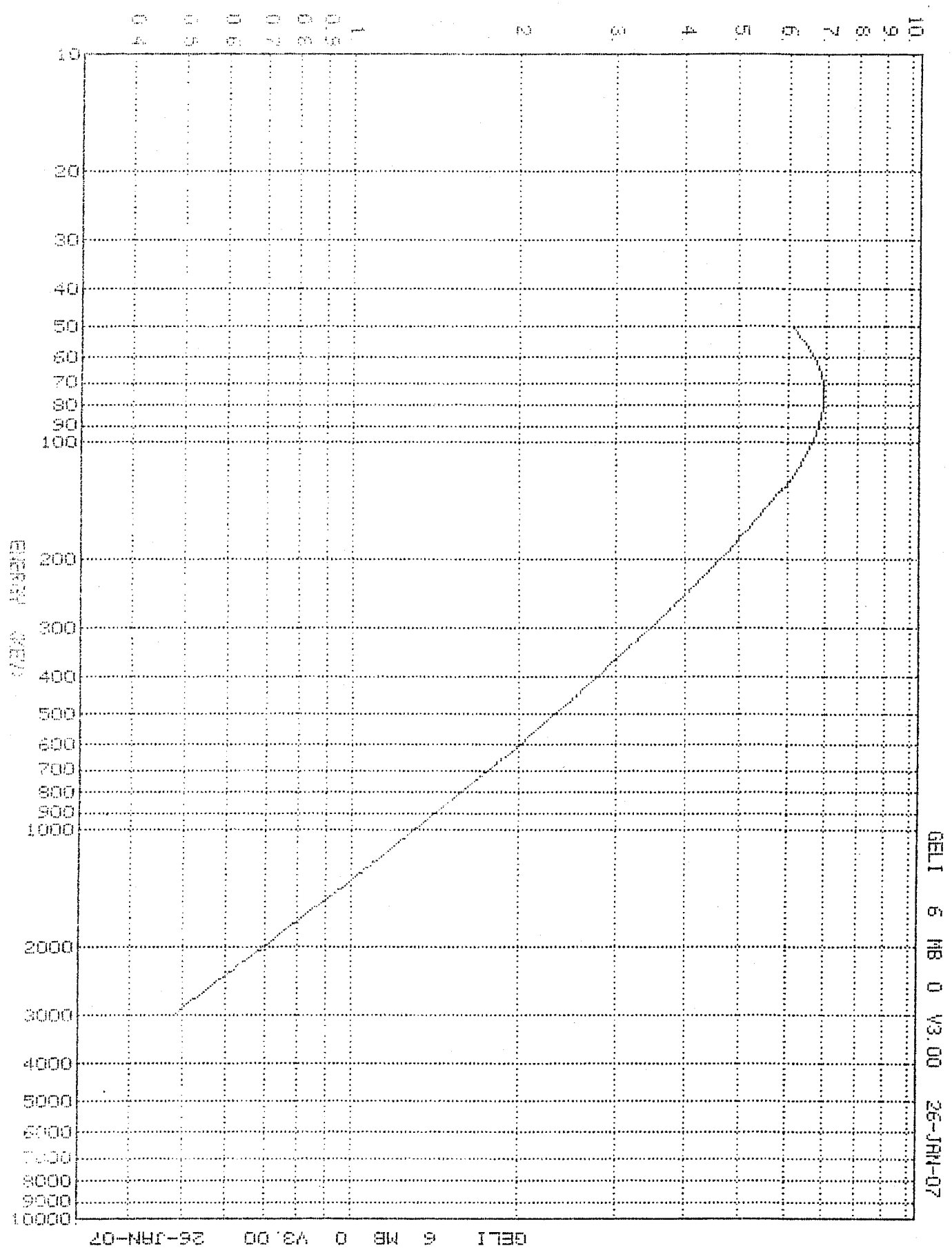
Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
50	5.65237	1.699	0.752		
55	5.89175	1.740	0.770		
60	6.02420	1.778	0.780		#DIV/0!
65	6.07724	1.813	0.784		
70	6.07249	1.845	0.783		
80	5.95146	1.903	0.775		
90	5.74892	1.954	0.760		
100	5.51275	2.000	0.741		#DIV/0!
110	5.26841	2.041	0.722		
130	4.80110	2.114	0.681		
150	4.38845	2.176	0.642		
170	4.03403	2.230	0.606		
190	3.73118	2.279	0.572		
250	3.05219	2.398	0.485		
300	2.66047	2.477	0.425		#DIV/0!
500	1.79279	2.699	0.254		
700	1.36814	2.845	0.136		
1000	1.01267	3.000	0.005		#DIV/0!
1400	0.75098	3.146	-0.124		
2000	0.54184	3.301	-0.266		
3000	0.37978	3.477	-0.420		

Polynomial Coefficients

x5 =	0.236642
x4 =	-3.263969
x3 =	17.894512
x2 =	-48.845391
x1 =	65.721846
x0 =	-33.825590




PERCENT EFFICIENCY
GELI 6 MB 0 V3.00 26-JAN-07

Det .. @ELI 6 Date ..... 26-JAN-07 Page 1
Geo .. MB - Marinelli beaker Version .. 3.00
Eff .. 0 File ..... ND:[25,4]GELI06MB0.EFF
...

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	6.10729	108	6.47079	216	4.37031	324	3.24970	432	2.59723
51	6.17999	110	6.42975	218	4.34241	326	3.23416	434	2.58790
52	6.25212	112	6.37963	220	4.31494	328	3.21879	436	2.57865
53	6.32369	114	6.33078	222	4.28789	330	3.20358	438	2.56947
54	6.39473	116	6.28314	224	4.26125	332	3.18853	440	2.56037
55	6.46523	118	6.23667	226	4.23500	334	3.17365	442	2.55134
56	6.51454	120	6.19131	228	4.20916	336	3.15892	444	2.54238
57	6.56334	122	6.14702	230	4.18369	338	3.14435	446	2.53349
58	6.61165	124	6.10377	232	4.15859	340	3.12993	448	2.52468
59	6.65949	126	6.06150	234	4.13386	342	3.11566	450	2.51593
60	6.70685	128	6.02018	236	4.10948	344	3.10154	452	2.50726
61	6.73756	130	5.97978	238	4.08545	346	3.08757	454	2.49865
62	6.76790	132	5.93017	240	4.06176	348	3.07373	456	2.49010
63	6.79789	134	5.88171	242	4.03841	350	3.06004	458	2.48163
64	6.82754	136	5.83436	244	4.01538	352	3.04649	460	2.47322
65	6.85686	138	5.78806	246	3.99266	354	3.03307	462	2.46487
66	6.87308	140	5.74280	248	3.97026	356	3.01979	464	2.45659
67	6.88910	142	5.69852	250	3.94816	358	3.00664	466	2.44838
68	6.90491	144	5.65520	252	3 92498	360	2.99362	468	2.44022
69	6.92053	146	5.61279	254	3.90212	362	2.98072	470	2.43213
70	6.93596	148	5.57128	256	3.87957	364	2.96796	472	2.42409
71	6.93690	150	5.53062	258	3.85732	366	2.95532	474	2.41612
72	6.93783	152	5.48694	260	3.83537	368	2.94280	476	2.40821
73	6.93875	154	5.44418	262	3.81372	370	2.93040	478	2.40036
74	6.93965	156	5.40229	264	3.79235	372	2.91811	480	2.39256
75	6.94054	158	5.36125	266	3.77125	374	2.90595	482	2.38482
76	6.94142	160	5.32103	268	3.75044	376	2.89390	484	2.37714
77	6.94229	162	5.28161	270	3.72989	378	2.88197	486	2.36952
78	6.94315	164	5.24296	272	3.70960	380	2.87014	488	2.36195
79	6.94399	166	5.20505	274	3.68957	382	2.85843	490	2.35444
80	6.94483	168	5.16787	276	3.66980	384	2.84682	492	2.34698
81	6.93251	170	5.13139	278	3.65027	386	2.83533	494	2.33957
82	6.92036	172	5.09300	280	3.63098	388	2.82393	496	2.33222
83	6.90838	174	5.05533	282	3.61193	390	2.81265	498	2.32492
84	6.89656	176	5.01837	284	3.59312	392	2.80146	500	2.31767
85	6.88491	178	4.98209	286	3.57453	394	2.79038	502	2.31012
86	6.87340	180	4.94648	288	3.55618	396	2.77939	504	2.30263
87	6.86205	182	4.91151	290	3.53804	398	2.76850	506	2.29519
88	6.85085	184	4.87716	292	3.52011	400	2.75771	508	2.28781
89	6.83980	186	4.84342	294	3.50240	402	2.74702	510	2.28048
90	6.82888	188	4.81027	296	3.48490	404	2.73642	512	2.27320
91	6.80944	190	4.77770	298	3.46760	406	2.72591	514	2.26597
92	6.79027	192	4.74306	300	3.45050	408	2.71550	516	2.25879
93	6.77136	194	4.70903	302	3.43268	410	2.70517	518	2.25166
94	6.75271	196	4.67558	304	3.41508	412	2.69494	520	2.24459
95	6.73430	198	4.64271	306	3.39768	414	2.68479	522	2.23756
96	6.71613	200	4.61040	308	3.38048	416	2.67473	524	2.23058
97	6.69820	202	4.57863	310	3.36347	418	2.66475	526	2.22365
98	6.68050	204	4.54739	312	3.34667	420	2.65486	528	2.21676
99	6.66303	206	4.51667	314	3.33005	422	2.64505	530	2.20993
100	6.64578	208	4.48644	316	3.31362	424	2.63533	532	2.20314
102	6.60031	210	4.45671	318	3.29737	426	2.62568	534	2.19639
104	6.55602	212	4.42745	320	3.28130	428	2.61612	536	2.18970
106	6.51286	214	4.39865	322	3.26542	430	2.60664	538	2.18305

Det ... GELI 6
Geo ... ME - Marinelli beaker
Bkg# .. 0
Ref ...

Date 26-JAN-07
Version .. 3.00
File ..... ND:[25,4]GELI06MB0.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	2.17644	660	1.84735	930	1.38279	1260	1.05907	1800	0.76598
542	2.16987	665	1.83600	935	1.37650	1270	1.05167	1810	0.76210
544	2.16335	670	1.82479	940	1.37027	1280	1.04437	1820	0.75826
546	2.15688	675	1.81374	945	1.36410	1290	1.03719	1830	0.75446
548	2.15045	680	1.80284	950	1.35800	1300	1.03011	1840	0.75069
550	2.14406	685	1.79208	955	1.35195	1310	1.02313	1850	0.74697
552	2.13771	690	1.78147	960	1.34596	1320	1.01625	1860	0.74329
554	2.13140	695	1.77099	965	1.34003	1330	1.00947	1870	0.73964
556	2.12513	700	1.76065	970	1.33415	1340	1.00279	1880	0.73603
558	2.11891	705	1.75003	975	1.32833	1350	0.99619	1890	0.73246
560	2.11273	710	1.73954	980	1.32257	1360	0.98969	1900	0.72892
562	2.10658	715	1.72919	985	1.31685	1370	0.98328	1925	0.72023
564	2.10048	720	1.71898	990	1.31120	1380	0.97696	1950	0.71176
566	2.09441	725	1.70889	995	1.30559	1390	0.97072	1975	0.70349
568	2.08838	730	1.69893	1000	1.30004	1400	0.96457	2000	0.69542
570	2.08240	735	1.68910	1005	1.29430	1410	0.95829	2025	0.68753
572	2.07645	740	1.67939	1010	1.28862	1420	0.95210	2050	0.67983
574	2.07053	745	1.66980	1015	1.28298	1430	0.94599	2075	0.67230
576	2.06466	750	1.66033	1020	1.27740	1440	0.93996	2100	0.66495
578	2.05882	755	1.65098	1025	1.27187	1450	0.93402	2125	0.65776
580	2.05302	760	1.64174	1030	1.26640	1460	0.92815	2150	0.65074
582	2.04725	765	1.63261	1035	1.26097	1470	0.92235	2175	0.64386
584	2.04152	770	1.62359	1040	1.25559	1480	0.91664	2200	0.63714
586	2.03583	775	1.61468	1045	1.25026	1490	0.91099	2225	0.63057
588	2.03017	780	1.60587	1050	1.24498	1500	0.90542	2250	0.62413
590	2.02455	785	1.59717	1055	1.23974	1510	0.89992	2275	0.61783
592	2.01896	790	1.58857	1060	1.23455	1520	0.89448	2300	0.61166
594	2.01340	795	1.58007	1065	1.22941	1530	0.88912	2325	0.60562
596	2.00788	800	1.57167	1070	1.22431	1540	0.88382	2350	0.59970
598	2.00239	805	1.56337	1075	1.21926	1550	0.87859	2375	0.59390
600	1.99694	810	1.55515	1080	1.21425	1560	0.87342	2400	0.58821
602	1.99152	815	1.54704	1085	1.20928	1570	0.86832	2425	0.58264
604	1.98613	820	1.53901	1090	1.20436	1580	0.86328	2450	0.57718
606	1.98077	825	1.53108	1095	1.19948	1590	0.85830	2475	0.57183
608	1.97545	830	1.52323	1100	1.19465	1600	0.85337	2500	0.56657
610	1.97016	835	1.51547	1105	1.18985	1610	0.84851	2525	0.56142
612	1.96489	840	1.50780	1110	1.18509	1620	0.84371	2550	0.55636
614	1.95966	845	1.50021	1115	1.18038	1630	0.83896	2575	0.55140
616	1.95446	850	1.49270	1120	1.17570	1640	0.83426	2600	0.54653
618	1.94930	855	1.48528	1125	1.17107	1650	0.82962	2625	0.54175
620	1.94416	860	1.47793	1130	1.16647	1660	0.82504	2650	0.53705
622	1.93905	865	1.47066	1135	1.16191	1670	0.82051	2675	0.53244
624	1.93397	870	1.46347	1140	1.15739	1680	0.81602	2700	0.52791
626	1.92892	875	1.45636	1150	1.14846	1690	0.81159	2725	0.52346
628	1.92390	880	1.44932	1160	1.13967	1700	0.80721	2750	0.51909
630	1.91891	885	1.44235	1170	1.13103	1710	0.80288	2775	0.51480
632	1.91395	890	1.43546	1180	1.12252	1720	0.79860	2800	0.51057
634	1.90901	895	1.42864	1190	1.11415	1730	0.79437	2825	0.50642
636	1.90411	900	1.42189	1200	1.10591	1740	0.79018	2850	0.50234
638	1.89923	905	1.41521	1210	1.09780	1750	0.78603	2875	0.49833
640	1.89438	910	1.40859	1220	1.08981	1760	0.78194	2900	0.49438
645	1.88237	915	1.40204	1230	1.08195	1770	0.77788	2925	0.49050
650	1.87054	920	1.39556	1240	1.07420	1780	0.77387	2950	0.48668
655	1.85886	925	1.38914	1250	1.06658	1790	0.76991	2975	0.48293

ANALYTICS
An Isotope Products Laboratories Company

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Fax 404-352-2837
www.analyticsinc.com

Log 417 Recd 12/27/06 K Trenton

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

1098-2

LIBR A982

74159-207
100 mL Solid in Wide Mouth PPi Parkway Jar

Customer: Eberline Services / Richmond, CA
P.O. No.: 00003890, Item 1
Calibration Date: 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01515

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1990.0	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	189000	2863.9	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	94570	1433.0	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	133800	2027.5	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	295300	4475	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	185600	2812.4	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	116700	1768.4	0.70	1.20	2.78	HPGe
Y-88	898.0	106.60	455400	6901	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	226900	3438	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	227000	3440	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	481200	7292	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
This standard will expire one year after the calibration date.

Source Prepared by: M. Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate

DEAD TIME = 5.22% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-6 XX 15.865 7 68.35 MIN 1.00000 SM 215

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.995E-01	41G		
59 (59.54)	1.990000	1.00000	7200.399	3.618E+03 s		0.19%	1.631E+03
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.528E-01	2G		
87 (88.03)	0.039000	1.00000	8463.392	2.170E+05 s		0.19%	1.146E+05
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.628E-01	10G		
121 (122.06)	1.433000	1.00000	3501.593	2.444E+03 s		0.36%	1.443E+03
136 (136.47)	0.000001	1.00000	448.237	4.482E+08 s		1.89%	2.647E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 5.858E-01	3G		
165 (165.80)	0.800000	1.00000	3060.977	3.826E+03 s		0.36%	2.942E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.062E-01	2G		
**** (279.21)	0.815000	1.00000	23.729	2.912E+01 s		<	6.359E+01
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.277E-01	5G		
**** (391.40)	0.642000	1.00000	23.187	3.612E+01 s		<	3.083E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.933E-01	3G		
**** (661.64)	1.768400	1.00000	14.561	8.234E+00 s		<	3.734E+00
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.014E-01	8G		
**** (898.00)	0.920000	1.00000	13.884	1.509E+01 s		<	1.356E+01
**** (1836.10)	1.000000	1.00000	3.338	3.338E+00 s		<	2.999E+00
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.624E-01	5G		
**** (1173.21)	0.999200	1.00000	6.680	6.685E+00 s		<	3.129E+00
**** (1332.48)	1.000000	1.00000	5.328	5.328E+00 s		<	2.494E+00

DEAD TIME = 5.22% LIVE TIME------v <---- HEY THERE!

NO EFFICIENCIES

1098 GLY 2 G-6 XX 15.865 7 68.35 MIN 1.00000 SM 215

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

Group	1098	Time of count	15.865 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	68.35
Type code	GLY	Dead Time Pct	5.223018
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-6	Standard GMT	5.755 2007
Aliquot	1.	Days since TO	106.1565
Unit of Aliquot	SMPL	Time on	12:45 PST 15-JAN
Data Sheet Units	PCI /SMPL	Time off	13:53 PST 15-JAN
Library	A982	Calc Time	15:37 15-JAN-07
Slope	1.004323	Width slope	0.010382
Intercept	-.286814	Width offset	-.359554
X**2 TERM	-0.15486747E-05	Sensitivity	4.

NP: [7,67]215.GSP 29 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	4	21.6	20	10401548	2.48	799985	21.8	1.17E+04	0.1	0.061	0	*******	
2	4	25.2	20	10400553	1.78	859771	25.4	1.26E+04	0.2	0.096	0	0.00	
3	0	32.8	31	6223404	2.22	53630	32.9	7.85E+02	1.5	0.212	0	0.00	
4	0	42.2	41	6124770	2.24	3796	42.3	5.55E+01	15.2	0.452	0	0.00	
5	5	50.0	46	18167422	4.09	56883	50.1	8.32E+02	1.3	0.753	0	432.00	
6	5	55.5	46	18241986	4.12	62095	55.6	9.08E+02	2.0	100.	0	0.00	
7	5	59.4	46	18133636	2.39	492147	59.4	7.20E+03	0.2	100.	0	0.00	
8	3	67.0	65	15	81524	4.02	24745	67.0	3.62E+02	1.7	100.	0	136.00
9	3	73.2	65	15278621	4.93	107466	73.2	1.57E+03	1.1	100.	0	0.00	
10	0	87.5	83	10183951	2.42	578451	87.4	8.46E+03	0.2	100.	0	0.00	
11	0	104.7	100	12141013	8.18	4844	104.5	7.09E+01	15.5	100.	0	0.00	
12	0	121.3	116	12119215	2.50	239319	121.0	3.50E+03	0.4	100.	0	0.00	
13	0	135.6	131	10	87997	2.52	30635	135.3	4.48E+02	1.9	100.	0	0.00
14	0	164.8	159	12	85823	2.46	209191	164.4	3.06E+03	0.4	100.	0	0.00
15	0	186.4	183	6	37148	2.15	792	185.9	1.16E+01	38.6	100.	0	0.00
16	0	197.3	193	8	53083	2.81	7994	196.7	1.17E+02	5.1	100.	0	0.00
17	0	253.5	250	7	33971	2.45	6073	252.8	8.88E+01	5.2	100.	0	0.00
18	0	277.4	271	12	50398	2.55	116970	276.6	1.71E+03	0.5	100.	0	0.00
19	0	389.2	382	12	35785	2.74	141671	388.0	2.07E+03	0.4	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	507.7	501	11	25363	3.85	4397	506.2	6.43E+01	7.2	100.	0	0.00
21	0	657.6	649	14	34785	2.98	108863	655.7	1.59E+03	0.5	100.	0	0.00
22	0	808.9	803	9	14303	3.05	2140	806.8	3.13E+01	10.2	100.	0	0.00
23	0	892.5	882	17	29665	3.35	157489	890.2	2.30E+03	0.4	100.	0	0.00
24	0	906.7	900	10	18381	3.79	1941	904.4	2.84E+01	13.2	100.	0	0.00
[illegible]	0	1166.1	1154	18	15534	3.73	122837	1163.5	1.80E+03	0.4	100.	0	0.00
[illegible]	0	1324.6	1315	16	13901	3.86	107083	1321.8	1.57E+03	0.4	100.	0	0.00
[illegible]	0	1451.8	1446	8	4279	4.88	374	1449.0	5.47E+00	30.9	100.	0	0.00
28	0	1824.8	1811	22	3411	4.88	92662	1822.3	1.36E+03	0.4	100.	0	0.00
29	0	1841.1	1832	17	1831	5.60	1282	1838.6	1.88E+01	8.6	100.	0	0.00

FWHM=SQRT(1.04679E+01 + 6.26630E-03 *E)

BACKGROUND INFO 1098 GLY [illegible] 7 G- 6 BG DATE 1.811 7

```
v---------PEAK----------v      v-------BACKGROUND-------v      v--------NET-----v
ENERGY        CPM   %ERROR       ENERGY        CPM   %ERROR          CPM   %ERROR

 196.39    11.5865 38.56         186.00   0.5077 15.50          11.0788 40.34
 197.25   116.9564  5.12         198.00   0.1287  0.00         116.8276  5.13
 277.37  1711.3406  0.48         279.00   0.2460  0.00        1711.0946  0.48
    0 PEAKS REJECTED BY BACKGROUND

INTERFERING ISOTOPE ANALYSIS 1098     GLY    2          15.865  7 G- 6

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 15.865/2007

BACKGROUND FOR GELI DETECTOR 6 OF 1.811/2007 1375.0 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.6224	50.14	511.0	2.3106	3.31	1120.3	0.3595	13.96
92.0	0.7505	22.46	583.1	0.5662	19.50	1173.2	0.0430	0.00
143.0	0.1067	0.00	609.3	0.9957	5.07	1238.1	0.1603	14.78
186.0	0.5077	15.50	661.6	0.0853	28.48	1332.5	0.0532	28.93
198.0	0.1287	0.00	727.2	0.1281	17.80	1337.7	0.0000	0.00
238.6	1.1958	29.75	846.0	0.0625	0.00	1461.0	3.1055	9.84
279.0	0.2460	0.00	860.4	0.1053	19.95	1586.0	0.0773	0.00
295.2	0.4169	19.60	911.1	0.4260	15.85	1591.0	0.1130	31.59
338.4	0.2057	23.53	968.9	0.3063	28.89	1729.6	0.0661	22.69
351.9	0.8857	12.77	1001.0	0.0716	69.65	1764.5	0.3674	9.04

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 1/15/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
322.838	6	1.3358	12.317	78.NG
336.812	6	1.3293	13.679	22.NG
336.905	6	1.3338	12.583	73.
349.852	6	1.3218	11.981	63.
352.746	6	1.3080	12.674	24.
353.834	6	1.3114	12.373	30.
356.660	6	1.3386	13.451	111.
4.638	7	1.3913	12.530	18.NG
4.854	7	1.4380	11.424	46.NG
5.755	7	1.4354	12.275	24.NG
AVERAGE		1.3227	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
315.882	6	1.3541	14.648	20.
320.990	6	1.3895	15.941	50.
321.801	6	1.3496	13.162	25.
322.821	6	1.3393	13.918	22.
336.876	6	1.3866	16.427	40.
349.900	6	1.4000	17.996	30.
352.766	6	1.3902	16.717	35.
353.774	6	1.3305	13.970	27.
356.784	6	1.3369	13.477	23.
4.652	7	1.3440	13.744	26.
AVERAGE		1.3504	0.027	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 5.755 7
ENERGY= -0.286814 + 1.0043234*CH + -1.548675E-06*CH**2
FWHM =SQRT(-0.3596 + 0.010383*ENERGY) (C060= 3.671)

EFFICIENCIES FOR GEOMETRY XX 6 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

PK	ENERGY	CPM	%ERR	COMMENT	
1	21.61	1704.25	0.1		
2	25.21	2578.95	0.2		
3	32.8	784.64	1.5		
4	42.2	55.54	15.2	NO GEN.	22S
5	50.0	832.24	1.3		25S
6	55.5	908.49	2.0		
7	59.4	7200.40	0.2		Am241s
8	67.0	362.03	1.7		
9	73.2	1572.30	1.1		
10	87.5	8463.07	0.2		Cs136 Cd109s
11	104.7	70.87	15.5		
12	121.3	3501.37	0.4		Ag110 Co 57s
13	135.6	448.21	1.9		Co 57s
14	164.8	3060.59	0.4		Cs136 Ce139s
b 15	186.4	11.08	40.3	Ra226 NO GEN.	Cs136
b 16	197.3	116.83	5.1		
17	253.5	88.85	5.2	Th228	
b 18	277.4	1711.09	0.5	Th228 NO GEN.	
19	389.2	2072.74	0.4	NO GEN.	
20	507.7	64.33	7.2	NO GEN.	Cs136
21	657.6	1592.74	0.5	NO GEN.	Ag110
22	808.9	31.32	10.2	NO GEN.	
23	892.5	2304.15	0.4	Th228 NO GEN.	La140
24	906.7	28.40	13.2	NO GEN.	
25	1166.1	1797.18	0.4	NO GEN.	
26	1324.6	1566.69	0.4	NO GEN.	Sb124
27	1451.8	5.47	30.9	NO GEN.	
28	1824.8	1355.69	0.4		
29	1841.1	18.76	8.6		

DEAD TIME = 5.16% LIVE TIME------v <---- HEY THERE!

NO EFFICIENCIES

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1098 GLY 2 G-6 XX 26.699 7 117.32 MIN 1.00000 SM 337

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMP(AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.995E-01 41G			
60 (59.54)	1.990000	1.00000	7272.792	3.655E+03 s		0.13%	1.647E+03
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.390E-01 2G			
88 (88.03)	0.039000	1.00000	8028.696	2.059E+05 s		0.12%	1.105E+05
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.420E-01 10G			
122 (122.06)	1.433000	1.00000	3386.192	2.363E+03 s		0.22%	1.434E+03
136 (136.47)	0.000001	1.00000	430.360	4.304E+08 s		1.35%	2.612E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 5.547E-01 3G			
166 (165.80)	0.800000	1.00000	2899.170	3.624E+03 s		0.27%	2.943E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 1.756E-01 2G			
279 (279.21)	0.815000	1.00000	1453.986	1.784E+03 s		0.37%	4.578E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 4.943E-01 5G			
392 (391.40)	0.642000	1.00000	1919.381	2.990E+03 s		0.29%	2.724E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.927E-01 3G			
662 (661.64)	1.768400	1.00000	1582.950	6.951E+02 s		0.35%	4.062E+02
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 4.673E-01 8G			
898 (898.00)	0.920000	1.00000	2129.789	2.315E+03 s		0.28%	2.231E+03
1835 (1836.10)	1.000000	1.00000	1268.734	1.269E+03 s		0.29%	1.223E+03
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.587E-01 5G			
1173 (1173.21)	0.999200	1.00000	1791.814	1.793E+03 s		0.28%	8.426E+02
1333 (1332.48)	1.000000	1.00000	1565.447	1.565E+03 s		0.30%	7.356E+02

DEAD TIME = 5.16% LIVE TIME----v <---- HEY THERE!

NO EFFICIENCIES

1098 GLY 2 G-6 XX 26.699 7 117.32 MIN 1.00000 SM 337

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

* Group	1098	* Time of count	26.699 2007 *
* Sample	2	* Reference GMT	274.708 2006 *
* Element		* Elapsed Live Tm	117.3167 *
* Type code	GLY	* Dead Time Pct	5.160334 *
* ID	74159-207 (JR)	* Background GMT	1.811 2007 *
* Geometry, detector	XX-6	* Standard GMT	26.607 2007 *
* Aliquot	1.	* Days since T0	116.9906 *
* Unit of Aliquot	SMPL	* Time on	8:46 PST 26-JAN *
* Data Sheet Units	PCI /SMPL	* Time off	10:43 PST 26-JAN *
* Library	A982	* Calc Time	15:24 26-JAN-07 *
* Slope	1.003945	* Width slope	0.010932 *
* Intercept	-.248056	* Width offset	0.0 *
* X**2 TERM	-0.15754654E-05	* Sensitivity	4. *

NP: C7:671337.GSP 38 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	21.6	18	12196278	2.141954463			21.8	1.67E+04	0.1	0.061	0	*******
2	5	25.4	18	12327187	1.621896731			25.5	1.62E+04	0.1	0.098	0	0.00
3	0	32.9	32	4290842	1.43	50326		33.0	4.29E+02	1.6	0.214	0	0.00
4	0	43.2	41	6203969	2.34	15016		43.3	1.28E+02	5.0	0.484	0	0.00
5	5	50.2	46	18278217	3.38	87732		50.3	7.48E+02	1.1	0.762	0	*******
6	5	59.9	46	18149876	1.58	853220		59.9	7.27E+03	0.1	100.	0	0.00
7	4	67.4	66	14106504	2.32	21325		67.4	1.82E+02	2.1	100.	0	*******
8	4	71.6	66	14394565	3.54	65151		71.6	5.55E+02	1.9	100.	0	0.00
9	4	75.0	66	14217309	2.13	92856		75.0	7.92E+02	0.9	100.	0	0.00
10	2	85.1	84	9	89685	1.45	24466	85.1	2.09E+02	1.5	100.	0	94.10
11	2	88.2	84	9129682	1.46	941839		88.2	8.03E+03	0.1	100.	0	0.00
12	0	105.3	101	10192962	8.08	6844		105.1	5.83E+01	12.0	100.	0	0.00
13	0	122.1	118	8130959	1.40	397213		121.9	3.39E+03	0.2	100.	0	0.00
14	0	136.4	132	9126581	1.73	50483		136.2	4.30E+02	1.3	100.	0	0.00
15	0	143.0	141	6	81565	2.11	1238	142.7	1.06E+01	36.6	100.	0	0.00
16	0	165.9	160	11128039	1.97	340047		165.5	2.90E+03	0.3	100.	0	0.00
17	0	188.1	185	6	60713	2.28	1077	187.7	9.18E+00	36.2	100.	0	0.00
18	6	196.1	194	8	31354	2.27	1847	195.6	1.57E+01	12.9	100.	0	15.90
19	6	199.0	194	8	63708	1.89	13324	198.5	1.14E+02	3.1	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	203.7	202	5	51540	1.81	2269	203.2	1.93E+01	15.3	100.	0	0.00
21	0	255.1	251	8	62861	2.04	10500	254.4	8.95E+01	4.2	100.	0	0.00
22	0	279.2	274	10	67411	2.05	170497	278.4	1.45E+03	0.4	100.	0	0.00
23	0	310.9	308	6	34301	1.71	744	310.0	6.34E+00	39.5	100.	0	0.00
24	0	391.6	385	11	55014	2.09	225117	390.6	1.92E+03	0.3	100.	0	0.00
25	0	511.0	506	8	31795	2.92	5690	509.7	4.85E+01	5.6	100.	0	0.00
26	0	639.7	636	5	18961	2.60	430	638.1	3.67E+00	48.3	100.	0	0.00
27	0	661.6	654	13	52971	2.45	185716	659.9	1.58E+03	0.3	100.	0	0.00
28	0	690.8	687	7	28520	2.96	568	689.0	4.84E+00	49.4	100.	0	0.00
29	0	813.6	808	10	25698	3.09	3949	811.7	3.37E+01	7.8	100.	0	0.00
30	0	820.3	817	7	18067	3.13	372	818.4	3.17E+00	60.2	100.	0	0.00
31	0	898.0	888	16	47530	2.88	249790	895.9	2.13E+03	0.3	100.	0	0.00
32	0	912.2	907	9	27771	2.61	2656	910.1	2.26E+01	11.5	100.	0	0.00
33	0	1173.2	1162	17	24954	3.34	210211	1171.0	1.79E+03	0.3	100.	0	0.00

34	0	1332.5	1323	16	22821	3.66	183656	1330.3	1.57E+03	0.3	100.	0	0.00
35	0	1609.0	1603	10	11454	3.29	323	1607.0	2.75E+00	62.8	100.	0	0.00
36	0	1710.9	1704	10	3921	3.14	242	1709.0	2.06E+00	49.0	100.	0	0.00
37	0	1835.4	1822	22	5256	4.72	148809	1833.8	1.27E+03	0.3	100.	0	0.00
38	0	1850.0	1843	11	2689	4.58	1428	1848.3	1.22E+01	7.6	100.	0	0.00

FWHM=SQRT(6.01953E+00 + 4.84391E-03 *E)

****

BACKGROUND INFO 1098 GLY 2 26.699 7 @- 6 BG DATE 1.811 7

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PEAK			BACKGROUND			NET	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
142.99	10.5545	36.63	143.00	0.1067	0.00	10.4478	37.01
196.11	15.7465	12.93	198.00	0.1287	0.00	15.6178	13.03
199.00	113.5738	3.13	198.00	0.1287	0.00	113.4450	3.14
279.15	1453.3032	0.37	279.00	0.2460	0.00	1453.0573	0.37
511.03	48.5016	5.58	511.00	2.3106	3.31	46.1910	5.87
661.60	1583.0308	0.35	661.60	0.0853	28.48	1582.9454	0.35
912.17	22.6436	11.51	911.10	0.4260	15.85	22.2176	11.74
1173.17	1791.8297	0.28	1173.20	0.0430	0.00	1791.7867	0.28
1332.53	1565.4762	0.30	1332.50	0.0532	28.93	1565.4230	0.30

0 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 1098 GLY 2 26.699 7 @- 6

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SPANF TABLE SAVED IN @STOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 26.699/2007

BACKGROUND FOR GELI DETECTOR 6 OF 1 911/2007 1375.0 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.6224	50.14	511.0	2.3106	3.31	1120.3	0.3595	13.96
92.0	0.7505	22.46	583.1	0.5662	19.50	1173.2	0.0430	0.00
143.0	0.1067	0.00	609.3	0.9957	5.07	1238.1	0.1603	14.78
186.0	0.5077	15.50	661.6	0.0853	28.48	1332.5	0.0532	28.93
198.0	0.1287	0.00	727.2	0.1281	17.80	1337.7	0.0000	0.00
238.6	1.1958	29.75	846.0	0.0625	0.00	1461.0	3.1055	9.84
279.0	0.2460	0.00	860.4	0.1053	19.95	1586.0	0.0773	0.00
295.2	0.4169	19.60	911.1	0.4260	15.85	1591.0	0.1130	31.59
338.4	0.2057	23.53	968.9	0.3063	28.89	1729.6	0.0661	22.69
351.9	0.8857	12.77	1001.0	0.0716	69.65	1764.5	0.3674	9.04

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 1/26/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
336.905	6	1.3338	12.583	73.
349.852	6	1.3218	11.981	63.
352.746	6	1.3080	12.674	24.
353.834	6	1.3114	12.373	30.
356.660	6	1.3386	13.451	111.
4.638	7	1.3913	12.530	18. NG
4.854	7	1.4380	11.424	46. NG
5.755	7	1.4354	12.275	24. NG
20.762	7	1.4106	11.030	21. NG
26.607	7	1.4487	13.714	22. NG
AVERAGE		1.3227	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
320.990	6	1.3895	15.941	50.
321.801	6	1.3496	13.162	25.
322.821	6	1.3393	13.918	22.
336.876	6	1.3866	16.427	40.
349.900	6	1.4000	17.996	30.
352.766	6	1.3902	16.717	35.
353.774	6	1.3305	13.970	27.
356.784	6	1.3369	13.477	23.
4.652	7	1.3440	13.744	26.
20.778	7	1.3707	13.413	21. NG
AVERAGE		1.3545	0.025	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 26.607 7
ENERGY= -0.248056 + 1.0039451*CH + -1.575465E-06*CH**2
FWHM =SQRT(-0.6836 + 0.010933*ENERGY) (C060= 3.726)

EFFICIENCIES FOR GEOMETRY XX 6 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

DEAD TIME = 5.16% LIVE TIME------v <--- HEY THERE!

NO EFFICIENCIES

1098 GLY 2 G-6 XX 26.699 7 117.32 MIN 1.00000 SM 337

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

Group	1098	Time of count	26.699 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	117.3167
Type code	GLY	Dead Time Pct	5.160334
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-6	Standard GMT	26.607 2007
Aliquot	1.	Days since TO	116.9906
Unit of Aliquot	SMPL	Time on	8:46 PST 26-JAN
Data Sheet Units	PCI /SMPL	Time off	10:43 PST 26-JAN
Library	A982	Calc Time	10:52 26-JAN-07
Slope	1.003945	Width slope	0.010932
Intercept	-.248056	Width offset	-.683575
X**2 TERM	-0.15754654E-05	Sensitivity	4.

NP: 67.671337 GSP 38 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	21.6	18	12	196278	2.14	1954463	21.8	1.67E+04	0.1	0.061	0	******
2	5	25.4	18	12	327187	1.62	1896731	25.5	1.62E+04	0.1	0.098	0	0.00
3	0	32.9	32	4	290842	1.43	50326	33.0	4.29E+02	1.6	0.214	0	0.00
4	0	43.2	41	6	203969	2.34	15016	43.3	1.28E+02	5.0	0.484	0	0.00
5	5	50.2	46	18	278217	3.38	87732	50.3	7.48E+02	1.1	0.762	0	******
6	5	59.9	46	18	149876	1.58	853220	59.9	7.27E+03	0.1	100.	0	0.00
7	4	67.4	66	14	106504	2.32	21325	67.4	1.82E+02	2.1	100.	0	******
8	4	71.6	66	14	394565	3.54	65151	71.6	5.55E+02	1.9	100.	0	0.00
9	4	75.0	66	14	217309	2.13	92856	75.0	7.92E+02	0.9	100.	0	0.00
10	2	85.1	84	9	89685	1.45	24466	85.1	2.09E+02	1.5	100.	0	94.10
11	2	88.2	84	9	129682	1.46	941839	88.2	8.03E+03	0.1	100.	0	0.00
12	0	105.3	101	10	192962	8.08	6844	105.1	5.83E+01	12.0	100.	0	0.00
13	0	122.1	118	8	130959	1.40	397213	121.9	3.39E+03	0.2	100.	0	0.00
14	0	136.4	132	9	126581	1.73	50483	136.2	4.30E+02	1.3	100.	0	0.00
15	0	143.0	141	6	81565	2.11	1238	142.7	1.06E+01	36.6	100.	0	0.00
16	0	165.9	160	11	128039	1.97	340047	165.5	2.90E+03	0.3	100.	0	0.00
17	0	188.1	185	6	60713	2.28	1077	187.7	9.18E+00	36.2	100.	0	0.00
18	6	196.1	194	8	31354	2.27	1847	195.6	1.57E+01	12.9	100.	0	15.90
19	6	199.0	194	8	63708	1.89	13324	198.5	1.14E+02	3.1	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	203.7	202	5	51540	1.81	2269	203.2	1.93E+01	15.3	100.	0	0.00
21	0	255.1	251	8	62861	2.04	10500	254.4	8.95E+01	4.2	100.	0	0.00
22	0	279.2	274	10	67411	2.05	170497	278.4	1.45E+03	0.4	100.	0	0.00
23	0	310.9	308	6	34301	1.71	744	310.0	6.34E+00	39.5	100.	0	0.00
24	0	391.6	385	11	55014	2.09	225117	390.6	1.92E+03	0.3	100.	0	0.00
25	0	511.0	506	8	31795	2.92	5690	509.7	4.85E+01	5.6	100.	0	0.00
26	0	639.7	636	5	18961	2.60	430	638.1	3.67E+00	48.3	100.	0	0.00
27	0	661.6	654	13	52971	2.45	185716	659.9	1.58E+03	0.3	100.	0	0.00
28	0	690.8	687	7	28520	2.96	568	689.0	4.84E+00	49.4	100.	0	0.00
29	0	813.6	808	10	25698	3.09	3949	811.7	3.37E+01	7.8	100.	0	0.00
30	0	820.3	817	7	18067	3.13	372	818.4	3.17E+00	60.2	100.	0	0.00
31	0	898.0	888	16	47530	2.88	249790	895.9	2.13E+03	0.3	100.	0	0.00
32	0	912.2	907	9	27771	2.61	2656	910.1	2.26E+01	11.5	100.	0	0.00
33	0	1173.2	1162	17	24954	3.24	210211	1171.0	1.79E+03	0.3	100.	0	0.00

34	0	1332.5	1323	16	22821	3.66	183656	1330.3	1.57E+03	0.3	100.	0	0.00
35	0	1609.0	1603	10	11454	3.29	323	1607.0	2.75E+00	62.8	100.	0	0.00
36	0	1710.9	1704	10	3921	3.14	242	1709.0	2.06E+00	49.0	100.	0	0.00
37	0	1835.4	1822	22	5256	4.72	148802	1833.8	1.27E+03	0.3	100.	0	0.00
38	0	1850.0	1843	11	2689	4.58	1428	1848.3	1.22E+01	7.6	100.	0	0.00

FWHM=SQRT(6.01953E+00 + 4.84391E-03 *E)

****

BACKGROUND INFO 1098 GLY 2 26.699 7 G- 6 BG DATE 1.811 7

****

PEAK			BACKGROUND			NET	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
142.99	10.5545	36.63	143.00	0.1067	0.00	10.4478	37.01
196.11	15.7465	12.93	198.00	0.1287	0.00	15.6178	13.03
199.00	113.5738	3.13	198.00	0.1287	0.00	113.4450	3.14
279.15	1453.3032	0.37	279.00	0.2460	0.00	1453.0573	0.37
511.03	48.5016	5.58	511.00	2.3106	3.31	46.1910	5.87
661.60	1583.0308	0.35	661.60	0.0853	28.48	1582.9454	0.35
912.17	22.6436	11.51	911.10	0.4260	15.85	22.2176	11.74
1173.17	1791.8297	0.28	1173.20	0.0430	0.00	1791.7867	0.28
1332.53	1565.4762	0.30	1332.50	0.0532	28.93	1565.4230	0.30

0 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 1098 GLY 2 26.699 7 G- 6

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 26.699/2007

BACKGROUND FOR GELI DETECTOR 6 OF 1.811/2007 1375.0 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.6224	50.14	511.0	2.3106	3.31	1120.3	0.3595	13.96
92.0	0.7505	22.46	583.1	0.5662	19.50	1173.2	0.0430	0.00
143.0	0.1067	0.00	609.3	0.9957	5.07	1238.1	0.1603	14.78
186.0	0.5077	15.50	661.6	0.0853	28.48	1332.5	0.0532	28.93
198.0	0.1287	0.00	727.2	0.1281	17.80	1337.7	0.0000	0.00
238.6	1.1958	29.75	846.0	0.0625	0.00	1461.0	3.1055	9.84
279.0	0.2460	0.00	860.4	0.1053	19.95	1586.0	0.0773	0.00
295.2	0.4169	19.60	911.1	0.4260	15.85	1591.0	0.1130	31.59
338.4	0.2057	23.53	968.9	0.3063	28.89	1729.6	0.0661	22.69
351.9	0.8857	12.77	1001.0	0.0716	69.65	1764.5	0.3674	9.04

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 1/26/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
336.905	6	1.3338	12.583	73.
349.852	6	1.3218	11.981	63.
352.746	6	1.3080	12.674	24.
353.834	6	1.3114	12.373	30.
356.660	6	1.3386	13.451	111.
4.638	7	1.3913	12.530	18.NG
4.854	7	1.4380	11.424	46.NG
5.755	7	1.4354	12.275	24.NG
20.762	7	1.4106	11.030	21.NG
26.607	7	1.4487	13.714	22.NG
AVERAGE		1.3227	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
320.990	6	1.3895	15.941	50.
321.801	6	1.3496	13.162	25.
322.821	6	1.3393	13.918	22.
336.876	6	1.3866	16.427	40.
349.900	6	1.4000	17.996	30.
352.766	6	1.3902	16.717	35.
353.774	6	1.3305	13.970	27.
356.784	6	1.3369	13.477	23.
4.652	7	1.3440	13.744	26.
20.778	7	1.3707	13.413	21.NG
AVERAGE		1.3545	0.025	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 26.607 7
ENERGY= -0.248056 + 1.0039451*CH + -1.575465E-06*CH**2
FWHM =SQRT(-0.6836 + 0.010933*ENERGY) (C060= 3.726)

EFFICIENCIES FOR GEOMETRY XX 6 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

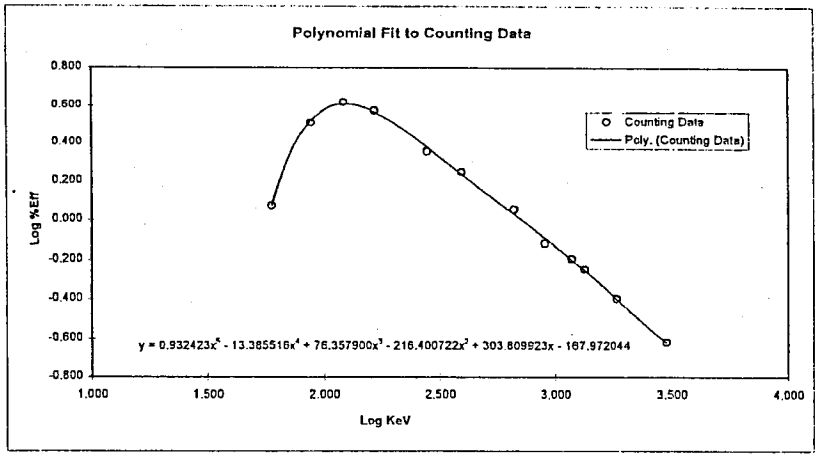
	PK	ENERGY	CPM	%ERR	COMMENT
	1	21.6	16659.72	0.1	
	2	25.4	16167.62	0.1	
	3	32.9	428.97	1.6	
	4	43.2	127.99	5.0	22S
	5	50.2	747.82	1.1	25S
	6	59.9	7272.79	0.1	Am241s
	7	67.4	181.78	2.1	
	8	71.6	555.34	1.9	
	9	75.0	791.50	0.9	
	10	85.1	208.55	1.5	Cs136
	11	88.2	8028.18	0.1	Cd109s
	12	105.3	58.33	12.0	
	13	122.1	3385.82	0.2	Co 57s
	14	136.4	430.31	1.3	Co 57s
b	15	143.0	10.45	37.0	Fe 59
	16	165.9	2898.54	0.3	Cs136 Ce139s
	17	188.1	9.18	36.2	Cs136
b	18	196.1	15.62	13.0	
p	19	199.0	113.45	3.1	Ac228
	20	203.7	19.34	15.3	Sb125
	21	255.1	89.50	4.2	Sn113
b	22	279.2	1453.06	0.4	Ac228 Hg203s
	23	310.9	6.34	39.5	Co 60p
	24	391.6	1918.88	0.3	Sn113s
b	25	511.0	46.19	5.9	Ac228 Th228 La140 Ru106 Na 22
	26	639.7	3.67	48.3	
b	27	661.6	1582.95	0.3	Cs137
	28	690.8	4.84	49.4	
	29	813.6	33.66	7.8	
	30	820.3	3.17	60.2	Co 60p
	31	898.0	2129.19	0.3	La140 Y 88s
b	32	912.2	22.22	11.7	Ac228
b	33	1173.2	1791.79	0.3	Cs134+ Co 60s
b	34	1332.5	1565.42	0.3	Co 60s
	35	1609.0	2.75	62.8	
	36	1710.9	2.06	49.0	
	37	1835.4	1268.38	0.3	Y 88s
	38	1850.0	12.17	7.6	

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	21.6	16659.72	0.1		
	2	25.4	16167.62	0.1		
	3	32.9	428.97	1.6		
	4	43.2	127.99	5.0	NO GEN.	22S
	5	50.2	747.82	1.1		25S
	6	59.9	7272.79	0.1		Am241s
	7	67.4	181.78	2.1		
	8	71.6	555.34	1.9		
	9	75.0	791.50	0.9		
	10	85.1	208.55	1.5		Cs136
	11	88.2	8028.18	0.1		Cd109s
	12	105.3	58.33	12.0		
	13	122.1	3385.82	0.2		Co 57s
	14	136.4	430.31	1.3		Co 57s
b	15	143.0	10.45	37.0		Fe 59
	16	165.9	2898.54	0.3		Cs136 Ce139s
	17	188.1	9.18	36.2		Cs136
b	18	196.1	15.62	13.0		
b	19	199.0	113.45	3.1	Ac228	
	20	203.7	19.34	15.3		Sb125
	21	255.1	89.50	4.2		Sn113
b	22	279.2	1453.06	0.4	Ac228	Hg203s
	23	310.9	6.34	39.5		Co 60p
	24	391.6	1918.88	0.3		Sn113s
b	25	511.0	46.19	5.9	Ac228 Th228 NO GEN.	La140 Ru106 Na 22
	26	639.7	3.67	48.3		
a	27	661.6	1582.95	0.3	NO GEN.	Cs137
	28	690.8	4.84	49.4	NO GEN.	
	29	813.6	33.66	7.8		
	30	820.3	3.17	60.2		Co 60p
	31	898.0	2129.19	0.3		La140 Y 88s
b	32	912.2	22.22	11.7	Ac228	
b	33	1173.2	1791.79	0.3		Cs134+ Co 60s
a	34	1332.5	1565.42	0.3		Co 60s
	35	1609.0	2.75	62.6	NO GEN.	
	36	1710.9	2.06	49.0		
	37	1835.4	1268.38	0.3		Y 88s
	38	1850.0	12.17	7.6		

Detector	G5	100 mL Jar	
Geometry	JR	Shelf 0	EFF. DATE
Std I.D.	(GLY)1098-2		13-Feb-07
Filename	GELI05JR0.EFF		

Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	%Eff Avg	%SD of %Eff	LogKev	Log%Eff	%Dev from Spline
59.50	1.16270	1.19850	1.17960	2.02599	1.775	0.072	0
88.00	3.18151	3.26594	3.24372	2.27651	1.944	0.511	-2
122.10	4.09627	4.1956	4.14596	1.69503	2.087	0.618	2
165.90	3.71294	3.8140	3.76315	1.90970	2.220	0.576	2
279.20	2.24380	2.28660	2.26520	1.33595	2.446	0.355	-5
391.70	1.75219	1.77923	1.76571	1.08263	2.593	0.247	2
661.70	1.12552	1.13128	1.12740	0.48637	2.821	0.052	5
898.00	0.75476	0.76407	0.75941	0.86633	2.953	-0.120	-7
1173.20	0.63410	0.64238	0.63824	0.91668	3.069	-0.195	1
1332.50	0.56038	0.56309	0.56174	0.34108	3.125	-0.250	1
1836.10	0.39849	0.40268	0.39959	1.09476	3.264	-0.398	0
			#DIV/0!		#NUM!	#DIV/0!	#DIV/0!
3000	(artificial data)		0.24000		3.477	-0.620	0
				avg	#DIV/0!		

(shaded cells are manual entry, all others are calculated)

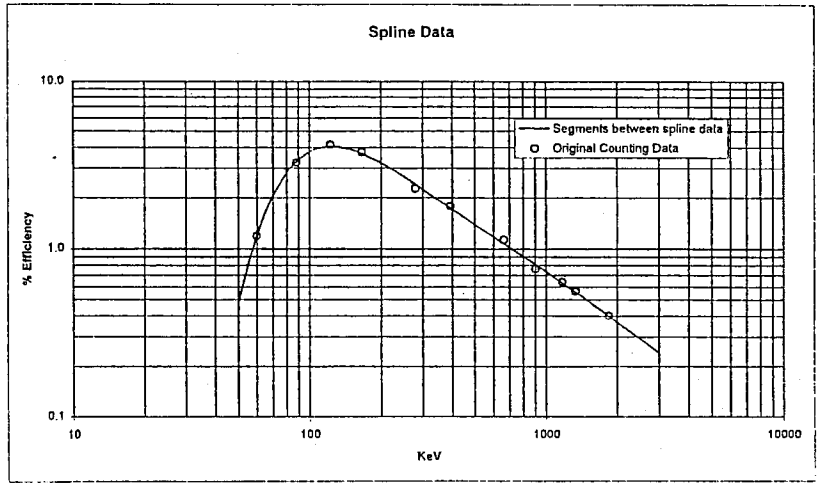


Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
50	0.48849	1.699	-0.311		
55	0.62151	1.740	-0.085		
60	1.21659	1.778	0.085		#DIV/0!
65	1.64145	1.813	0.215		
70	2.06584	1.845	0.315		
80	2.62714	1.903	0.451		
90	3.40193	1.954	0.532		
100	3.77915	2.000	0.577		#DIV/0!
110	3.98893	2.041	0.601		
130	4.06610	2.114	0.609		
150	3.89851	2.176	0.591		
170	3.63962	2.230	0.561		
190	3.36290	2.279	0.527		
250	2.64967	2.398	0.423		
300	2.22693	2.477	0.348		#DIV/0!
500	1.37492	2.699	0.138		
700	1.01663	2.845	0.007		
1000	0.73539	3.000	-0.133		#DIV/0!
1400	0.52950	3.146	-0.276		
2000	0.36353	3.301	-0.439		
3000	0.24040	3.477	-0.619		

Polynomial Coefficients

x5 =	0.932423
x4 =	-13.385516
x3 =	76.35790
x2 =	-216.400722
x1 =	303.609923
x0 =	-167.972044



Date . . . 19-FEB-07

NU.125.40GELIOSJRO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.48849	108	3.94766	216	3.00839	324	2.07088	432	1.57837
51	0.54420	110	3.93892	218	3.00440	326	2.05888	434	1.57151
52	0.60500	112	3.99718	220	3.96083	328	2.04703	436	1.56470
53	0.67182	114	4.00121	222	3.93764	330	2.03531	438	1.55795
54	0.74328	116	4.01330	224	3.91485	332	2.02374	440	1.55127
55	0.82151	118	4.00118	226	3.87243	334	2.01229	442	1.54464
56	0.89110	120	4.02894	228	3.87038	336	2.00099	444	1.53807
57	0.96520	122	4.03659	230	3.84869	338	1.98981	446	1.53156
58	1.04400	124	4.04412	232	3.82735	340	1.97876	448	1.52510
59	1.12773	126	4.05155	234	3.80634	342	1.96783	450	1.51870
60	1.21659	128	4.05888	236	3.78568	344	1.95703	452	1.51236
61	1.29422	130	4.06610	238	3.76533	346	1.94635	454	1.50607
62	1.37541	132	4.04788	240	3.74530	348	1.93579	456	1.49983
63	1.46028	134	4.03902	242	3.72559	350	1.92534	458	1.49365
64	1.54892	136	4.01250	244	3.70617	352	1.91501	460	1.48752
65	1.64145	138	3.99530	246	3.68705	354	1.90480	462	1.48144
66	1.72108	140	3.97947	248	3.66822	356	1.89469	464	1.47541
67	1.80330	142	3.96187	250	3.64967	358	1.88470	466	1.46943
68	1.88813	144	3.94560	252	3.63140	360	1.87481	468	1.46350
69	1.97563	146	3.92980	254	3.61340	362	1.86503	470	1.45762
70	2.06584	148	3.91413	256	3.59567	364	1.85536	472	1.45179
71	2.13567	150	3.89851	258	3.57819	366	1.84579	474	1.44601
72	2.20724	152	3.87027	260	3.56097	368	1.83631	476	1.44027
73	2.27997	154	3.84259	262	3.54399	370	1.82694	478	1.43458
74	2.35405	156	3.81546	264	3.52725	372	1.81767	480	1.42894
75	2.42950	158	3.78887	266	3.51075	374	1.80849	482	1.42334
76	2.50631	160	3.76280	268	3.49448	376	1.79941	484	1.41779
77	2.58450	162	3.73722	270	3.47844	378	1.79042	486	1.41228
78	2.66408	164	3.71213	272	3.46263	380	1.78152	488	1.40682
79	2.74505	166	3.68751	274	3.44704	382	1.77272	490	1.40139
80	2.82741	168	3.66334	276	3.43167	384	1.76400	492	1.39602
81	2.88311	170	3.63962	278	3.41652	386	1.75537	494	1.39068
82	2.93921	172	3.60948	280	3.37832	388	1.74683	496	1.38538
83	2.99570	174	3.57994	282	3.34224	390	1.73837	498	1.38013
84	3.05258	176	3.55097	284	3.34638	392	1.72999	500	1.37492
85	3.10985	178	3.52255	286	3.33073	394	1.72170	502	1.37000
86	3.16750	180	3.49468	288	3.31530	396	1.71349	504	1.36513
87	3.22554	182	3.46734	290	3.30008	398	1.70536	506	1.36028
88	3.28396	184	3.44050	292	3.28506	400	1.69731	508	1.35548
89	3.34275	186	3.41416	294	3.27024	402	1.68934	510	1.35071
90	3.40193	188	3.38830	296	3.25561	404	1.68145	512	1.34597
91	3.43966	190	3.36290	298	3.24118	406	1.67362	514	1.34127
92	3.47738	192	3.33345	300	3.22693	408	1.66588	516	1.33661
93	3.51510	194	3.30259	302	3.21300	410	1.65821	518	1.33197
94	3.55283	196	3.27330	304	3.19926	412	1.65061	520	1.32738
95	3.59055	198	3.24457	306	3.18569	414	1.64308	522	1.32281
96	3.62827	200	3.21636	308	3.17229	416	1.63562	524	1.31828
97	3.66599	202	3.18868	310	3.15905	418	1.62823	526	1.31378
98	3.70371	204	3.16152	312	3.14598	420	1.62091	528	1.30932
99	3.74143	206	3.13486	314	3.13308	422	1.61366	530	1.30488
100	3.77915	208	3.10869	316	3.12033	424	1.60647	532	1.30048
102	3.82181	210	3.08299	318	3.10774	426	1.59935	534	1.29611
104	3.86411	212	3.05780	320	3.09530	428	1.59229	536	1.29177
106	3.90605	214	3.03280	322	3.08302	430	1.58530	538	1.28746

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	1.28318	660	1.07174	930	0.78546	1360	0.58686	1800	0.40624
542	1.27893	665	1.06451	935	0.78166	1270	0.58235	1810	0.40388
544	1.27471	670	1.05728	940	0.77789	1280	0.57791	1820	0.40154
546	1.27052	675	1.05035	945	0.77415	1290	0.57353	1830	0.39922
548	1.26636	680	1.04345	950	0.77045	1300	0.56923	1840	0.39694
550	1.26223	685	1.03658	955	0.76679	1310	0.56498	1850	0.39468
552	1.25812	690	1.02974	960	0.76316	1320	0.56081	1860	0.39244
554	1.25405	695	1.02319	965	0.75957	1330	0.55669	1870	0.39023
556	1.25000	700	1.01663	970	0.75601	1340	0.55263	1880	0.38804
558	1.24598	705	1.01008	975	0.75249	1350	0.54864	1890	0.38587
560	1.24198	710	1.00369	980	0.74900	1360	0.54470	1900	0.38373
562	1.23802	715	0.99735	985	0.74555	1370	0.54082	1925	0.37848
564	1.23408	720	0.99096	990	0.74213	1380	0.53699	1950	0.37336
566	1.23017	725	0.98475	995	0.73874	1390	0.53322	1975	0.36838
568	1.22628	730	0.97868	1000	0.73539	1400	0.52950	2000	0.36353
570	1.22242	735	0.97258	1005	0.73182	1410	0.52554	2025	0.35895
572	1.21858	740	0.96661	1010	0.72828	1420	0.52164	2050	0.35449
574	1.21477	745	0.96072	1015	0.72478	1430	0.51779	2075	0.35013
576	1.21099	750	0.95490	1020	0.72131	1440	0.51400	2100	0.34588
578	1.20722	755	0.94916	1025	0.71785	1450	0.51027	2125	0.34173
580	1.20349	760	0.94348	1030	0.71447	1460	0.50658	2150	0.33768
582	1.19978	765	0.93788	1035	0.71110	1470	0.50295	2175	0.33372
584	1.19609	770	0.93235	1040	0.70777	1480	0.49937	2200	0.32985
586	1.19243	775	0.92689	1045	0.70446	1490	0.49583	2225	0.32607
588	1.18879	780	0.92149	1050	0.70118	1500	0.49235	2250	0.32238
590	1.18517	785	0.91616	1055	0.69794	1510	0.48891	2275	0.31877
592	1.18158	790	0.91090	1060	0.69473	1520	0.48552	2300	0.31523
594	1.17801	795	0.90569	1065	0.69154	1530	0.48218	2325	0.31178
596	1.17446	800	0.90055	1070	0.68839	1540	0.47888	2350	0.30839
598	1.17093	805	0.89547	1075	0.68526	1550	0.47562	2375	0.30508
600	1.16743	810	0.89045	1080	0.68216	1560	0.47240	2400	0.30184
602	1.16395	815	0.88549	1085	0.67910	1570	0.46923	2425	0.29867
604	1.16049	820	0.88059	1090	0.67605	1580	0.46610	2450	0.29556
606	1.15706	825	0.87574	1095	0.67304	1590	0.46301	2475	0.29251
608	1.15364	830	0.87095	1100	0.67005	1600	0.45996	2500	0.28953
610	1.15025	835	0.86621	1105	0.66709	1610	0.45695	2525	0.28661
612	1.14687	840	0.86152	1110	0.66416	1620	0.45398	2550	0.28374
614	1.14352	845	0.85690	1115	0.66125	1630	0.45104	2575	0.28093
616	1.14019	850	0.85232	1120	0.65837	1640	0.44814	2600	0.27818
618	1.13688	855	0.84779	1125	0.65551	1650	0.44528	2625	0.27548
620	1.13358	860	0.84332	1130	0.65268	1660	0.44245	2650	0.27283
622	1.13031	865	0.83889	1135	0.64988	1670	0.43966	2675	0.27023
624	1.12706	870	0.83451	1140	0.64709	1680	0.43690	2700	0.26767
626	1.12383	875	0.83018	1150	0.64160	1690	0.43417	2725	0.26517
628	1.12062	880	0.82590	1160	0.63620	1700	0.43148	2750	0.26271
630	1.11743	885	0.82166	1170	0.63099	1710	0.42882	2775	0.26030
632	1.11425	890	0.81747	1180	0.62567	1720	0.42619	2800	0.25793
634	1.11110	895	0.81332	1190	0.62054	1730	0.42359	2825	0.25560
636	1.10796	900	0.80921	1200	0.61549	1740	0.42103	2850	0.25331
638	1.10485	905	0.80515	1210	0.61052	1750	0.41849	2875	0.25107
640	1.10175	910	0.80114	1220	0.60564	1760	0.41598	2900	0.24886
642	1.09408	915	0.79716	1230	0.60083	1770	0.41351	2925	0.24669
644	1.08653	920	0.79323	1240	0.59610	1780	0.41106	2950	0.24456
646	1.07908	925	0.78933	1250	0.59144	1790	0.40864	2975	0.24246

PERCENT EFFICIENCY
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GELI 5 JR 0 V2.00 19-FEB-07

ANALYTICS
An Isotope Products Laboratories Company

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

Log 417 Recd 12/27/06 K Trenton

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

1098-2

LIBR= A782

74159-207

100 mL Solid in Wide Mouth PPi Parkway Jar

Customer: Eberline Services / Richmond, CA
P.O. No.: 00003890, Item 1
Calibration Date: 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01515

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1990.0	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	189000	2863.9	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	94570	1433.0	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	133800	2027.5	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	295300	4475	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	185600	2812.4	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	116700	1768.4	0.70	1.20	2.78	HPGe
Y-88	898.0	106.60	455400	6901	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	226900	3438	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	227000	3440	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	481200	7292	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
This standard will expire one year after the calibration date.

Source Prepared by: M. Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate

DEAD TIME = 5.43% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

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1098 GLY 2 G-5 XX 3.735 7 82.08 MIN 1.00000 SM 140

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

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SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.996E-01 41G		
59 (59.54)	1.990000	1.00000	1387.748	6.974E+02 s	0.65%	3.143E+02
103 (103.00)	0.000195	1.00000	6.986	3.582E+04	72.06%	1.614E+04
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.684E-01 2G		
88 (88.03)	0.039000	1.00000	4828.082	1.238E+05 s	0.26%	6.421E+04
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.868E-01 10G		
122 (122.06)	1.433000	1.00000	2835.379	1.979E+03 s	0.36%	1.133E+03
136 (136.47)	0.000001	1.00000	352.439	3.524E+08 s	1.98%	2.018E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 6.227E-01 3G		
166 (165.80)	0.800000	1.00000	2942.688	3.678E+03 s	0.32%	2.661E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.470E-01 2G		
279 (279.21)	0.815000	1.00000	1701.308	2.087E+03 s	0.42%	3.807E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.677E-01 5G		
392 (391.40)	0.642000	1.00000	1771.873	2.760E+03 s	0.39%	2.190E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.941E-01 3G		
662 (661.64)	1.768400	1.00000	1185.723	6.705E+02 s	0.52%	3.038E+02
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.426E-01 8G		
898 (898.00)	0.920000	1.00000	1797.892	1.954E+03 s	0.35%	1.622E+03
1836 (1836.10)	1.000000	1.00000	997.985	9.980E+02 s	0.39%	8.285E+02
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.666E-01 5G		
1173 (1173.21)	0.999200	1.00000	1268.566	1.270E+03 s	0.41%	5.916E+02
1333 (1332.48)	1.000000	1.00000	1121.734	1.122E+03 s	0.37%	5.227E+02
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 4.009E-01 4G		
1674 (1674.80)	0.005000	1.00000	1.354	2.709E+02	83.09%	3.044E+02

DEAD TIME = 5.43% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

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1098 GLY 2 G-5 XX 3.735 7 82.08 MIN 1.00000 SM 140

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

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Group	1098	Time of count	3.735 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	82.08334
Type code	GLY	Dead Time Pct	5.433948
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-5	Standard GMT	356.784 2006
Aliquot	1.	Days since TO	94.02733
Unit of Aliquot	SMPL	Time on	9:38 PST 3-JAN
Data Sheet Units	PCI /SMPL	Time off	11:00 PST 3-JAN
Library	A982	Calc Time	11:05 03-JAN-07
Slope	1.00297	Width slope	0.006600
Intercept	0.341194	Width offset	1.023502
X**2 TERM	-0.16058478E-05	Sensitivity	4.

NP:[7,67]140.GSP 22 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	10	27.0	24	11	10945	2.84	49263	26.6	6.00E+02	0.6	0.118	0	******
2	10	29.7	24	11	108955	3.73	41357	29.3	5.04E+02	1.7	0.158	0	0.00
3	0	59.3	55		8143401	1.38	113911	58.8	1.39E+03	0.6	100.	0	0.00
4	0	72.0	69		6121707	3.52	12978	71.4	1.58E+02	4.3	100.	0	0.00
5	0	87.9	83		10188982	1.92	396287	87.3	4.83E+03	0.3	100.	0	0.00
6	0	102.7	100	5	76133	1.83	573	102.0	6.99E+00	72.1	100.	0	0.00
7	0	121.9	116		10139285	1.79	232719	121.2	2.84E+03	0.4	100.	0	0.00
8	0	136.3	132		8100019	1.76	28927	135.6	3.52E+02	2.0	100.	0	0.00
9	0	165.7	160		10106427	1.45	241509	164.9	2.94E+03	0.3	100.	0	0.00
10	0	255.0	251	7	47400	1.57	7357	254.0	8.96E+01	5.1	100.	0	0.00
11	0	279.0	273	10	57557	1.59	139600	278.0	1.70E+03	0.4	100.	0	0.00
12	0	391.5	384	12	45451	2.06	145415	390.3	1.77E+03	0.4	100.	0	0.00
13	0	510.9	506	9	26281	3.08	3904	509.5	4.76E+01	7.7	100.	0	0.00
14	0	661.5	653	13	38113	2.21	97330	659.9	1.19E+03	0.5	100.	0	0.00
15	0	813.6	808	9	16681	2.78	3080	811.9	3.75E+01	7.8	100.	0	0.00
16	0	897.9	890	13	26953	2.57	147548	896.2	1.80E+03	0.3	100.	0	0.00
17	0	1173.1	1164	15	15220	2.93	104130	1171.5	1.27E+03	0.4	100.	0	0.00
18	4	1326.0	1315	24	9838	4.88	4996	1324.5	6.09E+01	6.6	100.	0	101.00
19	4	1332.6	1315	24	6484	3.27	92077	1331.1	1.12E+03	0.4	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1472.8	1469	8	4900	3.04	196	1471.6	2.39E+00	63.3	100.	0	0.00
21	0	1674.2	1672	7	2998	2.42	111	1673.4	1.35E+00	83.1	100.	0	0.00
22	0	1835.9	1826	18	3476	3.95	81902	1835.5	9.98E+02	0.4	100.	0	0.00

FWHM=SQRT(4.62563E+00 + 4.59348E-03 *E)

****

BACKGROUND INFO 1098 GLY 2 3.735 7 G- 5 BG DATE 1.811 7

****

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
279.05	1700.7107	0.42	279.00	0.1650	0.00	1700.5457	0.42
510.91	47.5585	7.67			6.51	46.9675	7.76

```
 661.53 1185.7448  0.52      661.60  0.0238  0.00      1185.7209  0.52
1173.13 1268.5845  0.41     1173.20  0.0319  0.00      1268.5525  0.41
1332.57 1121.7441  0.37     1332.50  0.0226  0.00      1121.7216  0.37
    0 PEAKS REJECTED BY BACKGROUND

**********************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY   2          3.735  7 G- 5
**********************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 3.735/2007

BACKGROUND FOR GELI DETECTOR 5 OF 1.811/2007 1109.7 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0533	24.57	511.0	0.5911	6.51	1120.3	0.0389	37.04
92.0	0.3626	15.36	583.1	0.0845	25.20	1173.2	0.0319	0.00
143.0	0.0460	22.16	609.3	0.0675	18.68	1238.1	0.0135	0.00
186.0	0.2620	9.81	661.6	0.0238	0.00	1332.5	0.0226	0.00
198.0	0.0955	48.90	727.2	0.0290	0.00	1377.7	0.0257	0.00
238.6	0.2377	17.58	846.0	0.0429	37.08	1460.8	0.2340	15.94
279.0	0.1650	0.00	860.4	0.0351	0.00	1586.0	0.0131	0.00
295.2	0.0440	35.89	911.1	0.0753	16.21	1591.3	0.0321	0.00
338.4	0.0675	29.91	968.9	0.0342	41.29	1729.6	0.0145	0.00
351.9	0.0657	25.86	1001.0	0.0411	12.40	1764.5	0.0358	29.32

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 1/ 3/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
266.961	6	0.9007	11.629	24.NG
280.799	6	0.9242	10.775	21.
287.775	6	0.9498	9.989	27.
294.983	6	0.9280	10.393	22.
302.004	6	0.9613	12.304	25.
308.831	6	0.9478	11.553	30.
316.042	6	0.9484	10.955	28.
322.802	6	0.9300	11.471	24.
336.793	6	0.9493	10.484	23.
356.784	6	0.9351	11.500	22.
AVERAGE		0.9415	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
113.737	5	1.0563	5.691	26.
115.895	5	1.0268	6.707	21.
120.831	5	1.0112	5.396	22.
123.895	5	1.0173	6.576	33.
127.778	5	0.9253	8.428	21.
163.023	5	1.0185	6.233	33.
262.653	5	0.8772	2.731	23.
361.604	5	0.9753	4.215	14.
120.933	6	0.9544	3.970	23.
130.842	6	1.0028	5.576	21.
AVERAGE		0.9987	0.040	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 356.784 6
ENERGY= 0.341194 + 1.0029696*CH + -1.605848E-06*CH**2
FWHM =SQRT(1.0235 + 0.006601*ENERGY) (CO60= 3.134)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

1098 2 GLY GSTOR 140

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	27.0	600.16	0.6	NO GEN.	
	2	29.7	503.85	1.7		
	3	59.3	1387.75	0.6	NO GEN.	Am241s
	4	72.0	158.11	4.3		
	5	87.9	4827.86	0.3		Cd109s
	6	102.7	6.99	72.1		
	7	121.9	2835.16	0.4		Co 57s
	8	136.3	352.41	2.0		Co 57s
	9	165.7	2942.24	0.3	NO GEN.	Cs136 Ce139s
	10	255.0	89.63	5.1		Sn113
b	11	279.0	1700.55	0.4	Ac228	Hg203s
	12	391.5	1771.55	0.4		Sn113s
b	13	510.9	46.97	7.8	Ac228 Th228	La140 Ru106 Na 22
b	14	661.5	1185.72	0.5	NO GEN.	Cs137s
	15	813.6	37.52	7.8		
	16	897.9	1797.54	0.3		La140 Y 88s
b	17	1173.1	1268.55	0.4	NO GEN.	Cs134+ Co 60s
	18	1326.0	60.87	6.6		Sb124
b	19	1332.6	1121.72	0.4	NO GEN.	Co 60s
	20	1472.8	2.39	63.3		
	21	1674.2	1.35	83.1		Co 58
	22	1835.9	997.79	0.4		Y 88s

DEAD TIME = 5.47% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

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.098 GLY 2 G-5 XX 2.698 7 79.73 MIN 1.00000 SM 545

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

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SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.996E-01 41G		
59 (59.54)	1.990000	1.00000	1428.094	7.176E+02 s	0.65%	3.234E+02
104 (103.00)	0.000195	1.00000	12.242	6.278E+04	48.71%	2.829E+04
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.698E-01 2G		
88 (88.03)	0.039000	1.00000	4993.817	1.280E+05 s	0.26%	6.631E+04
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.889E-01 10G		
122 (122.06)	1.433000	1.00000	2911.862	2.032E+03 s	0.36%	1.160E+03
136 (136.47)	0.000001	1.00000	374.934	3.749E+08 s	1.90%	2.141E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 6.260E-01 3G		
166 (165.80)	0.800000	1.00000	3039.084	3.799E+03 s	0.32%	2.734E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.509E-01 2G		
279 (279.21)	0.815000	1.00000	1760.702	2.160E+03 s	0.41%	3.879E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.712E-01 5G		
392 (391.40)	0.642000	1.00000	1810.482	2.820E+03 s	0.40%	2.224E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.942E-01 3G		
662 (661.64)	1.768400	1.00000	1193.985	6.752E+02 s	0.51%	3.059E+02
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.463E-01 8G		
898 (898.00)	0.920000	1.00000	1832.369	1.992E+03 s	0.35%	1.642E+03
1836 (1836.10)	1.000000	1.00000	1020.414	1.020E+03 s	0.39%	8.414E+02
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.670E-01 5G		
1173 (1173.21)	0.999200	1.00000	1285.599	1.287E+03 s	0.41%	5.993E+02
1333 (1332.48)	1.000000	1.00000	1127.579	1.128E+03 s	0.37%	5.253E+02

DEAD TIME = 5.47% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

.1098 GLY 2 G-5 XX 2.698 7 79.73 MIN 1.00000 SM 545

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

Group	1098	Time of count	2.698 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	79.73333
Type code	GLY	Dead Time Pct	5.473227
ID	74159-207 (JR)	Background GMT	1.811 2007
Geometry, detector	XX-5	Standard GMT	356.784 2006
Aliquot	1.	Days since TO	92.98962
Unit of Aliquot	SMPL	Time on	8:45 PST 2-JAN
Data Sheet Units	PCI /SMPL	Time off	10:04 PST 2-JAN
Library	A982	Calc Time	10:11 02-JAN-07
Slope	1.00297	Width slope	0.006600
Intercept	0.341194	Width offset	1.023502
X**2 TERM	-0.16058478E-05	Sensitivity	4.

NP:[7,67]545.GSP 20 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	3	27.5	24	12	17234	3.08	62512	27.1	7.84E+02	0.6	0.125	0	*******
2	3	31.3	24	12	116364	4.44	40753	30.9	5.11E+02	1.8	0.184	0	0.00
3	0	59.4	55	8	144052	1.37	113867	58.9	1.43E+03	0.7	100.	0	0.00
4	0	72.0	69	6	120950	3.73	13957	71.5	1.75E+02	4.0	100.	0	0.00
5	0	88.0	83	10	188292	1.97	398156	87.4	4.99E+03	0.3	100.	0	0.00
6	0	103.7	101	6	91074	1.08	976	103.0	1.22E+01	48.7	100.	0	0.00
7	0	122.0	116	10	138747	1.87	232155	121.3	2.91E+03	0.4	100.	0	0.00
8	0	136.4	132	8	98799	1.59	29893	135.6	3.75E+02	1.9	100.	0	0.00
9	0	165.8	160	10	105457	1.41	242281	165.0	3.04E+03	0.3	100.	0	0.00
10	0	255.0	251	7	47152	1.55	6844	254.1	8.58E+01	5.4	100.	0	0.00
11	0	279.1	273	10	57147	1.60	140339	278.1	1.76E+03	0.4	100.	0	0.00
12	0	391.6	384	12	45216	2.07	144330	390.4	1.81E+03	0.4	100.	0	0.00
13	0	511.0	505	10	28809	3.62	3988	509.5	5.00E+01	8.1	100.	0	0.00
14	0	661.6	654	12	35690	2.20	95202	660.0	1.19E+03	0.5	100.	0	0.00
15	0	813.6	808	9	16597	2.91	3251	811.9	4.08E+01	7.3	100.	0	0.00
16	0	898.0	889	13	26817	2.55	146073	896.3	1.83E+03	0.3	100.	0	0.00
17	0	1173.2	1164	15	15339	2.90	102507	1171.6	1.29E+03	0.4	100.	0	0.00
18	4	1326.0	1315	22	9733	5.00	4791	1324.6	6.01E+01	6.8	100.	0	130.00
19	4	1332.7	1315	22	6010	3.14	89907	1331.3	1.13E+03	0.4	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1835.9	1826	18	3397	3.89	81346	1835.5	1.02E+03	0.4	100.	0	0.00

FWHM=SQRT(5.00380E+00 + 5.68646E-03 *E)

****

BACKGROUND INFO 1098 GLY 2 2.698 7 G- 5 BG DATE 1.811 7

****

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
279.11	1760.1005	0.41	279.00	0.1650	0.00	1759.9354	0.41
510.97	50.0158	8.14	511.00	0.5911	6.51	49.4247	8.24
661.61	1194.0061	0.51	661.60	0.0238	0.00	1193.9823	0.51
1332.24	1285.6171	0.41			0.00	1285.5851	0.41

```
1332.72 1127.5900  0.37      1332.50  0.0226  0.00      1127.5674  0.37
     0 PEAKS REJECTED BY BACKGROUND

*****************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY   2          2.698  7 G- 5
*****************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 2.698/2007

BACKGROUND FOR GELI DETECTOR 5 OF 1.811/2007 1109.7 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0533	24.57	511.0	0.5911	6.51	1120.3	0.0389	37.04
92.0	0.3626	15.36	583.1	0.0845	25.20	1173.2	0.0319	0.00
143.0	0.0460	22.16	609.3	0.0675	18.68	1238.1	0.0135	0.00
186.0	0.2620	9.81	661.6	0.0238	0.00	1332.5	0.0226	0.00
198.0	0.0955	48.90	727.2	0.0290	0.00	1377.7	0.0257	0.00
238.6	0.2377	17.58	846.0	0.0429	37.08	1460.8	0.2340	15.94
279.0	0.1650	0.00	860.4	0.0351	0.00	1586.0	0.0131	0.00
295.2	0.0440	35.89	911.1	0.0753	16.21	1591.3	0.0321	0.00
338.4	0.0675	29.91	968.9	0.0342	41.29	1729.6	0.0145	0.00
351.9	0.0657	25.86	1001.0	0.0411	12.40	1764.5	0.0358	29.32

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 1/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
266.961	6	0.9007	11.629	24.NG
280.799	6	0.9242	10.775	21.
287.775	6	0.9498	9.989	27.
294.983	6	0.9280	10.393	22.
302.004	6	0.9613	12.304	25.
308.831	6	0.9478	11.553	30.
316.042	6	0.9484	10.955	28.
322.802	6	0.9300	11.471	24.
336.793	6	0.9493	10.484	23.
356.784	6	0.9351	11.500	22.
AVERAGE		0.9415	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH I' MINUTES
113.737	5	1.0563	5.691	26.
115.895	5	1.0268	6.707	21.
120.831	5	1.0112	5.396	22.
123.895	5	1.0173	6.576	33.
127.778	5	0.9253	8.428	21.
163.023	5	1.0185	6.233	33.
262.653	5	0.8772	2.731	23.
361.604	5	0.9753	4.215	14.
120.933	6	0.9544	3.970	23.
130.842	6	1.0028	5.576	21.
AVERAGE		0.9987	0.040	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 356.784 6
ENERGY= 0.341194 + 1.0029696*CH + -1.605848E-06*CH**2
FWHM =SQRT(1.0235 + 0.006601*ENERGY) (C060= 3.134)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

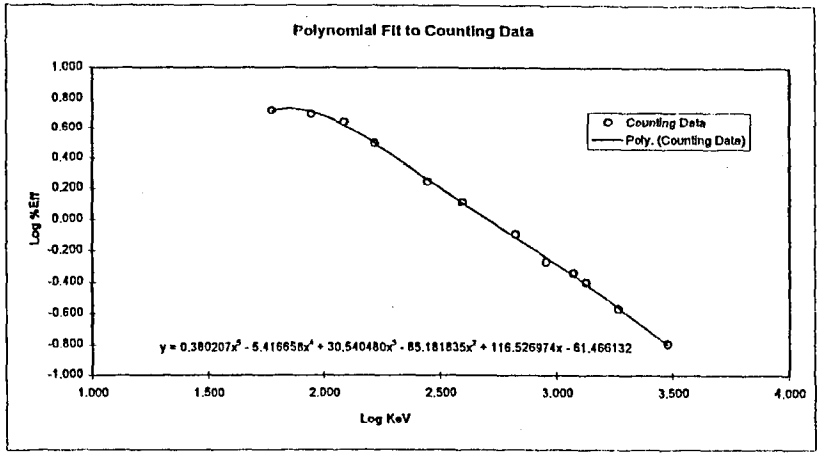
1098 2 GLY GSTOR 545

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	27.5	784.02	0.6		
	2	31.3	511.12	1.8		
	3	59.4	1428.09	0.7	NO GEN.	Am241s
	4	72.0	175.04	4.0		
	5	88.0	4993.60	0.3		Cd109s
	6	103.7	12.24	48.7		
	7	122.0	2911.64	0.4		Co 57s
	8	136.4	374.91	1.9		Co 57s
	9	165.8	3038.64	0.3	NO GEN.	Cs136 Ce139s
	10	255.0	85.83	5.4		Sn113
b	11	279.1	1759.94	0.4	Ac228	Hg203s
	12	391.6	1810.16	0.4		Sn113s
b	13	511.0	49.42	8.2	Ac228 Th228	La140 Ru106 Na 22
b	14	661.6	1193.98	0.5	NO GEN.	Cs137s
	15	813.6	40.77	7.3		
	16	898.0	1832.02	0.3		La140 Y 88s
b	17	1173.2	1285.59	0.4	NO GEN.	Cs134+ Co 60s
	18	1326.0	60.08	6.8		Sb124
b	19	1332.7	1127.57	0.4		Ag110 Co 60s
	20	1835.9	1020.22	0.4		Y 88s

Detector	G1	100 mL Jar	
Geometry	JR	Shelf 0	EFF. DATE
Std I.D.	(GLY)1098-2		13-Feb-07
Filename	GELI01JR0.EFF		

Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	%Eff Avg	%SD of %Eff	LogKev	Log%Eff	%Dev from Spline
59.50			5.26277	2.08009	1.775	0.721	1
88.00			4.96587	1.00931	1.944	0.696	-4
122.10			4.38276	0.11444	2.087	0.642	5
165.90			3.11318	0.41218	2.220	0.493	0
279.20			1.74771	0.67692	2.446	0.242	-3
391.70			1.29184	0.36942	2.593	0.111	1
661.70			0.80214	1.77639	2.821	-0.096	4
898.00			0.53442	0.52998	2.953	-0.272	-7
1173.20			0.45116	2.08065	3.069	-0.346	3
1332.50			0.39547	2.64735	3.125	-0.403	3
1836.10			0.26869	1.87047	3.264	-0.571	-2
			#DIV/0!		#NUM!	#DIV/0!	#DIV/0!
3000	(artificial data)				3.477	-0.796	0
				avg	#DIV/0!		

(shaded cells are manual entry, all others are calculated)

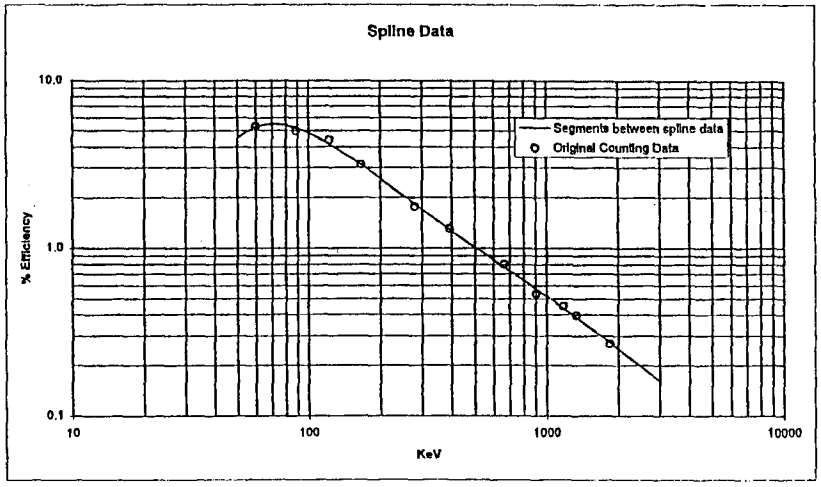


Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
50	4.53269	1.699	0.656		
55	4.96120	1.740	0.696		
60	5.23609	1.778	0.719		#DIV/0!
65	5.38659	1.813	0.731		
70	5.44124	1.845	0.736		
80	5.35704	1.903	0.729		
90	5.12692	1.954	0.710		
100	4.83508	2.000	0.684		#DIV/0!
110	4.52730	2.041	0.656		
130	3.94493	2.114	0.596		
150	3.44963	2.176	0.538		
170	3.04357	2.230	0.483		
190	2.71277	2.279	0.433		
250	2.03112	2.398	0.308		
300	1.67826	2.477	0.225		#DIV/0!
500	1.00580	2.699	0.003		
700	0.72806	2.845	-0.138		
1000	0.51550	3.000	-0.288		#DIV/0!
1400	0.36649	3.146	-0.436		
2000	0.24971	3.301	-0.603		
3000	0.15960	3.477	-0.797		

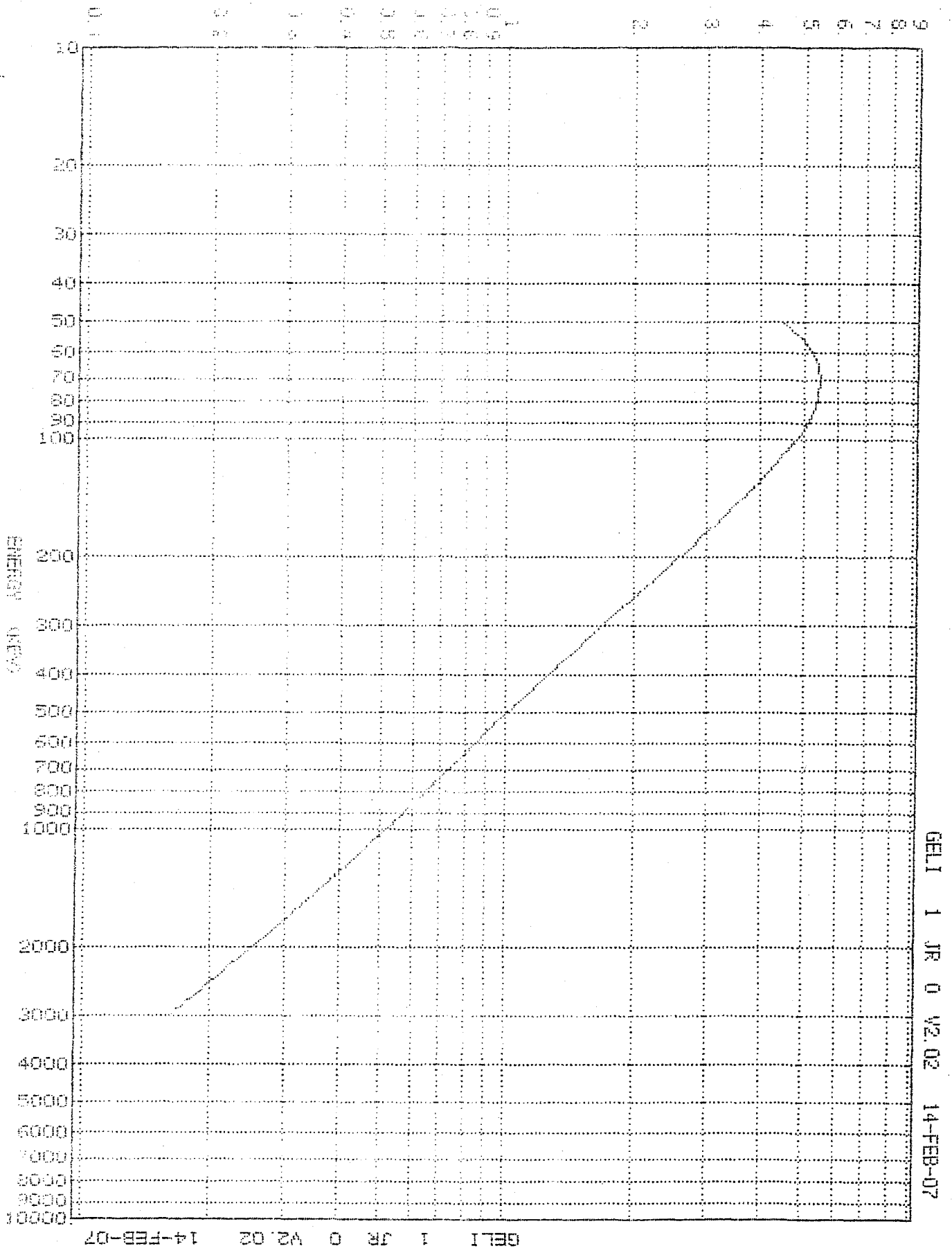
Polynomial Coefficients

x5 =	
x4 =	
x3 =	
x2 =	
x1 =	
x0 =	



KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	4.63269	108	4.52499	216	2.36962	324	1.55368	432	1.16450
51	4.61856	110	4.52700	218	2.34671	326	1.54412	434	1.15912
52	4.70435	112	4.46056	220	2.32422	328	1.53469	436	1.15380
53	4.79005	114	4.39596	222	2.30214	330	1.52536	438	1.14852
54	4.87567	116	4.33339	224	2.28047	332	1.51615	440	1.14328
55	4.96120	118	4.27276	226	2.25920	334	1.50706	442	1.13810
56	5.01691	120	4.21398	228	2.23831	336	1.49806	444	1.13296
57	5.07225	122	4.15696	230	2.21779	338	1.48918	446	1.12787
58	5.12722	124	4.10161	232	2.19763	340	1.48040	448	1.12282
59	5.18183	126	4.04787	234	2.17783	342	1.47172	450	1.11782
60	5.23609	128	3.99567	236	2.15837	344	1.46315	452	1.11286
61	5.26682	130	3.94493	238	2.13925	346	1.45467	454	1.10795
62	5.29723	132	3.89887	240	2.12046	348	1.44629	456	1.10308
63	5.32732	134	3.80442	242	2.10198	350	1.43801	458	1.09825
64	5.35710	136	3.78153	244	2.08382	352	1.42982	460	1.09347
65	5.38659	138	3.73012	246	2.06596	354	1.42173	462	1.08872
66	5.39780	140	3.68014	248	2.04840	356	1.41372	464	1.08402
67	5.40887	142	3.63153	250	2.03112	358	1.40580	466	1.07936
68	5.41980	144	3.58422	252	2.01425	360	1.39798	468	1.07473
69	5.43059	146	3.53816	254	1.99765	362	1.39024	470	1.07015
70	5.44124	148	3.49332	256	1.98132	364	1.38258	472	1.06560
71	5.43223	150	3.44963	258	1.96525	366	1.37501	474	1.06110
72	5.42337	152	3.40422	260	1.94943	368	1.36752	476	1.05663
73	5.41464	154	3.35998	262	1.93386	370	1.36011	478	1.05220
74	5.40604	156	3.31688	264	1.91853	372	1.35278	480	1.04780
75	5.39757	158	3.27487	266	1.90343	374	1.34553	482	1.04345
76	5.38923	160	3.23391	268	1.88856	376	1.33836	484	1.03913
77	5.38101	162	3.19396	270	1.87392	378	1.33126	486	1.03484
78	5.37290	164	3.15499	272	1.85951	380	1.32424	488	1.03059
79	5.36492	166	3.11695	274	1.84530	382	1.31729	490	1.02637
80	5.35704	168	3.07982	276	1.83131	384	1.31041	492	1.02219
81	5.33229	170	3.04357	278	1.81752	386	1.30361	494	1.01804
82	5.30796	172	3.00817	280	1.80393	388	1.29687	496	1.01393
83	5.28403	174	2.97362	282	1.79055	390	1.29021	498	1.00985
84	5.26049	176	2.93988	284	1.77735	392	1.28361	500	1.00580
85	5.23733	178	2.90218	286	1.76434	394	1.27708	502	1.00195
86	5.21455	180	2.86882	288	1.75152	396	1.27062	504	0.99813
87	5.19212	182	2.83622	290	1.73888	398	1.26422	506	0.99434
88	5.17005	184	2.80433	292	1.72642	400	1.25788	508	0.99058
89	5.14832	186	2.77314	294	1.71413	402	1.25161	510	0.98685
90	5.12692	188	2.74263	296	1.70201	404	1.24540	512	0.98315
91	5.09550	190	2.71277	298	1.69005	406	1.23925	514	0.97947
92	5.06462	192	2.68298	300	1.67826	408	1.23316	516	0.97583
93	5.03426	194	2.65383	302	1.66712	410	1.22713	518	0.97221
94	5.00439	196	2.62528	304	1.65613	412	1.22116	520	0.96862
95	4.97502	198	2.59732	306	1.64528	414	1.21525	522	0.96505
96	4.94613	200	2.56994	308	1.63457	416	1.20939	524	0.96152
97	4.91770	202	2.54312	310	1.62400	418	1.20360	526	0.95800
98	4.88972	204	2.51684	312	1.61357	420	1.19785	528	0.95452
99	4.86219	206	2.49108	314	1.60327	422	1.19216	530	0.95106
100	4.83508	208	2.46583	316	1.59310	424	1.18652	532	0.94762
102	4.76946	210	2.44107	318	1.58306	426	1.18094	534	0.94422
104	4.70597	212	2.41679	320	1.57314	428	1.17541	536	0.94083
106	4.64452	214	2.39298	322	1.56335	430	1.16993	538	0.93747

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	0.93414	660	0.77039	930	0.55301	1260	0.40781	1800	0.27968
542	0.93083	665	0.76482	935	0.55015	1270	0.40455	1810	0.27802
544	0.92754	670	0.75934	940	0.54732	1280	0.40135	1820	0.27637
546	0.92428	675	0.75394	945	0.54451	1290	0.39820	1830	0.27475
548	0.92104	680	0.74861	950	0.54174	1300	0.39509	1840	0.27314
550	0.91782	685	0.74337	955	0.53899	1310	0.39203	1850	0.27155
552	0.91463	690	0.73819	960	0.53628	1320	0.38902	1860	0.26998
554	0.91145	695	0.73309	965	0.53359	1330	0.38606	1870	0.26843
556	0.90830	700	0.72806	970	0.53092	1340	0.38313	1880	0.26690
558	0.90518	705	0.72306	975	0.52829	1350	0.38026	1890	0.26538
560	0.90207	710	0.71813	980	0.52568	1360	0.37742	1900	0.26388
562	0.89899	715	0.71327	985	0.52310	1370	0.37463	1925	0.26019
564	0.89593	720	0.70847	990	0.52054	1380	0.37188	1950	0.25660
566	0.89289	725	0.70375	995	0.51801	1390	0.36916	1975	0.25311
568	0.88987	730	0.69908	1000	0.51550	1400	0.36649	2000	0.24971
570	0.88687	735	0.69448	1005	0.51290	1410	0.36369	2025	0.24631
572	0.88389	740	0.68993	1010	0.51033	1420	0.36094	2050	0.24299
574	0.88093	745	0.68545	1015	0.50778	1430	0.35823	2075	0.23976
576	0.87799	750	0.68103	1020	0.50525	1440	0.35555	2100	0.23662
578	0.87508	755	0.67666	1025	0.50275	1450	0.35291	2125	0.23354
580	0.87218	760	0.67235	1030	0.50028	1460	0.35031	2150	0.23055
582	0.86930	765	0.66810	1035	0.49783	1470	0.34775	2175	0.22762
584	0.86644	770	0.66390	1040	0.49540	1480	0.34522	2200	0.22477
586	0.86360	775	0.65975	1045	0.49300	1490	0.34273	2225	0.22198
588	0.86078	780	0.65566	1050	0.49062	1500	0.34028	2250	0.21926
590	0.85797	785	0.65161	1055	0.48826	1510	0.33785	2275	0.21660
592	0.85519	790	0.64762	1060	0.48593	1520	0.33546	2300	0.21401
594	0.85243	795	0.64368	1065	0.48361	1530	0.33310	2325	0.21147
596	0.84968	800	0.63978	1070	0.48132	1540	0.33078	2350	0.20898
598	0.84695	805	0.63594	1075	0.47905	1550	0.32848	2375	0.20656
600	0.84424	810	0.63214	1080	0.47680	1560	0.32622	2400	0.20418
602	0.84154	815	0.62838	1085	0.47457	1570	0.32398	2425	0.20186
604	0.83887	820	0.62467	1090	0.47237	1580	0.32178	2450	0.19959
606	0.83621	825	0.62101	1095	0.47018	1590	0.31960	2475	0.19736
608	0.83357	830	0.61739	1100	0.46801	1600	0.31745	2500	0.19519
610	0.83094	835	0.61381	1105	0.46587	1610	0.31533	2525	0.19305
612	0.82833	840	0.61027	1110	0.46374	1620	0.31324	2550	0.19096
614	0.82574	845	0.60678	1115	0.46163	1630	0.31117	2575	0.18892
616	0.82317	850	0.60332	1120	0.45954	1640	0.30913	2600	0.18691
618	0.82061	855	0.59990	1125	0.45747	1650	0.30712	2625	0.18495
620	0.81806	860	0.59653	1130	0.45542	1660	0.30513	2650	0.18303
622	0.81554	865	0.59319	1135	0.45338	1670	0.30316	2675	0.18114
624	0.81303	870	0.58989	1140	0.45137	1680	0.30122	2700	0.17929
626	0.81053	875	0.58663	1150	0.44739	1690	0.29931	2725	0.17747
628	0.80805	880	0.58340	1160	0.44348	1700	0.29741	2750	0.17569
630	0.80559	885	0.58021	1170	0.43963	1710	0.29554	2775	0.17395
632	0.80314	890	0.57705	1180	0.43586	1720	0.29369	2800	0.17223
634	0.80071	895	0.57393	1190	0.43214	1730	0.29187	2825	0.17055
636	0.79829	900	0.57085	1200	0.42849	1740	0.29006	2850	0.16890
638	0.79588	905	0.56779	1210	0.42490	1750	0.28828	2875	0.16728
640	0.79350	910	0.56477	1220	0.42137	1760	0.28652	2900	0.16569
645	0.78759	915	0.56179	1230	0.41790	1770	0.28478	2925	0.16412
650	0.78177	920	0.55883	1240	0.41448	1780	0.28306	2950	0.16259
655	0.77604	925	0.55591	1250	0.41112	1790	0.28136	2975	0.16108


PERCENT EFFICIENCY
ENERGY (KEV)
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GELI 1 JR 0 V2.02 14-FEB-07

ANALYTICS
Isotope Products Laboratories Company

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

Log 417 Recd 12/27/06 K Trenton

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

1098-2

LIBR= A752

74159-207
100 mL Solid in Wide Mouth PPi Parkway Jar

Customer: Eberline Services / Richmond, CA
P.O. No.: 00003890, Item 1
Calibration Date: 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01515

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1990.0	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	189000	2863.9	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	94570	1433.0	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	133800	2027.5	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	295300	4475	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	185600	2812.4	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	116700	1768.4	0.70	1.20	2.78	HPGe
Y-88	898.0	106.60	455400	6901	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	226900	3438	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	227000	3440	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	481200	7292	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
This standard will expire one year after the calibration date.

Source Prepared by: M. Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate

DEAD TIME = 6.56% LIVE TIME-----> <---- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-1 XX 33.682 7 121.50 MIN 1.00000 SM 781

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

NUC-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.995E-01 41G			
59 (59.54)	1.990000	1.00000	6188.197	3.110E+03 s	0.22%	1.402E+03	
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.303E-01 2G			
88 (88.03)	0.039000	1.00000	7233.947	1.855E+05 s	0.14%	1.006E+05	
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.289E-01 10G			
122 (122.06)	1.423000	1.00000	2808.347	1.960E+03 s	0.33%	1.211E+03	
136 (136.47)	0.000001	1.00000	334.789	3.348E+08 s	1.96%	2.069E+08	
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 5.355E-01 3G			
166 (165.80)	0.800000	1.00000	2128.383	2.660E+03 s	0.37%	2.238E+03	
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 1.582E-01 2G			
279 (279.21)	0.815000	1.00000	852.962	1.047E+03 s	0.69%	2.979E+03	
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 4.740E-01 5G			
392 (391.40)	0.642000	1.00000	1087.926	1.695E+03 s	0.50%	1.610E+03	
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.922E-01 3G			
662 (661.64)	1.768400	1.00000	834.341	4.718E+02 s	0.49%	2.142E+02	
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 4.466E-01 8G			
898 (898.00)	0.920000	1.00000	1043.850	1.135E+03 s	0.52%	1.144E+03	
1835 (1836.10)	1.000000	1.00000	549.271	5.493E+02 s	0.50%	5.540E+02	
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.563E-01 5G			
1173 (1173.21)	0.999200	1.00000	879.756	8.805E+02 s	0.49%	4.147E+02	
1332 (1332.48)	1.000000	1.00000	768.477	7.685E+02 s	0.48%	3.620E+02	

DEAD TIME = 6.56% LIVE TIME=------V <---- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 Q-1 XX 33.682 7 121.50 MIN 1.00000 SM 781

LIB#=A982 REF TIME= 274.708 6 Calibration 1234

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Group	1098	Time of count	33.682 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	121.5
Type code	GLY	Dead Time Pct	6.56242
ID	74159-207 (JR)	Background GMT	27.044 2007
Geometry, detector	XX-1	Standard GMT	20.891 2007
Aliquot	1.	Days since TO	123.9744
Unit of Aliquot	SMPL	Time on	8:22 PST 2-FEB
Data Sheet Units	PC1 /SMPL	Time off	10:23 PST 2-FEB
Library	A982	Calc Time	14:22 02-FEB-07
Slope	1.001289	Width slope	0.005351
Intercept	-.114029	Width offset	5.175049
X**2 TERM	-0.17979892E-05	Sensitivity	4.

NP:[7,671781.GSP 40 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	7	26.1	21	33	78000	1.94	1829320	26.2	1.51E+04	0.1	0.107	0	*******
2	7	32.9	21	33	423137	3.92	671002	33.0	5.52E+03	0.3	0.214	0	0.00
3	7	38.0	21	33	437701	3.21	173444	38.1	1.43E+03	0.8	0.331	0	0.00
4	7	42.9	21	33	698543	4.65	229655	43.0	1.89E+03	0.7	0.475	0	0.00
5	7	49.7	21	33	457265	2.77	22234	49.8	1.83E+02	4.5	0.739	0	0.00
6	3	59.4	53	11	567717	2.41	751866	59.5	6.19E+03	0.2	100.	0	0.00
7	4	67.1	65	12	197304	2.96	25596	67.2	2.11E+02	2.7	100.	0	16.10
8	4	71.0	65	12	442136	4.47	84272	71.0	6.94E+02	1.6	100.	0	0.00
9	4	81.3	77	20	351662	4.40	44520	81.3	3.66E+02	2.3	100.	0	406.00
10	4	88.1	77	20	225819	2.44	878865	88.1	7.23E+03	0.1	100.	0	0.00
11	0	101.6	99	7	170928	3.58	2127	101.6	1.75E+01	32.3	100.	0	0.00
12	0	109.7	107	7	159708	2.99	8603	109.7	7.08E+01	7.8	100.	0	0.00
13	0	122.0	116	12	228243	2.50	341175	122.0	2.81E+03	0.3	100.	0	0.00
14	0	136.4	132	10	169569	2.49	40672	136.4	3.35E+02	2.0	100.	0	0.00
15	0	143.8	141	7	110088	4.33	3706	143.7	3.05E+01	15.0	100.	0	0.00
16	0	157.5	150	10	144865	3.24	1192	157.5	9.81E+00	60.1	100.	0	0.00
17	0	165.8	160	12	161631	2.56	258540	165.8	2.13E+03	0.4	100.	0	0.00
18	0	187.2	185	6	70320	2.95	1739	187.1	1.43E+01	24.2	100.	0	0.00
19	0	198.7	195	8	93617	2.62	9115	198.6	7.50E+01	5.9	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	255.2	252	8	67385	2.58	5941	255.1	4.89E+01	7.7	100.	0	0.00
21	0	279.1	273	13	95340	2.69	103565	279.0	8.52E+02	0.7	100.	0	0.00
22	0	300.4	297	8	51514	3.79	1274	300.3	1.05E+01	31.0	100.	0	0.00
23	0	310.6	308	8	48559	2.06	564	310.5	4.64E+00	67.8	100.	0	0.00
24	0	391.6	385	13	70219	2.73	132147	391.5	1.09E+03	0.5	100.	0	0.00
25	0	413.0	410	7	35755	4.13	1276	412.9	1.05E+01	24.6	100.	0	0.00
		510.9	507	8	36423			8	2.73E+01	10.5	100.	0	0.00
		661.8	653	14	40413			661.8	8.34E+02	0.5	100.	0	48.00

[illegible]	0	738.3	736	7	20771	2.83	803	738.4	4.76E+00	40.0	100.	0	0.00
[illegible]	0	813.9	809	11	29165	3.90	3516	814.1	2.89E+01	9.6	100.	0	0.00
[illegible]	0	897.9	889	13	57034	3.33	126791	898.3	1.04E+03	0.5	100.	0	0.00
[illegible]	0	911.6	909	9	30445	2.62	642	912.1	5.28E+00	49.1	100.	0	0.00
[illegible]	0	919.4	917	5	25429	3.19	972	919.8	8.17E+00	28.0	100.	0	0.00

34	0	1173.1	1165	18	31401	3.68	106892	1174.2	8.80E+02	0.5	100.	0	0.00
35	0	1194.3	1190	11	15081	5.00	1602	1195.4	1.32E+01	15.2	100.	0	0.00
36	0	1310.2	1309	7	5740	2.34	279	1311.7	2.29E+00	46.1	100.	0	0.00
37	0	1332.3	1325	17	22202	3.75	93372	1333.9	7.68E+02	0.5	100.	0	0.00
38	0	1352.6	1347	14	12889	6.08	1415	1354.2	1.16E+01	17.2	100.	0	0.00
39	0	1835.3	1830	13	8900	4.35	66717	1839.2	5.49E+02	0.5	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
40	0	1849.7	1850	9	3604	3.32	487	1853.6	4.00E+00	22.5	100.	0	0.00

FWHM=SQRT(1.01733E+01 + 4.56594E-03 *E)

****

BACKGROUND INFO 1098 GLY 2 33.682 7 G- 1 BG DATE 27.044 7

****

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
143.77	30.5057	15.00	143.00	0.0931	34.71	30.4126	15.05
187.16	14.3148	24.18	186.00	0.3656	9.57	13.9493	24.81
198.68	75.0189	5.90	198.00	0.0518	27.78	74.9671	5.90
279.14	852.3890	0.69	279.00	0.0000	0.00	852.3890	0.69
510.85	27.3274	10.48	511.00	0.8929	4.60	26.4346	10.83
661.78	834.3720	0.49	661.60	0.0338	0.00	834.3383	0.49
911.63	5.2846	49.14	911.10	0.0514	49.98	5.2332	49.63
1173.09	879.7686	0.49	1173.20	0.0272	0.00	879.7415	0.49
1332.32	768.4932	0.48	1332.50	0.0288	0.00	768.4644	0.48

0 PEAKS REJECTED BY BACKGROUND

****

INTERFERING ISOTOPE ANALYSIS 1098 GLY 2 33.682 7 G- 1

****

SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

GC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 33.682/2007

BACKGROUND FOR GELI DETECTOR 1 OF 27 044/2007 3667.7 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.7847	18.25	511.0	0.8929	4.60	1120.3	0.0313	9.89
72.0	0.8600	4.40	583.1	0.1094	27.34	1173.2	0.0272	0.00
143.0	0.0931	34.71	609.3	0.1309	30.86	1238.1	0.0000	0.00
186.0	0.3656	9.57	661.6	0.0338	0.00	1332.5	0.0288	0.00
198.0	0.0518	27.78	727.2	0.0443	0.00	1377.7	0.0075	0.00
238.6	0.4981	8.05	846.0	0.0291	26.45	1461.0	0.0474	39.01
279.0	0.0000	0.00	860.4	0.0410	0.00	1586.0	0.0000	0.00
295.2	0.1010	34.14	911.1	0.0514	49.98	1591.0	0.0620	0.00
338.4	0.0575	21.55	968.9	0.0269	0.00	1729.6	0.0061	0.00
351.9	0.1766	21.85	1001.0	0.0394	0.00	1764.5	0.0384	27.35

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 2/ 2/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
295.001	6	1.0519	3.532	22.
301.975	6	1.0622	4.270	36.
309.042	6	1.0675	2.249	22.
316.064	6	1.0692	4.219	20.
322.821	6	1.0844	2.233	20.
336.853	6	1.0756	2.800	23.
350.006	6	1.0721	3.790	21.
356.822	6	1.0885	3.272	13.
5.705	7	1.0875	3.007	20.
20.868	7	1.0580	4.663	29.
AVERAGE		1.0717	0.012	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
302.004	6	1.0626	4.563	27.
306.609	6	1.0640	5.601	22. NG
309.022	6	1.0609	4.908	26.
316.042	6	1.0737	5.494	30.
322.838	6	1.0726	4.175	83.
336.812	6	1.0804	3.118	24.
349.983	6	1.0623	5.691	29.
356.803	6	1.0920	3.791	25.
5.722	7	1.0735	5.147	24.
20.891	7	1.0901	7.076	25.
AVERAGE		1.0732	0.011	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 20.891 7
ENERGY= -0.114029 + 1.0012885*CH + -1.797989E-06*CH**2
FWHM =SQRT(5.1750 + 0.005352*ENERGY) (C060= 3.508)

EFFICIENCIES FOR GEOMETRY XX 1 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
95.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

1098 2 GLY GSTOR 781

	PK	ENERGY	CPM	%ERR	COMMENT
	1	26.1	15056.13	0.1	
	2	32.9	5522.65	0.3	
	3	38.0	1427.52	0.8	
	4	42.9	1890.16	0.7	
	5	49.7	182.99	4.5	
	6	59.4	6188.20	0.2	Am241s
	7	67.1	210.66	2.7	NO GEN. 33S
	8	71.0	693.60	1.6	
	9	81.3	366.42	2.3	Ce144 I 131
	10	88.1	7233.46	0.1	Cd109s
	11	101.6	17.51	32.3	
	12	109.7	70.80	7.8	La140 Cs136 Sb125
	13	122.0	2808.02	0.3	Co 57s
	14	136.4	334.75	2.0	Co 57s
P	15	143.8	30.41	15.0	Fe 59
	16	157.5	9.81	60.1	
	17	165.8	2127.90	0.4	Cs136 Ce139s
b	18	187.2	13.95	24.9	Ra226 Cs136
b	19	198.7	74.97	5.9	Ac228
	20	255.2	48.90	7.7	Sn11
b	21	279.1	852.39	0.7	Ac228 Hg203s
	22	300.4	10.49	31.0	Th228
	23	310.6	4.64	67.8	Co 60p
	24	391.6	1087.63	0.5	Sn113s
	25	413.0	10.51	24.6	
b	26	510.9	26.43	10.6	Ac228 Th228 La140 Ru106 Na 22
b	27	661.8	834.34	0.5	Cs137s
	28	681.4	22.14	21.3	
	29	738.3	4.96	40.0	NO GEN.
	30	813.9	28.94	9.6	
	31	897.9	1043.54	0.5	La140 Y 88s
b	32	911.6	5.23	49.6	Ac228 NO GEN.
	33	919.4	8.17	28.0	La140
b	34	1173.1	879.74	0.5	Cs134+ Co 60s
	35	1194.3	13.19	15.2	NO GEN.
	36	1310.2	2.29	46.1	
b	37	1332.3	768.46	0.5	NO GEN. Co 60s
	38	1352.6	11.64	17.2	
	39	1835.3	549.11	0.5	Y 88s
	40	1849.7	4.00	22.5	

DEAD TIME = 7.39% LIVE TIME------v <---- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-1 XX 3.892 7 78.58 MIN 1.00000 SM 149

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Am241 1.582E+05 DAYS		LAMBDA= 4.381E-06		DECAY= 9.996E-01 41G		
59 (59.54)	1.990000	1.00000	6373.786	3.203E+03 s	0.28%	1.443E+03
102 (103.00)	0.000195	1.00000	16.765	8.598E+04	39.46%	3.874E+04
Cd109 4.620E+02 DAYS		LAMBDA= 1.500E-03		DECAY= 8.682E-01 2G		
88 (88.03)	0.039000	1.00000	7456.956	1.912E+05 s	0.18%	9.920E+04
Co 57 2.718E+02 DAYS		LAMBDA= 2.550E-03		DECAY= 7.865E-01 10G		
122 (122.06)	1.433000	1.00000	3034.929	2.118E+03 s	0.40%	1.213E+03
136 (136.47)	0.000001	1.00000	385.206	3.852E+08 s	2.47%	2.206E+08
Ce139 1.376E+02 DAYS		LAMBDA= 5.037E-03		DECAY= 6.222E-01 3G		
166 (165.80)	0.800000	1.00000	2458.614	3.073E+03 s	0.43%	2.225E+03
Hg203 4.661E+01 DAYS		LAMBDA= 1.487E-02		DECAY= 2.464E-01 2G		
279 (279.21)	0.815000	1.00000	1315.741	1.614E+03 s	0.62%	2.951E+03
Sn113 1.151E+02 DAYS		LAMBDA= 6.022E-03		DECAY= 5.671E-01 5G		
392 (391.40)	0.642000	1.00000	1308.520	2.038E+03 s	0.57%	1.619E+03
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.941E-01 3G		
662 (661.64)	1.768400	1.00000	857.178	4.847E+02 s	0.87%	2.196E+02
Y 88 1.066E+02 DAYS		LAMBDA= 6.502E-03		DECAY= 5.420E-01 8G		
898 (898.00)	0.920000	1.00000	1276.491	1.387E+03 s	0.56%	1.153E+03
1836 (1836.10)	1.000000	1.00000	684.542	6.845E+02 s	0.61%	5.689E+02
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.666E-01 5G		
1173 (1173.21)	0.999200	1.00000	915.805	9.165E+02 s	0.63%	4.271E+02
1333 (1332.48)	1.000000	1.00000	806.405	8.064E+02 s	0.60%	3.758E+02

DEAD TIME = 7.39% LIVE TIME------v <----- HEY THERE!

NO EFFICIENCIES

****

1098 GLY 2 G-1 XX 3.892 7 78.58 MIN 1.00000 SM 149

LIBR=A982 REF TIME= 274.708 6 Calibration 1234

****

Group	1098	Time of count	3.892 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	78.58334
Type code	GLY	Dead Time Pct	7.385582
ID	74159-207 (JR)	Background GMT	1.810 2007
Geometry, detector	XX-1	Standard GMT	356.822 2006
Aliquot	1.	Days since TO	94.18388
Unit of Aliquot	SMPL	Time on	13:24 PST 3-JAN
Data Sheet Units	PCI /SMPL	Time off	14:43 PST 3-JAN
Library	A982	Calc Time	15:08 03-JAN-07
Slope	1.001241	Width slope	0.007769
Intercept	0.126842	Width offset	4.628612
X**2 TERM	-0.18197669E-05	Sensitivity	4.

NP:[7,67]149.GSP 36 PEAKS

****

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	25.9	21	32	62993	1.991317557		25.8	1.68E+04	0.1	0.105	0	******
2	5	33.0	21	32	302862	3.92	496944	32.8	6.32E+03	0.3	0.216	0	0.00
3	5	38.0	21	32	274588	2.90	117457	37.8	1.49E+03	0.9	0.330	0	0.00
4	5	42.9	21	32	518382	5.03	179992	42.7	2.29E+03	0.8	0.474	0	0.00
5	5	49.7	21	32	238197	2.59	13164	49.5	1.68E+02	5.1	0.739	0	0.00
6	0	59.4	53	11	371775	2.43	500873	59.2	6.37E+03	0.3	100.	0	0.00
7	3	67.2	65	12	114513	2.04	16199	67.0	2.06E+02	3.1	100.	0	50.60
8	3	70.3	65	12	259361	3.10	43438	70.1	5.53E+02	2.2	100.	0	0.00
9	3	72.8	65	12	261319	2.85	23558	72.6	3.00E+02	4.0	100.	0	0.00
10	4	83.1	77	21	317820	3.85	34866	82.9	4.44E+02	3.7	100.	0	167.00
11	4	88.1	77	21	160088	2.39	585967	87.8	7.46E+03	0.2	100.	0	0.00
12	0	102.3	99	6	107812	2.75	1317	102.0	1.68E+01	39.5	100.	0	0.00
13	0	109.0	106	7	119390	3.49	6170	108.8	7.85E+01	9.4	100.	0	0.00
14	0	122.0	116	12	168873	2.46	238477	121.8	3.03E+03	0.4	100.	0	0.00
15	0	136.4	131	11	141238	2.54	30269	136.1	3.85E+02	2.5	100.	0	0.00
16	0	143.9	141	7	84857	2.44	2300	143.6	2.93E+01	21.1	100.	0	0.00
17	0	165.8	160	12	122080	2.51	193177	165.5	2.46E+03	0.4	100.	0	0.00
18	0	187.0	184	7	60662	2.58	2082	186.7	2.65E+01	19.7	100.	0	0.00
19	0	198.7	195	8	69418	2.50	6771	198.4	8.62E+01	6.8	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	255.0	251	9	55729	2.69	5053	254.7	6.43E+01	8.5	100.	0	0.00
21	0	279.2	272	13	71591	2.67	103350	278.8	1.32E+03	0.6	100.	0	0.00
22	0	300.3	297	8	37748	3.85	1067	300.0	1.36E+01	31.8	100.	0	0.00
23	0	391.7	384	14	54118	2.70	102810	391.4	1.31E+03	0.6	100.	0	0.00
24	0	412.8	410	8	29155	3.30	752	412.4	9.57E+00	39.4	100.	0	0.00
25	0	511.0	507	9	25867	3.26	2351	510.7	2.99E+01	12.5	100.	0	0.00
26	0	661.8	654	17	51660	3.09	67362	661.6	8.57E+02	0.9	100.	0	0.00
27	0	813.7	808	12	22013	3.94	3140	813.8	4.00E+01	9.6	100.	0	0.00
28	0	898.2	889	18	39680	3.31	100292	898.4	1.28E+03	0.6	100.	0	0.00
29	0	912.4	909	9	21257	2.23	673	912.6	8.57E+00	39.3	100.	0	0.00
30	0	1173.4	1164	20	22999	3.54	71968	1174.3	9.16E+02	0.6	100.	0	0.00
31	0	1194.1	1190	11	10885	5.35	1103	1195.0	1.40E+01	18.6	100.	0	0.00
32	0	1332.6	1324	18	15872	3.78	63371	1334.0	8.06E+02	0.6	100.	0	0.00
33	-	1559.3	1560	6	4685	1.52	222	1561.7	2.83E+00	49.6	100.	0	0.00

```
 34   0 1836.2 1829 23   7779 4.28   53783 1839.9   6.84E+02   0.6  100.    0   0.00
 35   0 1851.0 1851  9   2932 5.27     402 1854.9   5.12E+00  24.9  100.    0   0.00
 36   0 1858.5 1859  9   1727 4.41     416 1862.4   5.29E+00  20.1  100.    0   0.00
FWHM=SQRT( 7.98383E+00 +  5.56538E-03 *E)

*****************************************************************************
BACKGROUND INFO 1098    GLY   2          3.892  7 G- 1      BG DATE   1.810  7
*****************************************************************************

v---------PEAK---------v      v------BACKGROUND------v      v-------NET----v
ENERGY       CPM   %ERROR      ENERGY       CPM   %ERROR          CPM   %ERROR

 143.89    29.2720 21.13        143.00  0.0892 34.87         29.1828 21.20
 186.96    26.4918 19.68        186.00  0.3670  9.35         26.1248 19.95
 198.73    86.1654  6.83        198.00  0.0621  0.00         86.1033  6.84
 279.17  1315.1650  0.62        279.00  0.0000  0.00       1315.1650  0.62
 511.00    29.9177 12.51        511.00  0.8900  3.38         29.0278 12.89
 661.78   857.2103  0.87        661.60  0.0338  0.00        857.1766  0.87
 912.38     8.5693 39.26        911.10  0.0725 24.29          8.4968 39.60
1173.41   915.8226  0.63       1173.20  0.0272  0.00        915.7955  0.63
1332.56   806.4213  0.60       1332.50  0.0251  0.00        806.3962  0.60
    0 PEAKS REJECTED BY BACKGROUND

*****************************************************************************
INTERFERING ISOTOPE ANALYSIS 1098    GLY   2          3.892  7 G- 1
*****************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
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QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 3.892/2007

BACKGROUND FOR GELI DETECTOR 1 OF 1.810/2007 1109.5 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.8253	20.99	511.0	0.8900	3.38	1120.3	0.0473	0.00
92.0	0.8400	4.94	583.1	0.1098	27.51	1173.2	0.0272	0.00
143.0	0.0892	34.87	609.3	0.1211	30.56	1238.1	0.0000	0.00
186.0	0.3670	9.35	661.6	0.0338	0.00	1332.5	0.0251	0.00
198.0	0.0621	0.00	727.2	0.0443	0.00	1377.7	0.0075	0.00
238.6	0.4796	11.53	846.0	0.0474	72.96	1461.0	0.0483	40.59
279.0	0.0000	0.00	860.4	0.0410	0.00	1586.0	0.0000	0.00
295.2	0.1010	41.67	911.1	0.0725	24.29	1591.0	0.0620	0.00
338.4	0.0575	21.55	968.9	0.0433	0.00	1729.6	0.0061	0.00
351.9	0.1621	23.82	1001.0	0.0394	0.00	1764.5	0.0332	6.63

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 1/ 3/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
280.781	6	1.0202	3.827	23.
287.818	6	1.0257	4.019	22.
295.001	6	1.0519	3.532	22.
301.975	6	1.0622	4.270	36.
309.042	6	1.0675	2.249	22.
316.064	6	1.0692	4.219	20.
322.821	6	1.0844	2.233	20.
336.853	6	1.0756	2.800	23.
350.006	6	1.0721	3.790	21.
356.822	6	1.0885	3.272	13.
AVERAGE		1.0617	0.023	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
287.797	6	1.0180	7.644	28.
294.983	6	1.0504	5.738	23.
302.004	6	1.0626	4.563	27.
306.609	6	1.0640	5.601	22. NG
309.022	6	1.0609	4.908	26.
316.042	6	1.0737	5.494	30.
322.838	6	1.0726	4.175	83.
336.812	6	1.0804	3.118	24.
349.983	6	1.0623	5.691	29.
356.803	6	1.0920	3.791	25.
AVERAGE		1.0637	0.020	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 356.822 6
ENERGY= 0.126843 + 1.0012411*CH + -1.819767E-06*CH**2
FWHM =SQRT(4.6286 + 0.007770*ENERGY) (C060= 3.871)

EFFICIENCIES FOR GEOMETRY XX 1 CALIBRATED 33.000 1990

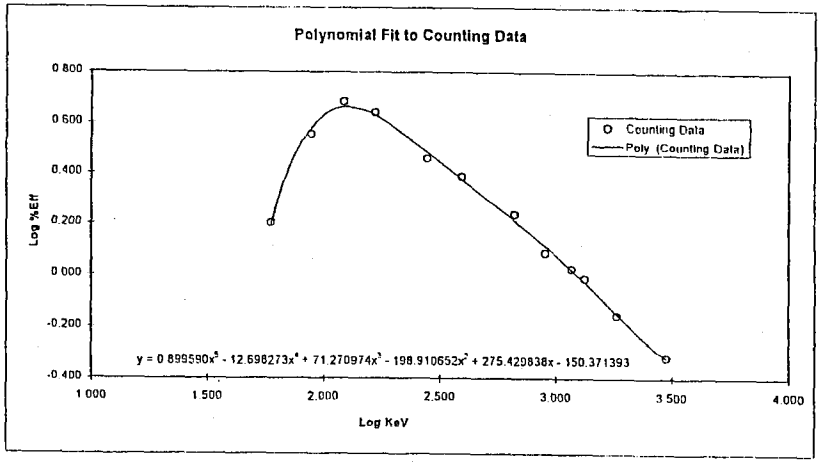
ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

	PK	ENERGY	CPM	%ERR	COMMENT
	1	25.9	16766.37	0.1	
	2	33.0	6323.78	0.3	
	3	38.0	1494.68	0.9	
	4	42.9	2290.46	0.8	
	5	49.7	167.52	5.1	
	6	59.4	6373.79	0.3	Am241s
	7	67.2	206.13	3.1	33S
	8	70.3	552.76	2.2	
	9	72.8	299.78	4.0	
	10	83.1	443.69	3.7	
	11	88.1	7456.63	0.2	Cd109s
	12	102.3	16.77	39.5	
	13	109.0	78.51	9.4	La140 Cs136 Sb125
	14	122.0	3034.70	0.4	Co 57s
	15	136.4	385.18	2.5	Co 57s
b	16	143.9	29.18	21.2	Fe 59
	17	165.8	2458.25	0.4	Cs136 Ce139s
b	18	187.0	26.12	20.0	Ra226 Cs136
b	19	198.7	86.10	6.8	Ac228
	20	255.0	64.30	8.5	Sn113
b	21	279.2	1315.17	0.6	Ac228 Hg203s
	22	300.3	13.58	31.8	Th228
	23	391.7	1308.29	0.6	Sn113s
	24	412.8	9.57	39.4	
b	25	511.0	29.03	12.9	Ac228 Th228 La140 Ru106 Na 22
b	26	661.8	857.18	0.9	NO GEN. Cs137s
	27	813.7	39.95	9.6	
	28	898.2	1276.25	0.6	La140 Y 88s
b	29	912.4	8.50	39.6	Ac228
b	30	1173.4	915.80	0.6	Cs134+ Co 60s
	31	1194.1	14.04	18.6	
b	32	1332.6	806.40	0.6	NO GEN. Co 60s
	33	1559.3	2.83	49.6	
	34	1836.2	684.41	0.6	NO GEN. Y 88s
	35	1851.0	5.12	24.9	
	36	1858.5	5.29	20.1	

Detector	G8	100 mL Jar	
Geometry	JR	Shelf 0	EFF. DATE
Std I.D.	(GLY)1098-2		4-Jun-07
Filename	GELI08JR0.EFF		

Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	%Eff Avg	%SD of %Eff	LogKev	Log%Eff	%Dev from Spline
59.50	1.58768	1.59342	1.59055	0.25539	1.775	0.202	1
88.00	3.62048	3.57248	3.59648	0.94370	1.944	0.556	-5
122.10	4.69231	4.8641	4.77819	2.54175	2.087	0.679	5
165.90	4.32424	4.35607	4.34247	0.59385	2.220	0.638	2
279.20	2.88287	2.83392	2.85829	1.20584	2.446	0.456	-6
391.70	2.43446	2.43238	2.43342	0.06026	2.593	0.386	2
661.70	1.72497	1.73185	1.72841	0.28131	2.821	0.238	6
898.00	1.21952	1.21942	1.21947	0.00565	2.953	0.086	-7
1173.20	1.06143	1.06183	1.06163	0.02640	3.069	0.026	1
1332.50	0.97061	0.97429	0.97245	0.26746	3.125	-0.012	3
1836.10	0.69239	0.70337	0.69788	1.11189	3.264	-0.156	-2
			#DIV/0!		#NUM!	#DIV/0!	#DIV/0!
3000	(artificial data)		0.48000		3.477	-0.319	0
					avg	#DIV/0!	

(shaded cells are manual entry, all others are calculated)

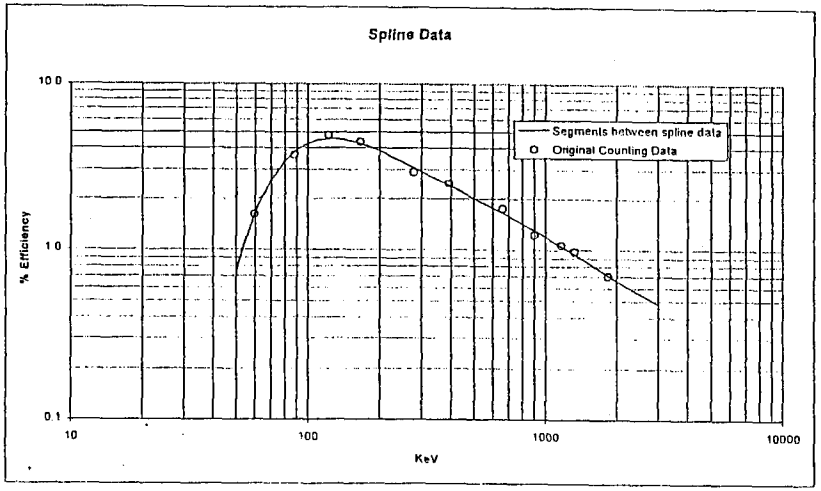


Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
50	0.74516	1.699	-0.128		
55	1.15980	1.740	0.064		
60	1.61917	1.778	0.209		#DIV/0!
65	2.08791	1.813	0.320		
70	2.53772	1.845	0.404		
80	3.31215	1.903	0.520		
90	3.87813	1.954	0.589		
100	4.24599	2.000	0.628		#DIV/0!
110	4.45413	2.041	0.649		
130	4.55194	2.114	0.658		
150	4.42173	2.176	0.646		
170	4.20182	2.230	0.623		
190	3.95865	2.279	0.598		
250	3.30384	2.398	0.519		
300	2.89513	2.477	0.462		#DIV/0!
500	1.99928	2.699	0.301		
700	1.57140	2.845	0.196		
1000	1.19897	3.000	0.079		#DIV/0!
1400	0.90384	3.146	-0.044		
2000	0.65671	3.301	-0.183		
3000	0.47888	3.477	-0.320		

Polynomial Coefficients

x5 =	0.89959
x4 =	-12.698273
x3 =	71.270974
x2 =	-198.910652
x1 =	275.429838
x0 =	-150.371393



Det ... GELI 8
Geo ... JR - 100-ml Jar
Shlf .. 0
Ref ... 100ML IN PARKWAY JAR

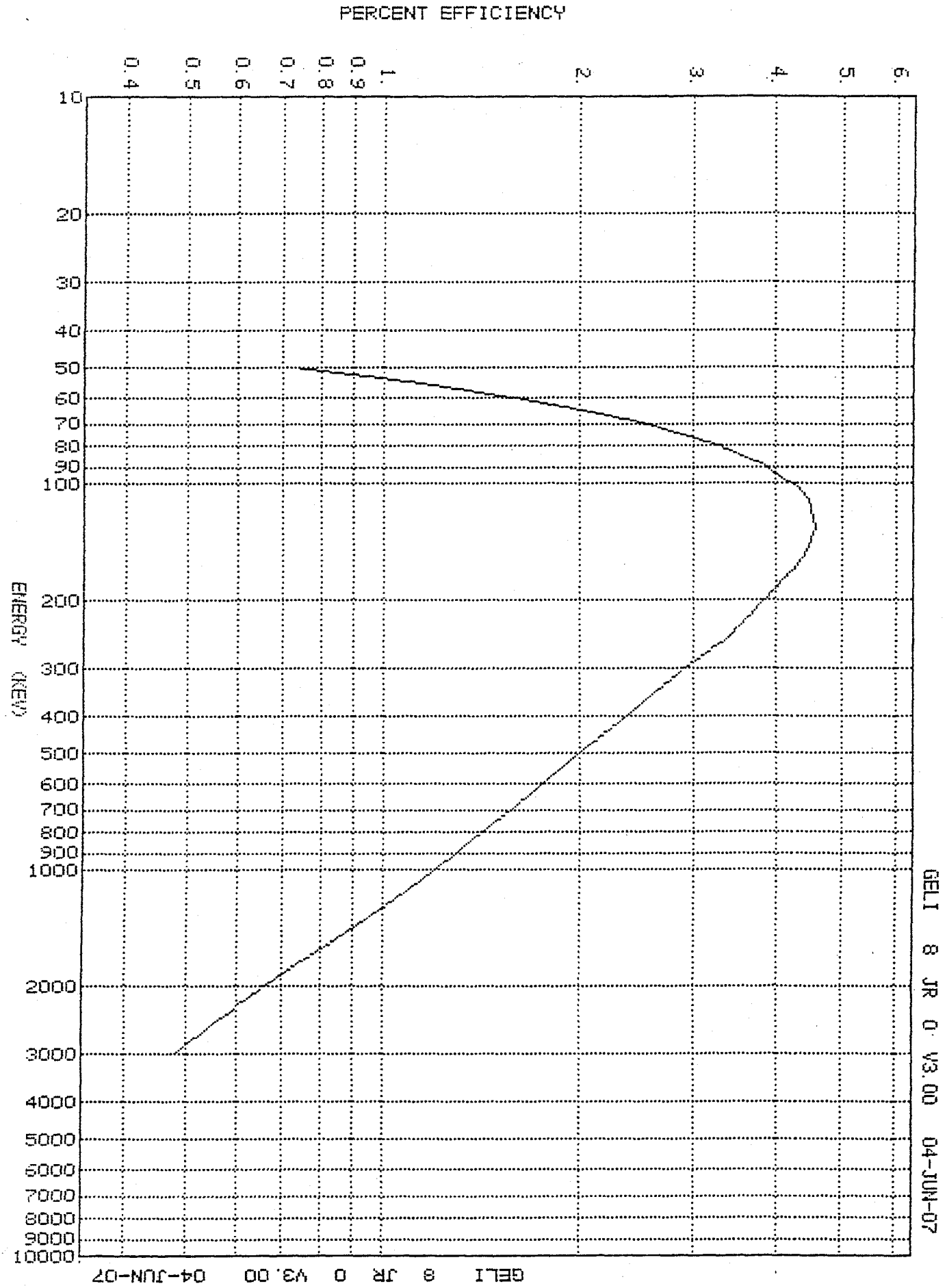
Date 04-JUN-07
Version .. 3.00
File ..... ND:[25,4]GELIOBJRO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.74516	108	4.41328	216	3.68386	324	2.73806	432	2.22274
51	0.81690	110	4.45413	218	3.66486	326	2.72587	434	2.21531
52	0.89395	112	4.46482	220	3.64614	328	2.71382	436	2.20794
53	0.97659	114	4.47534	222	3.62768	330	2.70188	438	2.20063
54	1.06511	116	4.48570	224	3.60947	332	2.69008	440	2.19337
55	1.15980	118	4.49591	226	3.59152	334	2.67839	442	2.18617
56	1.24277	120	4.50597	228	3.57381	336	2.66683	444	2.17903
57	1.33005	122	4.51589	230	3.55635	338	2.65538	446	2.17195
58	1.42178	124	4.52566	232	3.53912	340	2.64405	448	2.16491
59	1.51811	126	4.53530	234	3.52212	342	2.63284	450	2.15794
60	1.61917	128	4.54481	236	3.50534	344	2.62173	452	2.15101
61	1.70645	130	4.55419	238	3.48879	346	2.61074	454	2.14414
62	1.79691	132	4.53987	240	3.47245	348	2.59986	456	2.13732
63	1.89059	134	4.52581	242	3.45632	350	2.58908	458	2.13055
64	1.98757	136	4.51200	244	3.44040	352	2.57841	460	2.12383
65	2.08791	138	4.49844	246	3.42469	354	2.56784	462	2.11716
66	2.17354	140	4.48511	248	3.40917	356	2.55738	464	2.11055
67	2.26132	142	4.47200	250	3.39384	358	2.54702	466	2.10398
68	2.35126	144	4.45912	252	3.37035	360	2.53675	468	2.09746
69	2.44339	146	4.44645	254	3.34720	362	2.52659	470	2.09098
70	2.53772	148	4.43399	256	3.32440	364	2.51652	472	2.08456
71	2.61054	150	4.42173	258	3.30192	366	2.50654	474	2.07818
72	2.68439	152	4.39792	260	3.27977	368	2.49666	476	2.07185
73	2.75927	154	4.37456	262	3.25793	370	2.48687	478	2.06556
74	2.83517	156	4.35161	264	3.23641	372	2.47717	480	2.05932
75	2.91210	158	4.32907	266	3.21519	374	2.46757	482	2.05312
76	2.99006	160	4.30694	268	3.19426	376	2.45805	484	2.04697
77	3.06904	162	4.28518	270	3.17362	378	2.44861	486	2.04086
78	3.14905	164	4.26381	272	3.15327	380	2.43927	488	2.03479
79	3.23009	166	4.24280	274	3.13320	382	2.43000	490	2.02877
80	3.31215	168	4.22214	276	3.11340	384	2.42082	492	2.02279
81	3.36772	170	4.20182	278	3.09386	386	2.41173	494	2.01685
82	3.42352	172	4.17556	280	3.07459	388	2.40271	496	2.01095
83	3.47956	174	4.14977	282	3.05557	390	2.39377	498	2.00510
84	3.53582	176	4.12443	284	3.03681	392	2.38491	500	1.99928
85	3.59231	178	4.09952	286	3.01829	394	2.37613	502	1.99358
86	3.64903	180	4.07505	288	3.00001	396	2.36743	504	1.98791
87	3.70597	182	4.05098	290	2.98197	398	2.35880	506	1.98228
88	3.76314	184	4.02732	292	2.96415	400	2.35025	508	1.97669
89	3.82052	186	4.00406	294	2.94657	402	2.34177	510	1.97114
90	3.87813	188	3.98117	296	2.92921	404	2.33336	512	1.96563
91	3.91516	190	3.95865	298	2.91206	406	2.32502	514	1.96015
92	3.95214	192	3.93547	300	2.89513	408	2.31675	516	1.95471
93	3.98906	194	3.91266	302	2.88122	410	2.30856	518	1.94931
94	4.02593	196	3.89021	304	2.86747	412	2.30043	520	1.94394
95	4.06274	198	3.86812	306	2.85387	414	2.29237	522	1.93861
96	4.09949	200	3.84637	308	2.84043	416	2.28438	524	1.93331
97	4.13620	202	3.82497	310	2.82714	418	2.27645	526	1.92804
98	4.17285	204	3.80389	312	2.81399	420	2.26859	528	1.92281
99	4.20944	206	3.78313	314	2.80099	422	2.26079	530	1.91762
100	4.24599	208	3.76268	316	2.78813	424	2.25305	532	1.91245
102	4.28842	210	3.74253	318	2.77541	426	2.24538	534	1.90732
104	4.33044	212	3.72269	320	2.76282	428	2.23777	536	1.90223
106	4.37205	214	3.70313	322	2.75037	430	2.23023	538	1.89716

Det ... GELI 8
Geo ... JR - 100-ml Jar
Shlf ... 0
Ref ... 100ML IN PARKWAY JAR

Date 04-JUN-07
Version .. 3.00
File ..... ND:[25,4]GELIOBJRO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	1.89213	660	1.63899	930	1.26681	1260	0.98746	1800	0.72169
542	1.88713	665	1.63016	935	1.26167	1270	0.98092	1810	0.71812
544	1.88216	670	1.62144	940	1.25657	1280	0.97448	1820	0.71458
546	1.87723	675	1.61284	945	1.25153	1290	0.96814	1830	0.71109
548	1.87232	680	1.60434	950	1.24653	1300	0.96188	1840	0.70762
550	1.86745	685	1.59595	955	1.24158	1310	0.95571	1850	0.70420
552	1.86260	690	1.58767	960	1.23667	1320	0.94962	1860	0.70081
554	1.85779	695	1.57948	965	1.23181	1330	0.94362	1870	0.69745
556	1.85300	700	1.57140	970	1.22699	1340	0.93771	1880	0.69413
558	1.84824	705	1.56294	975	1.22221	1350	0.93187	1890	0.69084
560	1.84352	710	1.55459	980	1.21748	1360	0.92611	1900	0.68758
562	1.83882	715	1.54633	985	1.21279	1370	0.92043	1925	0.67958
564	1.83415	720	1.53818	990	1.20814	1380	0.91483	1950	0.67177
566	1.82951	725	1.53013	995	1.20354	1390	0.90930	1975	0.66415
568	1.82490	730	1.52218	1000	1.19897	1400	0.90384	2000	0.65671
570	1.82031	735	1.51432	1005	1.19396	1410	0.89810	2025	0.65039
572	1.81575	740	1.50655	1010	1.18899	1420	0.89243	2050	0.64420
574	1.81122	745	1.49888	1015	1.18407	1430	0.88684	2075	0.63815
576	1.80672	750	1.49129	1020	1.17920	1440	0.88132	2100	0.63222
578	1.80224	755	1.48380	1025	1.17436	1450	0.87588	2125	0.62642
580	1.79779	760	1.47639	1030	1.16957	1460	0.87050	2150	0.62074
582	1.79337	765	1.46906	1035	1.16483	1470	0.86520	2175	0.61518
584	1.78897	770	1.46182	1040	1.16012	1480	0.85996	2200	0.60973
586	1.78460	775	1.45466	1045	1.15546	1490	0.85479	2225	0.60438
588	1.78025	780	1.44759	1050	1.15084	1500	0.84969	2250	0.59915
590	1.77593	785	1.44059	1055	1.14625	1510	0.84465	2275	0.59401
592	1.77163	790	1.43367	1060	1.14171	1520	0.83967	2300	0.58898
594	1.76736	795	1.42682	1065	1.13721	1530	0.83475	2325	0.58404
596	1.76312	800	1.42006	1070	1.13274	1540	0.82990	2350	0.57920
598	1.75889	805	1.41336	1075	1.12832	1550	0.82510	2375	0.57444
600	1.75470	810	1.40674	1080	1.12393	1560	0.82036	2400	0.56978
602	1.75052	815	1.40019	1085	1.11958	1570	0.81568	2425	0.56520
604	1.74637	820	1.39371	1090	1.11526	1580	0.81106	2450	0.56070
606	1.74224	825	1.38730	1095	1.11099	1590	0.80649	2475	0.55628
608	1.73814	830	1.38096	1100	1.10674	1600	0.80197	2500	0.55195
610	1.73406	835	1.37468	1105	1.10254	1610	0.79751	2525	0.54768
612	1.73000	840	1.36847	1110	1.09836	1620	0.79310	2550	0.54350
614	1.72597	845	1.36232	1115	1.09423	1630	0.78874	2575	0.53938
616	1.72195	850	1.35624	1120	1.09012	1640	0.78443	2600	0.53534
618	1.71796	855	1.35022	1125	1.08605	1650	0.78017	2625	0.53137
620	1.71400	860	1.34427	1130	1.08202	1660	0.77596	2650	0.52746
622	1.71005	865	1.33837	1135	1.07801	1670	0.77180	2675	0.52361
624	1.70612	870	1.33253	1140	1.07404	1680	0.76769	2700	0.51983
626	1.70222	875	1.32675	1150	1.06619	1690	0.76362	2725	0.51612
628	1.69834	880	1.32103	1160	1.05847	1700	0.75959	2750	0.51246
630	1.69448	885	1.31537	1170	1.05086	1710	0.75561	2775	0.50886
632	1.69064	890	1.30976	1180	1.04338	1720	0.75168	2800	0.50532
634	1.68682	895	1.30420	1190	1.03601	1730	0.74779	2825	0.50183
636	1.68302	900	1.29871	1200	1.02876	1740	0.74394	2850	0.49840
638	1.67924	905	1.29326	1210	1.02161	1750	0.74013	2875	0.49502
640	1.67549	910	1.28787	1220	1.01458	1760	0.73636	2900	0.49169
645	1.66618	915	1.28253	1230	1.00764	1770	0.73263	2925	0.48842
650	1.65700	920	1.27724	1240	1.00082	1780	0.72895	2950	0.48519
655	1.64793	925	1.27200	1250	0.99409	1790	0.72530	2975	0.48201


PERCENT EFFICIENCY
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10000
ENERGY (KEV)
GELI 8 JR 0 V3.00 04-JUN-07

```
1098   GLY  2      G-8 XX 152.742  7  112.00 MIN     1.00000 SM      464
LIBR=A982  REF TIME= 274.708  6
```

Group	1098	Time of count	152.742 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	112.
Type code	GLY	Dead Time Pct	2.665122
ID	74159-207 (JR)	Background GMT	148.779 2007
Geometry, detector	XX-8	Standard GMT	146.689 2007
Aliquot	1.	Days since TO	243.0337
Unit of Aliquot	SMPL	Time on	10:48 PDT 1-JUN
Data Sheet Units	PCI /SMPL	Time off	12:40 PDT 1-JUN
Library	A982	Calc Time	08:25 04-JUN-07
Slope	1.008624	Width slope	0.042773
Intercept	-2.19831	Width offset	0.0
X**2 TERM	-0.22302215E-05	Sensitivity	4.

NP:[7,67]464.GSP 25 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	7	24.3	24	8	30307	1.83	33089	26.2	2.95E+02	1.20.	000	0	101.65
2	7	26.2	24	8	67630	2.50	29508	28.2	2.63E+02	1.80.	000	0	101.65
3	2	34.4	31	11	181573	2.62	375	36.3	3.35E+00	197.	30.	000	0 2.89
4	2	37.6	31	11	85725	2.62	1387	39.5	1.24E+01	30.	40.	000	0 2.89
5	0	59.1	56		9182772	1.65	212099	60.8	1.89E+03	0.	40.	000	0 2.89
6	10	67.4	66	29	83085	5.17	21991	69.0	1.96E+02	2.	00.	000	0405.43
7	10	74.2	66	29	299654	6.28	91870	75.7	8.20E+02	1.	40.	000	0405.43
8	10	85.0	66	29	177866	4.42	94487	86.4	8.44E+02	1.	20.	000	0405.43
9	10	87.9	66	29	63206	1.70	490681	89.4	4.38E+03	0.	20.	000	0405.43
10	0	121.9	117	11	119251	1.84	248765	123.1	2.22E+03	0.	30.	000	0405.43
11	0	136.4	133	9	77392	2.10	30913	137.5	2.76E+02	1.	70.	000	0405.43
12	0	165.8	161	10	79500	2.04	181234	166.6	1.62E+03	0.	40.	000	0405.43
13	0	186.2	184	9	61148	2.95	1034	186.9	9.23E+00	43.	30.	000	0405.43
14	0	255.2	252	9	53746	2.40	5337	255.4	4.77E+01	8.	00.	000	0405.43
15	0	279.2	274	11	58258	2.45	26710	279.2	2.38E+02	1.	80.	000	0405.43
16	0	391.7	383	14	57890	3.06	112398	390.9	1.00E+03	0.	50.	000	0405.43
17	0	511.6	506	10	31764	3.92	3539	510.0	3.16E+01	9.	60.	000	0405.43
18	0	661.6	647	21	62678	4.44	202025	659.1	1.80E+03	0.	40.	000	0405.43
19	0	691.4	684	10	27673	5.41	723	688.7	6.45E+00	43.	30.	000	0405.43
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	812.9	806	11	25993	5.13	1030	809.6	9.20E+00	30.	60.	000	0405.43
21	0	897.9	880	26	69330	5.67	123474	894.1	1.10E+03	0.	60.	000	0405.43
22	0	1173.0	1152	29	37581	6.94	225409	1168.2	2.01E+03	0.	30.	000	0405.43
23	0	1332.0	1309	30	19725	7.68	206243	1326.7	1.84E+03	0.	30.	000	0405.43
24	4	1831.1	1808	33	3240	5.97	26277	1825.0	2.35E+02	1.	10.	000	0216.52
25	4	1837.3	1808	33	1665	4.18	47798	1831.2	4.27E+02	0.	50.	000	0216.52

FWHM=SQRT(9.01826E+00 + 1.81703E-02 *E)

```
BACKGROUND INFO 1098    GLY   2        152.742  7 G- 8     BG DATE 148.779  7
```

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
186.24	9.2337	43.34	186.00	0.4940	10.61	8.7397	45.79
279.22	238.4799	1.85	279.00	0.1166	0.00	238.3632	1.85
511.58	31.5971	9.56	511.00	2.7627	5.61	28.8344	10.49

```
 661.64 1803.7959  0.38      661.60  0.3624 16.72      1803.4335  0.38
1173.03 2012.5823  0.29     1173.20  0.0927  0.00      2012.4896  0.29
1332.04 1841.4550  0.27     1332.50  0.0965  7.15      1841.3584  0.27
     0 PEAKS REJECTED BY BACKGROUND

**********************************************************************************
 NTERFERING ISOTOPE ANALYSIS 1098    GLY   2        152.742  7 G- 8
**********************************************************************************
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED
```

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 152.742/2007

BACKGROUND FOR GELI DETECTOR 8 OF 148.779/2007 1265.7 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.2261	62.01	511.0	2.7627	5.61	1173.2	0.0927	0.00
92.0	0.6445	8.46	583.1	0.5399	24.89	1238.1	0.1478	28.08
143.0	0.0943	29.91	609.3	0.9053	22.58	1332.5	0.0965	7.15
186.0	0.4940	10.61	661.6	0.3624	16.72	1377.7	0.1743	0.00
198.0	0.1733	59.43	727.2	0.1320	42.49	1460.8	3.2905	20.88
238.5	1.0416	18.53	860.0	0.0834	0.00	1586.0	0.1235	36.03
279.0	0.1166	0.00	911.1	0.5059	25.20	1591.0	0.0777	55.70
295.2	0.3167	35.68	968.9	0.4218	25.53	1729.6	0.0424	0.00
338.4	0.2046	28.35	1001.0	0.1562	0.00	1764.5	0.3128	24.87
351.9	0.6750	20.59	1120.3	0.3533	26.10	0.0	0.0000	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 8 ON 6/ 4/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.719	3	0.9279	15.753	61.*
322.765	5	0.8833	18.759	31.*
322.789	5	0.8727	17.160	43.*
322.825	5	0.8755	17.370	41.*
352.103	5	0.8703	18.548	21.*
355.939	5	0.8663	19.048	20.*
58.691	6	0.9079	17.307	83.*
312.732	6	0.8798	18.209	22.*
146.689	7	0.9437	22.807	27.
53.871	7	0.9404	23.280	21.
AVERAGE		0.9421	0.002	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
55.907	7	0.8497	13.966	22.NG
61.951	7	0.8381	12.615	42.NG
69.881	7	0.8217	10.936	33.
76.788	7	0.8444	12.015	30.
81.924	7	0.8275	10.834	33.NG
92.670	7	0.8012	11.271	24.
96.949	7	1.2243	10.113	32.NG
103.953	7	0.8129	11.386	25.NG
133.873	7	0.8257	11.864	28.NG
140.052	7	0.8416	13.026	21.
AVERAGE		0.0000	0.016	

CALIBRATION LINE FROM STANDARD FOR G- 8 OF 146.689 7
ENERGY= -2.198306 + 1.0086241*CH + -2.230222E-06*CH**2
FWHM =SQRT(-6.9307 + 0.042773*ENERGY) (CO60= 7.076)

EFFICIENCIES FOR GEOMETRY XX 8 CALIBRATED 0.000 2000

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000		
0.0	0.000000	0.0	0.000000	0.0	0.000000		
0.0	0.000000	0.0	0.000000	0.0	0.000000		

1098 2 GLY GSTOR 464

	PK	ENERGY	CPM	%ERR	COMMENT
	1	24.3	295.44	1.2	
	2	26.2	263.46	1.8	
	3	34.4	3.35	99.9	
	4	37.6	12.38	30.4	
	5	59.1	1893.74	0.4	Am241s
	6	67.4	196.35	2.0	
	7	74.2	820.27	1.4	
	8	85.0	843.64	1.2	Cs136
	9	87.9	4381.08	0.2	Cd109s
	10	121.9	2221.12	0.3	Co 57s
	11	136.4	276.01	1.7	Co 57s
	12	165.8	1618.16	0.4	Cs136 Ce139s
b	13	186.2	8.74	45.8	Ra226 Cs136
	14	255.2	47.66	8.0	Sn113
b	15	279.2	238.36	1.9	Ac228 Hg203s
	16	391.7	1003.56	0.5	Sn113s
b	17	511.6	28.83	10.5	Th228 La140 Ru106 Na 22
b	18	661.6	1803.43	0.4	Cs137s
	19	691.4	6.45	43.3	Co 57
	20	812.9	9.20	30.6	
	21	897.9	1102.45	0.6	La140 Y 88s
b	22	1173.0	2012.49	0.3	Cs134+ Co 60s
b	23	1332.0	1841.36	0.3	Co 60s
	24	1831.1	234.62	1.1	
	25	1837.3	426.77	0.5	Ra226 Y 88s

1098 GLY 2 G-8 XX 115.846 7 202.63 MIN 1.00000 SM 198

LIBR=A982 REF TIME= 274.708 6

Group	1098	Time of count	115.846 2007
Sample	2	Reference GMT	274.708 2006
Element		Elapsed Live Tm	202.6333
Type code	GLY	Dead Time Pct	2.875859
ID	74159-207 (JR)	Background GMT	110.963 2007
Geometry, detector	XX-8	Standard GMT	110.881 2007
Aliquot	1.	Days since TO	206.1383
Unit of Aliquot	SMPL	Time on	13:18 PDT 25-APR
Data Sheet Units	PCI /SMPL	Time off	16:41 PDT 25-APR
Library	A982	Calc Time	17:56 25-APR-07
Slope	1.008353	Width slope	0.040798
Intercept	-2.12583	Width offset	-5.47015
X**2 TERM	-0.20896141E-05	Sensitivity	4.

NP:[7,67]198.GSP 24 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	3	24.4	24	8	33044	1.93	71045	26.3	3.51E+02	0.60.	000	0358.	26
2	3	26.4	24	8	176412	2.83	58056	28.3	2.87E+02	1.40.	000	0358.	26
3	0	59.2	56	9	354435	1.64	385185	60.8	1.90E+03	0.30.	000	0358.	26
4	10	67.3	66	29	164118	4.50	38646	68.9	1.91E+02	1.60.	000	0606.	03
5	10	74.1	66	29	621818	6.57	189162	75.6	9.34E+02	1.00.	000	0606.	03
6	10	85.1	66	29	407537	5.06	204313	86.5	1.01E+03	0.90.	000	0606.	03
7	10	88.0	66	29	126638	1.70	925775	89.3	4.57E+03	0.10.	000	0606.	03
8	4	113.8	97	30	186183	2.87	17045	115.0	8.41E+01	4.70.	000	0668.	28
9	4	122.0	97	30	114494	1.89	512579	123.1	2.53E+03	0.20.	000	0668.	28
10	0	136.4	133	9	158798	2.10	61601	137.4	3.04E+02	1.20.	000	0668.	28
11	0	165.8	161	10	159517	2.07	398196	166.6	1.97E+03	0.20.	000	0668.	28
12	0	255.1	252	9	106740	2.42	11246	255.2	5.55E+01	5.30.	000	0668.	28
13	0	279.2	274	10	105612	2.45	82215	279.1	4.06E+02	0.80.	000	0668.	28
14	0	309.8	306	8	74193	1.41	722	309.5	3.56E+00	65.60.	000	0668.	28
15	0	391.6	383	14	113593	3.02	253735	390.8	1.25E+03	0.30.	000	0668.	28
16	0	511.0	505	11	68579	4.28	7547	509.4	3.72E+01	6.80.	000	0668.	28
17	0	661.4	647	19	113402	4.35	367815	658.9	1.82E+03	0.30.	000	0668.	28
18	0	813.7	805	12	53511	5.22	2892	810.4	1.43E+01	16.10.	000	0668.	28
19	0	897.6	879	23	117103	5.54	283939	893.9	1.40E+03	0.30.	000	0668.	28
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1113.7	1101	17	597681	0.06	3964	1109.1	1.96E+01	12.20.	000	0668.	28
21	0	1172.6	1151	29	72845	6.79	413435	1167.9	2.04E+03	0.20.	000	0668.	28
22	0	1331.7	1310	29	39588	7.52	379574	1326.4	1.87E+03	0.20.	000	0668.	28
23	4	1830.6	1809	34	6518	5.25	63076	1824.4	3.11E+02	0.60.	000	0733.	49
24	4	1837.0	1809	34	3377	3.83	109982	1830.8	5.43E+02	0.40.	000	0733.	49

FWHM=SQRT(9.63069E+00 + 2.10185E-02 *E)

BACKGROUND INFO 1098 GLY 2 115.846 7 G- 8 BG.DATE 110.963 7

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
279.16	405.7323	0.82	279.00	0.1166	0.00	405.6157	0.82
510.97	37.2464	6.83	511.00	2.7764	7.75	34.4700	7.40
662.42	1815.1771	0.27	661.60	0.3418	15.07	1814.8353	0.27
1834.84	2040.3099	0.22	1177.20	0.1297	11.18	2040.1802	0.22

1381.69 1873.2065 0.20 1332.50 0.1415 0.00 1873.0651 0.20
0 PEAKS REJECTED BY BACKGROUND

****
NTERFERING ISOTOPE ANALYSIS 1098 GLY 2 115.846 7 G- 8
****
PANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

QC USED IN DATA REDUCTION OF SAMPLE 1098 2 GLY RUN AT 115.846/2007

BACKGROUND FOR GELI DETECTOR 8 OF 110.963/2007 3732.9 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.2421	58.91	511.0	2.7764	7.75	1173.2	0.1297	11.18
92.0	0.6458	6.19	583.1	0.5464	24.29	1238.1	0.1378	34.75
143.0	0.1143	0.00	609.3	0.8816	16.31	1332.5	0.1415	0.00
186.0	0.4844	14.37	661.6	0.3418	15.07	1377.7	0.0989	66.92
198.0	0.1386	21.21	727.2	0.1264	45.17	1460.8	3.2983	16.96
238.5	1.0015	16.92	860.0	0.0834	0.00	1586.0	0.1242	50.66
279.0	0.1166	0.00	911.1	0.5001	17.56	1591.0	0.1211	76.58
295.2	0.3080	27.85	968.9	0.4081	21.47	1729.6	0.0424	0.00
338.4	0.2416	34.19	1001.0	0.1562	0.00	1764.5	0.3079	29.82
351.9	0.6914	18.95	1120.3	0.3610	20.58	0.0	0.0000	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 8 ON 4/25/ 7

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
76.719	3	0.9279	15.753	61.
322.765	5	0.8833	18.759	31.
322.789	5	0.8727	17.160	43.
323.825	5	0.8755	17.370	41.
352.103	5	0.8703	18.548	21.
355.939	5	0.8663	19.048	20.
58.691	6	0.9079	17.307	83.
312.732	6	0.8798	18.209	22.
4.921	7	0.8151	17.364	39.
10.881	7	0.7126	23.100	22. NG
AVERAGE		0.8776	0.031	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
50.959	7	0.8133	14.108	22.
53.696	7	0.8334	12.601	46.
55.907	7	0.8497	13.966	22. NG
61.951	7	0.8381	12.615	42. NG
69.881	7	0.8217	10.936	33.
76.788	7	0.8444	12.015	30.
81.924	7	0.8275	10.834	33. NG
92.670	7	0.8012	11.271	24.
96.949	7	1.2243	10.113	32. NG
103.953	7	0.8129	11.386	25. NG
AVERAGE		0.8286	0.016	

CALIBRATION LINE FROM STANDARD FOR G- 8 OF 110.881 7
ENERGY= -2.125832 + 1.0083526*CH + -2.089614E-06*CH**2
FWHM =SQRT(-5.4702 + 0.040799*ENERGY) (CO60= 6.992)

EFFICIENCIES FOR GEOMETRY XX 8 CALIBRATED 0.000 2000

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000	0.0	0.000000
0.0	0.000000	0.0	0.000000	0.0	0.000000		
0.0	0.000000	0.0	0.000000	0.0	0.000000		
0.0	0.000000	0.0	0.000000	0.0	0.000000		

	PK	ENERGY	CPM	%ERR	COMMENT
	1	24.4	350.61	0.6	
	2	26.4	286.51	1.4	
	3	59.2	1900.90	0.3	Am241s
	4	67.3	190.72	1.6	
	5	74.1	933.52	1.0	
	6	85.1	1008.29	0.9	Cs136
	7	88.0	4568.72	0.1	Cd109s
	8	113.8	84.12	4.7	Th228
	9	122.0	2529.59	0.2	Co 57s
	10	136.4	304.00	1.2	Co 57s
	11	165.8	1965.11	0.2	Cs136 Ce139s
	12	255.1	55.50	5.3	Sn113
b	13	279.2	405.62	0.8	Ac228 Hg203s
	14	309.8	3.56	65.6	Co 60p
	15	391.6	1252.19	0.3	Sn113s
b	16	511.0	34.47	7.4	Ac228 Th228 La140 Ru106 Na 22
b	17	661.4	1814.84	0.3	Cs137s
	18	813.7	14.27	16.1	
	19	897.6	1401.25	0.3	La140 Y 88s
	20	1113.7	19.56	12.2	
b	21	1172.6	2040.18	0.2	Cs134+ Co 60s
b	22	1331.7	1873.07	0.2	Co 60s
	23	1830.6	311.28	0.6	
	24	1837.0	542.76	0.4	Ra226 Y 88s

ANALYTICS
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Log 417 Recd 12/27/06 K Trenton

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

1098-2

LIBR= A752

74159-207
100 mL Solid in Wide Mouth PPi Parkway Jar

Customer: Eberline Services / Richmond, CA
P.O. No.: 00003890, Item 1
Calibration Date: 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01515

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1990.0	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	189000	2863.9	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	94570	1433.0	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	133800	2027.5	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	295300	4475	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	185600	2812.4	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	116700	1768.4	0.70	1.20	2.78	HPGe
Y-88	898.0	106.60	455400	6901	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	226900	3438	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	227000	3440	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	481200	7292	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
This standard will expire one year after the calibration date.

Source Prepared by: M. Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate