ZION STATION RESTORATION PROJECT
FINAL STATUS SURVEY RELEASE RECORD

STATION CONSTRUCTION AREA

SURVEY UNIT 10206B

REVISION 1

Robert F. Yetter III
Apr 29 2020 9:39 AM

PREPARED BY / DATE: Robert Yetter III

Final Status Survey Specialist

Robert F. Yetter
Apr 29 2020 1:49 PM

REVIEWED BY / DATE: Robert Yetter

Director, Radiological Site Closure

Sarah Roberts
Apr 29 2020 6:32 PM

APPROVED BY / DATE: Sarah Roberts

Vice President, Radiological Programs

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LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
AMCG	Average Member of the Critical Group
BcDCGL	Base Case Derived Concentration Guideline Level
BcSOF	Base Case Sum of Fractions
C/LT	Characterization/License Termination
cpm	Counts per minute
DQO	Data Quality Objective
DCGL	Derived Concentration Guideline Level
EMC	Elevated Measurement Comparison
FSS	Final Status Survey
GPS	Global Positioning System
HTD	Hard-to-Detect
HSA	Historical Site Assessment
IC	Insignificant Contributor
LBGR	Lower Bound of the Gray Region
LTP	License Termination Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
MDCR	Minimum Detectable Count Rate
NAD	North American Datum
NaI	Sodium Iodide
OpDCGL	Operational Derived Concentration Guideline Level
OpSOF	Operational Sum of Fractions
QC	Quality Control
RE	Radiological Engineer
ROC	Radionuclides of Concern
SOF	Sum of Fractions
TEDE	Total Effective Dose Equivalent

TSD	Technical Support Document
UBGR	Upper Bound of the Gray Region
VSP	Visual Sample plan
ZNPS	Zion Nuclear Power Station
ZSRP	Zion Station Restoration Project

1. EXECUTIVE SUMMARY

This Final Status Survey (FSS) Release Record for Survey Unit 10206B, "Station Construction Area," has been generated for the Zion Station Restoration Project (ZSRP) in accordance with Zion*Solutions* procedure ZS-LT-300-001-005, *"Final Status Survey Data Reporting"* (Reference 1) and satisfies the requirements of Section 5.11 of the *"Zion Station Restoration Project License Termination Plan"* (LTP) (Reference 2).

An FSS package (L1-10206B-F) was developed in accordance with Zion*Solutions* procedure ZS-LT-300-001-001, *"Final Status Survey Package Development"* (Reference 3), the ZSRP LTP, and guidance from NUREG-1575, "*Multi-Agency Radiation Survey and Site Investigation Manual"* (MARSSIM) (Reference 4).

This open land survey unit has a MARSSIM classification of one. A survey plan was designed based upon use of the Sign Test as the nonparametric statistical test for compliance. Both the Type I (α) and Type II (β) decision error rates were set at 0.05. Seventeen (17) systematic surface soil samples were acquired from the survey unit. In addition, surface scanning was performed on 100% of the total surface area in the survey unit. One area of elevated activity was identified in row #55 during scanning activities. The analytical results for all systematic and judgmental soil samples taken in survey unit 10206B indicated that the Sum of Fractions (SOF) for each sample, when compared to the Operational Derived Concentration Guideline Levels (OpDCGL), was less than 1.0. The maximum Operational SOF (OpSOF) for the systematic samples was 0.117. The mean OpSOF for the systematic samples was 0.048. The mean Base Case SOF (BcSOF) for the systematic samples, when the analytical results were compared to the Base Case DCGLs (BcDCGL), was 0.012, which results in a dose assigned to the survey unit of 0.309 mrem/year Total Effective Dose Equivalent (TEDE). Therefore, the null hypothesis is rejected and survey unit 10206B is acceptable for unrestricted release.

2. SURVEY UNIT DESCRIPTION

Survey unit 10206B, the Station Construction Area, is a Class 1 open land survey unit and is 1,837 m^2 in size. The survey unit is bounded on the west by survey unit 10206A, the south by survey unit 10207B, on the east by survey unit 10206C, and the north by survey unit 10204A and 10204B.

The topography of the survey unit is mainly flat with some small dips and depressions. The soil is mostly loam.

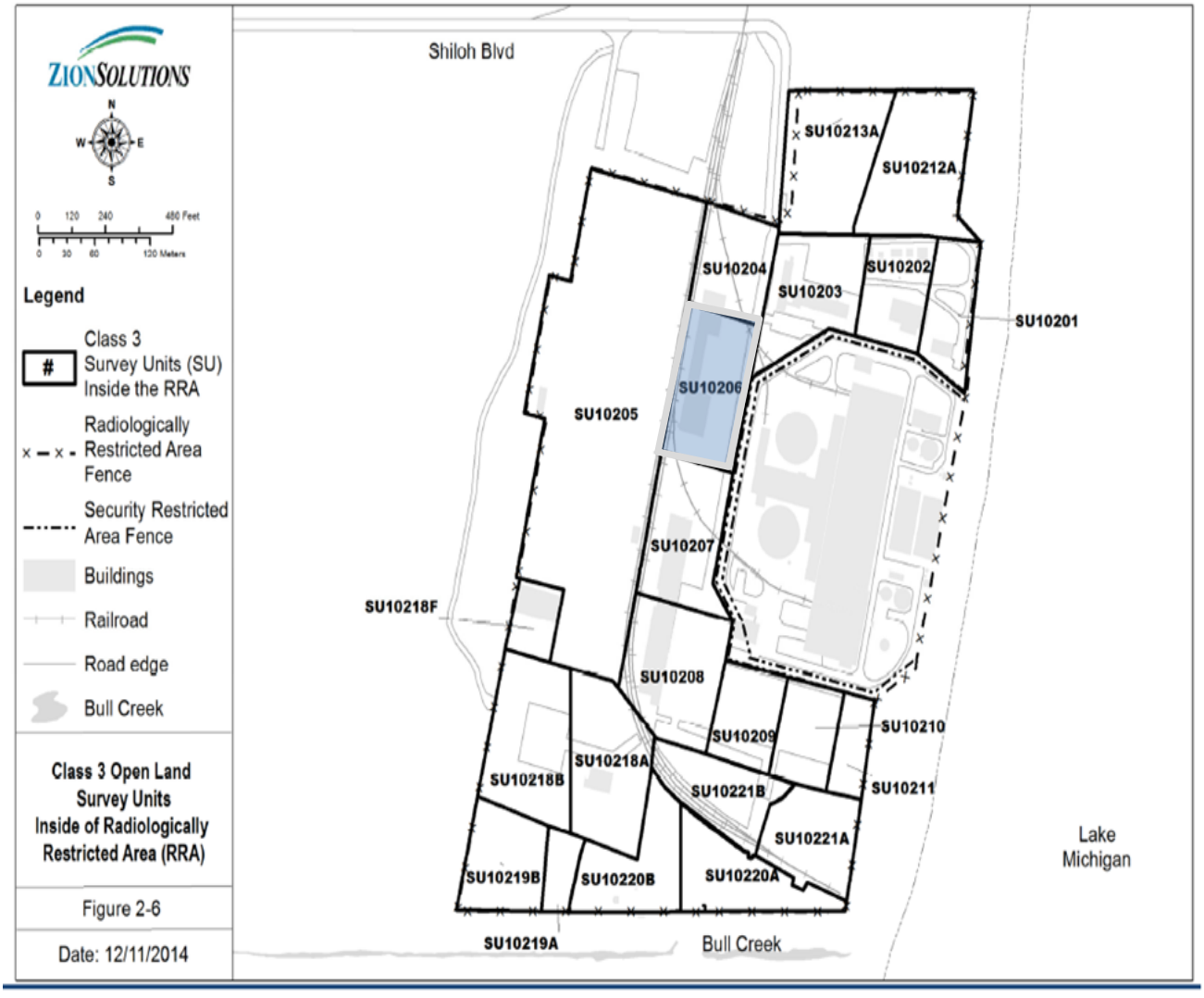
The boundary of the survey unit was defined using a Global Positioning System (GPS) based on the Illinois State Plane System North American Datum (NAD) 1983 East. The reference coordinates associated with the sample locations in this survey unit are presented in Table 8.

3. CLASSIFICATION BASIS

Survey unit 10206B was classified in accordance with Zion*Solutions* procedure ZS-LT-300-001-002, "*Survey Unit Classification*" (Reference 5).

The area encompassing this survey unit was formerly described as the "Station Construction Area" and is located within survey unit 10206 as identified in the "*Zion Station Historical Site Assessment"* (HSA) (Reference 6). Subsequently, this area was described as the "Station Construction Area" (survey unit 10206A) in Table 2-4 of the Zion Station Restoration Project License Termination Plan (LTP) as represented in Figure 2-6 of the LTP, which is replicated below as Figure 1.

Figure 1 - Class 3 Open Land Survey Units from Figure 2-6 of the LTP



A characterization survey was performed in July, 2013 for the Class 3 open land survey unit 10206. The following data was obtained:

- Four (4) random surface samples.
- Thirteen (13) judgmental surface samples and two (2) judgmental subsurface samples taken at the direction of the cognizant Radiological Engineer (RE).
- One (1) investigation surface sample where a scan alarm occurred.
- Sodium iodide (NaI) walkover scans of approximately 26% of the survey unit.

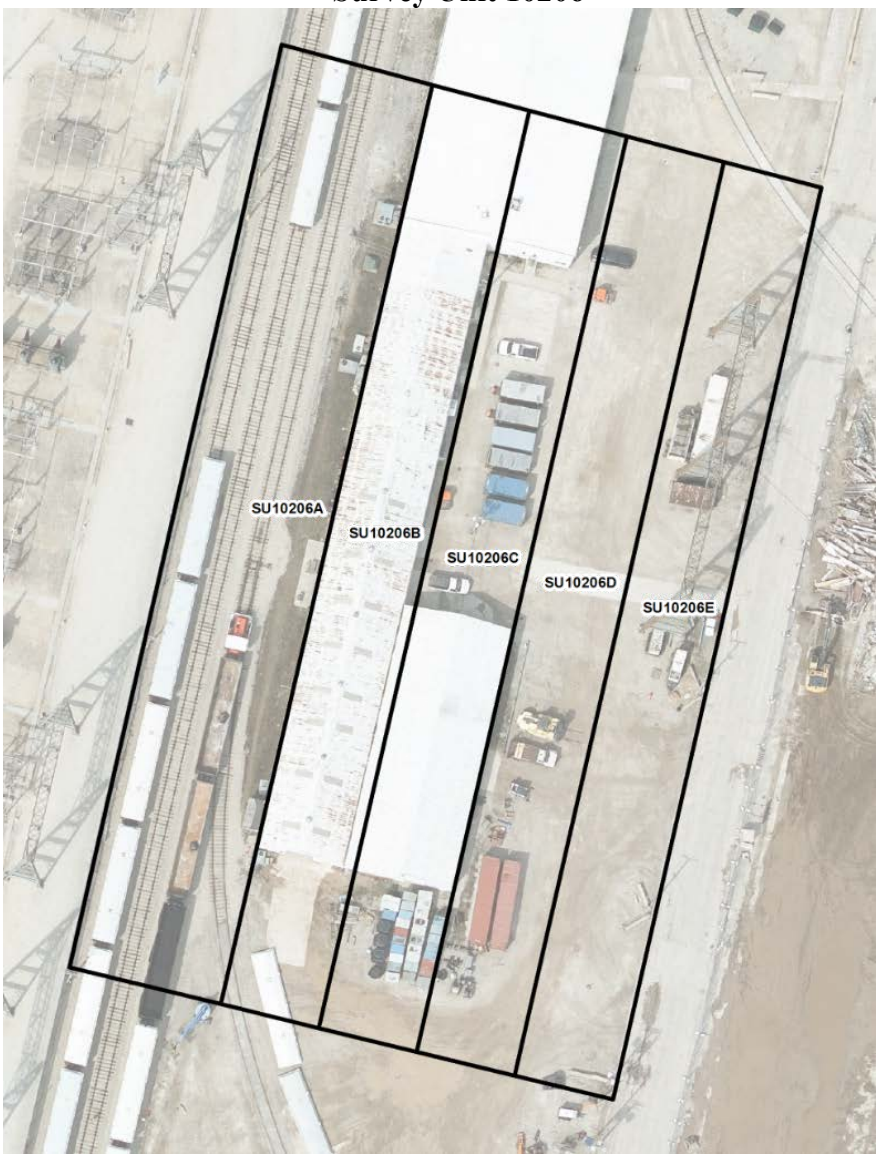
The results of the characterization survey were:

- The four (4) random surface samples were all <Minimum Detectable Concentration (MDC) for the Radionuclides of Concern (ROC).
- One (1) of the thirteen (13) judgmental surface samples was positive for Cs-137 with an activity of 0.11 pCi/g.
- Both of the judgmental subsurface samples were <MDC for the ROC.

This survey unit was part of the original survey unit 10206, which was classified in the HSA as a Class 3. On June 12, 2017, due to changing radiological and operational conditions brought about by site decommissioning activities inside or adjacent to this area, survey unit 10206 was re-classified as a Class 1 and split into five survey units: 10206A, 10206B, 10206C, 10206D and 10206E. Also, during the later stages of site decommissioning activities, much of the sacrificial soil was stockpiled and waste was loaded within this survey unit 10206B as well.

Figure 2 shows the boundaries of the resulting Class 1 survey units along with the adjacent survey units 10206A through 10206E. The change in classification was a conservative response and ensured that the survey unit would be surveyed with the appropriate rigor.

Figure 2 - Class 1 Open Land Survey Units Created from the Original Class 3 Survey Unit 10206



An RE and a Characterization/License Termination (C/LT) Supervisor performed a visual inspection and walk-down of the survey unit on September 4, 2019, prior to performing FSS. The purpose of the walk-down was to assess the physical condition of the survey unit, evaluate access points and travel paths, and identify potentially hazardous conditions. A final classification assessment was performed in accordance with ZS-LT-300-001-002, as part of the survey design for FSS. The assessment confirmed that survey unit 10206B was correctly classified as Class 1.

4. DATA QUALITY OBJECTIVES

FSS planning and design hinges on coherence with the Data Quality Objective (DQO) process to ensure, through compliance with explicitly defined inputs and boundaries, that the primary objective of the survey is satisfied. The DQO process, utilized in accordance with MARSSIM, is described in the LTP. The appropriate design for a given survey is developed using the DQO process as outlined in Appendix D of MARSSIM.

The DQO process incorporated hypothesis testing and probabilistic sampling distributions to control decision errors during data analysis. Hypothesis testing is a process based on the scientific method that compares a baseline condition to an alternate condition. The baseline condition is technically known as the null hypothesis. Hypothesis testing rests on the premise that the null hypothesis is true and that sufficient evidence must be provided for rejection. In designing the survey plan, the underlying assumption, or null hypothesis was that residual activity in the survey unit exceeded the release criteria. Rejection of the null hypothesis would indicate that residual activity within the survey unit does not exceed the release criteria. Therefore, the survey unit would satisfy the primary objective of the FSS sample plan.

The primary objective of the FSS sample plan is to demonstrate that the level of residual radioactivity in survey unit 10206B does not exceed the release criteria specified in the LTP and that the potential dose from residual radioactivity is As Low As Reasonably Achievable (ALARA).

Zion*Solutions* Technical Support Document (TSD) 11-001, *"Technical Support Document for Potential Radionuclides of Concern During the Decommissioning of the Zion Station"* (Reference 7), established the basis for an initial suite of potential Radionuclides of Concern (ROC) for the decommissioning of the Zion Nuclear Power Station (ZNPS).

Zion*Solutions* TSD 14-019, *"Radionuclides of Concern for Soil and Basement Fill Model Source Terms"* (Reference 8), was written to refine the initial selection of ROC for decommissioning at ZSRP. The list of ROC was evaluated using Containment and Auxiliary Building concrete core analysis data to evaluate the dose significance of each radionuclide in the end state model. Section 4.4 of TSD 14-019 evaluated the results of the characterization data of surveys taken of soils. The following conclusion was reached: *"The results of surface and subsurface soil characterization in the impacted area surrounding Zion indicate that there is minimal residual radioactivity in soil. Essentially all of the soil results were reported as non-detectable. Other than Cs-137 at very low levels, and Co-60 at a concentration of 0.24 pCi/g in one sample, the results for all radionuclides were less than MDC. Therefore, the direct determination of radionuclide mixture fractions for initial suite radionuclides in soil is not technically feasible due to the MDC biasing issues discussed above. Based on a generalized assumption that the contaminated water that caused concrete contamination would be similar to the source of soil contamination, the ROC and radionuclide mixture derived for the Auxiliary Building concrete was considered to be reasonably representative of soils for FSS planning and implementation.*"

The ROC for surface soils is listed in Table 1 below (from Table 5-2 of the LTP):

Table 1 - Dose Significant Radionuclides and Mixture

Radionuclide	Auxiliary Building % of Total Activity (normalized)(1)(2)
Co-60	0.92%
Ni-63	23.71%
Sr-90	0.05%
Cs-134	0.01%
Cs-137	75.32%

(1) Based on maximum percent of total activity from Table 20 of TSD 14-019, normalized to one for the dose significant radionuclides
(2) Does not include dose significant radionuclides for activated concrete (H-3, Eu-152, Eu-154).

A fundamental precursor to survey design is to establish a relationship between the release criteria and some measurable quantity. This is done through the development of DCGLs. The DCGLs represent average levels of radioactivity above background levels and are presented in terms of surface or mass activity concentrations. Chapter 6 of the LTP describes in detail the modeling used to develop the DCGLs for soils.

Surface soil is defined as soil residing in the first 0.15 m (6 inches) layer of soil. A subsurface soil category, which is defined as a layer of soil beginning at the surface but extending to a depth of 1 m, is also assessed to allow for flexibility in compliance demonstration if contamination deeper than 0.15 m is encountered. Site-specific DCGLs for soil were calculated for both the 0.15 m and 1 m thicknesses. Based on characterization data and historical information, there are no expectations of encountering a source term geometry that is comprised of a clean surface layer of soil over a contaminated subsurface soil layer. Zion*Solutions* TSD 14-011, *"Soil Area Factors"* (Reference 9) and LTP, Section 6.8 provide the exposure scenarios and modeling parameters that were used to calculate the site-specific DCGLs for soils (referred to as BcDCGL in this Release Record).

At ZNPS, compliance is demonstrated through the summation of dose from four distinct source terms (basements, soils, buried pipe and groundwater) for the end-state. Basements are comprised of the summation of four structural source terms (surfaces, embedded pipe, penetrations and fill). When applied to soil, the DCGLs are expressed in units of activity per unit of mass (pCi/g). The "unity rule" is applied when there is more than one ROC. The measurement results for each singular ROC present in the mixture are compared against their respective DCGL to derive a dose fraction.

The surface and subsurface soil BcDCGLs for the unrestricted release of open land survey units are listed in Tables 5-5 and 5-6 of the LTP and are provided in Table 2 and Table 3, respectively. The Insignificant Contributor (IC) dose percentage of 10% was used to adjust the DCGLs in soils to account for the dose from the eliminated IC radionuclides.

Table 2 - Base Case DCGLs for Surface Soils ($BcDCGL_{SS}$)

Radionuclide	Surface Soil DCGL (pCi/g)
Co-60	4.26
Cs-134	6.77
Cs-137	14.18
Ni-63	3,572.10
Sr-90	12.09

Table 3 - Base Case DCGLs for Subsurface Soils ($BcDCGL_{SB}$)

Radionuclide	Subsurface Soil DCGL (pCi/g)
Co-60	3.44
Cs-134	4.44
Cs-137	7.75
Ni-63	763.02
Sr-90	1.66

Each radionuclide-specific BcDCGL is equivalent to the level of residual radioactivity (above background levels) that could, when considered independently, result in a TEDE of 25 mrem/year to an Average Member of the Critical Group (AMCG). To ensure that the summation of dose from each source term is 25 mrem/year or less after all FSS is completed, the BcDCGLs are reduced based on an expected, or *a priori*, fraction of the 25 mrem/year dose limit from each source term. The reduced DCGLs, or "Operational" DCGLs, can be related to the BcDCGLs as an expected fraction of dose based on an *a priori* assessment of what the expected dose should be based on the results of site characterization, process knowledge and the extent of planned remediation. The OpDCGL is then used as the DCGL for the FSS design of the survey unit (calculation of surrogate DCGLs, investigations levels, etc.). Details of the OpDCGLs derived for each dose component and the basis for the applied *a priori* dose fractions are provided in Zion*Solutions* TSD 17-004, *"Operational Derived Concentration Guideline Levels for Final Status Survey"* (Reference 10).

The OpDCGLs for the FSS of surface and subsurface soils are listed in Tables 5-7 and 5-8 of the LTP and are presented in Table 4 and Table 5, respectively.

Table 4 - Operational DCGLs for Surface Soils (OpDCGL$_{SS}$)

Radionuclide	Surface Soil DCGL (pCi/g)
Co-60	1.091
Cs-134	1.733
Cs-137	3.630
Ni-63	914.458
Sr-90	3.095

Table 5 - Operational DCGLs for Subsurface Soils (OpDCGL$_{SB}$)

Radionuclide	Subsurface Soil DCGL (pCi/g)
Co-60	0.881
Cs-134	1.137
Cs-137	1.984
Ni-63	195.333
Sr-90	0.425

In accordance with NUREG-1757, Appendix G, if the HSA indicates that there is no likelihood of substantial subsurface residual radioactivity, subsurface surveys are not necessary. The HSA, as well as the results of the extensive characterization of subsurface soils in the impacted area surrounding the Zion facility have shown that there is minimal residual radioactivity in subsurface soil. Consequently, Zion proposes to perform minimal subsurface sampling during FSS.

Instrument DQOs included a verification of the ability of the survey instrument to detect the radiation(s) of interest at the required scan MDC, which for Class 1 open land survey units, is the *a priori* DCGL Elevated Measurement Comparison (DCGL$_{EMC}$). Survey instrument response checks were required prior to issuance and after the instrument had been used. Control and accountability of survey instruments was required to ensure the quality and prevent the loss of data.

As part of the DQOs applied to laboratory processes, analysis results were reported as actual calculated results. The actual recorded value was used as the recorded FSS result for measurement and/or sample values that are less than MDC. Negative values were recorded as "zero." For radionuclides less than MDC, the value representing the highest abundance was

selected. Results were not reported as "less than MDC." Sample report summaries included unique sample identification, analytical method, radionuclide, result, uncertainty, laboratory data qualifiers, units, and the observed MDC.

In accordance with the LTP, for laboratory analysis, MDCs less than 10% of the OpDCGL were preferable while MDCs up to 50% of the OpDCGL were acceptable. The maximum acceptable MDC for measurements obtained using field instruments was the *a priori* $DCGL_{EMC}$, which was calculated using the methodology described in the LTP, Section 5.6.4.3.

5. SURVEY DESIGN

The level of effort associated with planning a survey is based on the complexity of the survey and nature of the hazards. Guidance for preparing FSS plans is provided in ZS-LT-300-001-001, *"Final Status Survey Package Development."*

The DQO process determined that Co-60, Ni-63, Sr-90, Cs-134 and Cs-137 would be the ROC in survey unit 10206B. During FSS, concentrations for Hard-to-Detect (HTD) ROC Ni-63 and Sr-90 were inferred using a surrogate approach. Cs-137 is the principle surrogate radionuclide for Sr-90 and Co-60 is the principle surrogate radionuclide for Ni-63. The mean, maximum and 95% Upper Confidence Level (UCL) of the surrogate ratios for concrete core samples taken in the Auxiliary Building basement were calculated in TSD 14-019, *"Radionuclides of Concern for Soil and Basement Fill Model Source Terms,"* and are presented in Table 6. The maximum ratios were used in the surrogate calculations during FSS unless area specific ratios are determined by continuing characterization.

Table 6 - Surrogate Ratios

Ratios	Auxiliary Building		
	Mean	Max	95%UCL
Ni-63/Co-60	44.143	180.450	154.632
Sr-90/Cs-137	0.001	0.002	0.002

For the FSS of survey unit 10206B, the surrogate OpDCGLs for Co-60 and Cs-137 were computed based on the maximum ratios from Table 6.

The equation for calculating a surrogate DCGL is as follows:

Equation 1

$$Surrogate_{DCGL} = \frac{1}{\left[\left(\frac{1}{DCGL_{Sur}}\right) + \left(\frac{R_2}{DCGL_2}\right) + \left(\frac{R_3}{DCGL_3}\right) + \cdots \left(\frac{R_n}{DCGL_n}\right)\right]}$$

Where: $DCGL_{Sur}$ = Surrogate radionuclide DCGL

$DCGL_{2,3\ldots n}$ = DCGL for radionuclides to be represented by the surrogate

R_n = Ratio of concentration (or nuclide mixture fraction) of radionuclide "n" to surrogate radionuclide

Using the OpDCGLs for surface soils presented in Table 4 and the maximum ratios from Table 6, the following surrogate calculations for surface soils were performed:

Equation 2

$$Surrogate_{OpDCGL\ (Cs-137)} = \frac{1}{\left[\left(\frac{1}{3.630_{(Cs-137)}}\right) + \left(\frac{0.002}{3.095_{(Sr-90)}}\right)\right]} = 3.622\ pCi/g$$

The surrogate OpDCGL for surface soils that was used for Cs-137 in this survey unit for direct comparison of surface soil sample results to demonstrate compliance is 3.622 pCi/g.

Equation 3

$$Surrogate_{OpDCGL\ (Co-60)} = \frac{1}{\left[\left(\frac{1}{1.091_{(Co-60)}}\right) + \left(\frac{180.45}{914.458_{(Ni-63)}}\right)\right]} = 0.898\ pCi/g$$

The surrogate OpDCGL for surface soils that was used for Co-60 in this survey unit for direct comparison of surface soil sample results to demonstrate compliance is 0.898 pCi/g.

Using the BcDCGLs presented in Table 2 and the maximum ratios from Table 6, the following surrogate calculations were performed:

Equation 4

$$Surrogate_{BcDCGL\ (Cs-137)} = \frac{1}{\left[\left(\frac{1}{14.18_{(Cs-137)}}\right) + \left(\frac{0.002}{12.09_{(Sr-90)}}\right)\right]} = 14.15\ pCi/g$$

The surrogate BcDCGL for surface soils that was used for Cs-137 in this survey unit for calculating the $DCGL_{EMC}$ is 14.15 pCi/g.

Equation 5

$$Surrogate_{BcDCGL\ (Co-60)} = \frac{1}{\left[\left(\frac{1}{4.26_{(Co-60)}}\right) + \left(\frac{180.45}{3572.10_{(Ni-63)}}\right)\right]} = 3.51\ pCi/g$$

The surrogate BcDCGL for surface soils that was used for Co-60 in this survey unit for calculating the $DCGL_{EMC}$ is 3.51 pCi/g.

For this Class 1 open land survey unit, the "Investigation Levels" for area scanning and soil sample measurement results are those levels specified in LTP Chapter 5, Table 5-25 and are reproduced below in Table 7.

Table 7 - Investigation Levels

Classification	Scan Investigation Levels	Direct Investigation Levels
Class 1	>Operational DCGL or >MDC_{scan} if MDC_{scan} is greater than Operational DCGL	> Operational DCGL

The MDC_{scan} for the 2350-1/44-10 was calculated using the methodology of TSD-11-004, *"Ludlum Model 44-10 Detector Sensitivity"* (Reference 11) with the following parameters:

- background count rate of 5,000 counts per minute (cpm)
- scan speed of 0.5 m/sec
- distance from detector to surface of 2 inches
- isotopic mix of 95% Cs-137 and 5% Co-60

The calculated MDC_{scan} value was 3.75 pCi/g, which was greater than the calculated Surrogate DCGLs, therefore the scan investigation level was set at the MDC_{scan} of the 2350-1/44-10. The collimator was used during the scan surveys to lower the background count rate.

The Sign Test was selected as the non-parametric statistical test. The use of the Sign Test did not require the selection or use of a background reference area, which simplified survey design and implementation. This approach was conservative since it included background Cs-137 as part of the sample set.

The number of soil samples for FSS was determined in accordance with ZS-LT-300-001-001. The relative shift (Δ/σ) for the survey unit data set is defined as shift (Δ), which is the Upper Bound of the Gray Region (UBGR), or the DCGL (SOF of 1), minus the Lower Bound of the Gray Region (LBGR) (SOF of 0.5), divided by sigma (σ), which is the standard deviation of the data set used for survey design. The optimal value for Δ/σ should range between one and three. The largest value the Δ/σ can have is three. If the Δ/σ exceeds three, then the value of three will be used for Δ/σ. For this survey design, a conservative estimate of the sample variability of 0.30 was used as the coefficient of variation to calculate Δ/σ.

The calculated relative shift was 1.67. Both the Type I error, or α value and the Type II error, or β value was set at 0.05. The sample size from Table 5.5 of MARSSIM that equates to the Type I and Type II error of 0.05 for use with the Sign Test is an N value of 17.

The computer program Visual Sample plan (VSP) was used to generate the sample map, in accordance with ZS-LT-300-001-001. The map used was provided by the Survey Mapping/Computer Assisted Design Specialist, with coordinates based on the Illinois State Plane NAD 1983 standard topographical grid coordinate system. The number of samples generated by VSP for a systematic triangular grid was seventeen. The Prospective Power Curve generated by VSP showed adequate power for the survey design.

In accordance with Section 5.6.4.3 of the LTP, the *a priori* $DCGL_{EMC}$ values were calculated for the gamma emitting ROC to ensure that the MDC_{scan} of the selected instrument was sufficient to detect small areas of elevated activity in the survey unit. The calculations were:

- To calculate the area bounded by the systematic samples: $A = \frac{A_{SU}}{N} = \frac{1837}{17} = 108.1\ m^2$
- From the LTP, Table 5-16, the Area Factors for the next larger area (300 m^2) were used:
  - Cs-137 - 1.46
  - Cs-134 - 1.30
  - Co-60 - 1.16
- The $DCGL_{EMC}$ is the Surrogate Base Case DCGL times the Area Factor:
  - The $DCGL_{EMC}$ for Cs-137 = $1.46 * 14.15 = 20.66\ pCi/g$
  - The $DCGL_{EMC}$ for Cs-134 = $1.30 * 6.77 = 8.80\ pCi/g$
  - The $DCGL_{EMC}$ for Co-60 = $1.16 * 3.51 = 4.07\ pCi/g$

The calculated MDC_{scan}, of 3.75 pCi/g, is less than the $DCGL_{EMC}$ values calculated above, therefore, the spacing of the statistical systematic sampling and measurement locations was adequate to detect small areas of elevated radioactivity. No adjustment to the sample number was required.

The implementation of quality control (QC) measures as referenced by LTP Section 5.9 and Zion*Solutions* procedure ZS-LT-01, "*Quality Assurance Project Plan (for Characterization and FSS)*" (QAPP) (Reference 12) includes the collection of a soil sample for "split sample" analysis on 5% of the soil samples taken in a survey unit with the locations selected at random. One (1) surface soil sample (L1-10206B-FQGS-005-SS) was selected randomly for split sample analysis for the FSS of this survey unit. Two (2) additional investigational soil samples (L1-10206B-QIGS-001-SS and L1-10206B-QIGS-001-SB) were also collected for split sample analysis.

In accordance with Section 5.7.1.6.2 of the LTP, a subsurface soil sample was taken at 10% of the systematic surface soil sample locations in the survey unit with the location(s) selected at random. Locations L1-10206B-FSGS-006-SB and L1-10206B-FSGS-014-SB were selected for this survey unit.

The locations of the seventeen (17) systematic samples and two (2) subsurface samples are listed in Table 8. A map of the systematic sample locations is included in Attachment 1.

Table 8 - Systematic Sample Measurement Locations

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L1-10206B-FSGS-001-SS	641815.76	343510.80
L1-10206B-FSGS-002-SS	641815.76	343521.97
L1-10206B-FSGS-003-SS	641825.43	343516.38
L1-10206B-FSGS-004-SS	641835.10	343521.97
L1-10206B-FSGS-005-SS	641844.78	343527.55
L1-10206B-FSGS-006-SS	641844.78	343527.55
L1-10206B-FSGS-007-SS	641854.45	343521.97
L1-10206B-FSGS-008-SS	641854.45	343533.14
L1-10206B-FSGS-009-SS	641864.12	343527.55
L1-10206B-FSGS-010-SS	641873.79	343533.14
L1-10206B-FSGS-011-SS	641883.47	343527.55
L1-10206B-FSGS-012-SS	641883.47	343538.72
L1-10206B-FSGS-013-SS	641893.14	343533.14
L1-10206B-FSGS-014-SS	641902.81	343538.72
L1-10206B-FSGS-015-SS	641912.48	343533.14
L1-10206B-FSGS-016-SS	641912.48	343544.31
L1-10206B-FSGS-017-SS	641922.16	343538.72
L1-10206B-FSGS-006-SB	641844.78	343527.55
L1-10206B-FSGS-014-SB	641844.78	343527.55

ZSRP LTP, Section 5.1 states that soil samples will be collected during FSS to confirm the HTD to surrogate radionuclide ratios (provided in Table 6). Ten percent (10%) of the FSS samples collected from open land survey units will be analyzed for HTD ROC. Only HTD radionuclides included as ROC (Ni-63 and Sr-90 for soils) will be analyzed in the FSS confirmatory samples. For soil samples with positive results for both a HTD ROC and the corresponding surrogate radionuclide (Cs-137 or Co-60), the HTD surrogate ratio will be derived and compared against the maximum ratio. The maximum ratios will be used unless specific survey information supports the use of a surrogate ratio that is specific to the area. In these cases, the survey unit-specific radiological data and the derived surrogate ratios will be submitted to the NRC for approval. If approved, then the survey unit-specific ratios used and the survey data serving as the basis for the surrogate ratios will be documented in the release record for the survey unit.

Two (2) samples (L1-10206B-FSGS-010-SS and L1-10206B-FSGS-012-SS) met the requirement that 10% of the samples collected for the FSS of survey unit 10206B be analyzed for HTD ROC. Each sample was sent off-site (Eberline Analytical) for analysis of the HTD

ROC as specified in LTP Section 5.1. Eberline analytical reports are provided in Attachment 8.

In addition, LTP Section 5.1 states that if levels of residual gamma radioactivity in an individual soil sample exceed an OpSOF of 0.1, then the sample(s) will be analyzed for HTD ROC. One (1) sample (L1-10206B-FSGS-012-SS) exceeded an OpSOF of 0.1 during the FSS of survey unit 10206B. Another HTD sample (L1-10206B-FIGS-004-SS) was added as part of the investigational sampling process within this survey unit.

Table 9 provides a synopsis of the survey design for survey unit 10206B.

Table 9 - Synopsis of Survey Design

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Area	1,837 m^2	GPS measurements of area
Number of Surface Soil Samples	17 (Systematic)	• σ = 0.30 • UBGR = SOF of 1 • LBGR = SOF of 0.5 • Type I error = 0.05 • Type II error = 0.05 • Δ/σ = 1.67 (MARSSIM Table 5.5)
Grid Spacing	11.2 m	(LTP, Section 5.6.4.5.2)
DCGLs	• Co-60 – 1.091 pCi/g • Cs-134 – 1.733 pCi/g • Cs-137 – 3.630 pCi/g • Ni-63 – 914.458 pCi/g • Sr-90 – 3.095 pCi/g	Operational DCGLs for Surface Soils, (LTP Chapter 5, Table 5-7)
HTD ROC Analysis	A minimum of two (2) soil samples selected for HTD ROC analysis(1)	(LTP, Section 5.1)
Measurement Investigation Level	Operational DCGL	(LTP Chapter 5, Table 5-25)
Scan Survey Area Coverage	100%	(LTP Chapter 5, Table 5-24)
QC	One (1) surface soil samples selected randomly for split sample analysis(2)	(LTP, Section 5.9)
Number of Subsurface Soil Samples	Two (2) systematic surface soil sample locations 6 and 14(3)	(LTP, Section 5.7.1.6.2)

(1) Additional HTD samples were collected as a result of investigations within the survey unit.
(2) Additional QC samples were collected as a result of investigations within the survey unit.
(3) Additional subsurface samples were collected as a result of investigations within the survey unit.

6. SURVEY IMPLEMENTATION

Survey instructions for this FSS were incorporated into and performed in accordance with FSS sample plan L1-10206B-F, which was developed in accordance with Zion*Solutions* procedure ZS-LT-300-001-001, "*Final Status Survey Package Development*." The FSS unit was inspected and controlled in accordance with Zion*Solutions* procedure ZS-LT-300-001-003, "*Isolation and Control for Final Status Survey*" (Reference 13).

For survey unit 10206B, compliance with the unrestricted release criteria was demonstrated through a combination of surface scanning with a Ludlum Model 44-10 gamma detector and the sampling of surface soil for isotopic analysis. In accordance with the LTP Chapter 5, two (2) subsurface samples were obtained and analyzed. Also, if during the performance of FSS, the analysis of a surface soil sample, or the results of a surface gamma scan indicated the potential presence of residual radioactivity at a concentration of 75% of the subsurface OpDCGL, then a biased subsurface soil sample(s) would have been taken to the appropriate depth within the area of concern as part of the investigation.

FSS field activities were conducted under FSS sample plan L1-10206B-F. A "Field Log" (ZS-LT-300-001-001, Attachment 14) was used to document field activities and other information pertaining to the performance of the FSS. FSS field activities were projected to take four (4) working days to complete. Daily briefings were conducted to discuss the expectations for job performance and to review safety aspects of the job. The survey required field activities were performed during normal working hours starting on October 28, 2019, and concluding on November 21, 2019.

The seventeen (17) systematic surface soil sample locations were marked with flags based on GPS coordinates provided by VSP.

Gamma scans were performed on 100% of the surface area of the survey unit using a Ludlum 2350-1 paired with a Model 44-10 (2-inch x 2-inch) NaI detector operated in the rate-meter mode and using audio response. The probe was positioned within 2 inches of the ground and was moved at a scan speed of approximately 0.5 meters per second. One small area of elevated activity was detected by the scans.

Daily, prior to and following use, each detector was subjected to an Operational Response Check in accordance with Zion*Solutions* procedure ZS-RP-108-004-011, *"Operation of the Ludlum Model 2350-1 Data Logger"* (Reference 14). The daily Operational Response Check compared the background response and the response to check sources ranges established for normal background and detector source response to ensure that the detector was working properly.

The instruments and detectors used for this survey are presented in Table 10. The instruments and detectors were verified to be properly calibrated prior to use.

Table 10 - Instruments and Detectors

Instrument/Detector Type	Serial #	Calibration Due Date
Ludlum 2350-1/Ludlum 44-10	304730/PR375273	1/16/2020
Ludlum 2350-1/Ludlum 44-10	216173/ES0118	10/7/2020
Ludlum 2350-1/Ludlum 44-10	304718/PR363311	9/19/2020
Ludlum 2350-1/Ludlum 44-10	304726/PR363452	8/28/2020
Ludlum 2350-1/Ludlum 44-10	266656/PR311750	7/24/2020
Ludlum 2350-1/Ludlum 44-10	304708/PR321892	9/4/2020
Ludlum 2350-1/Ludlum 44-10	266657/PR308037	10/28/2020
Ludlum 2350-1/Ludlum 44-10	216188/PR372152	12/3/2019
Ludlum 2350-1/Ludlum 44-10	304711/PR321902	1/18/2020

In accordance with the survey design, seventeen (17) surface soil samples were collected at the designated systematic sample locations. Two (2) subsurface samples were collected at the randomly selected sample locations. In addition, eight (8) investigational samples (4 surface and 4 subsurface) were collected in response to scan alarms.

Three (3) samples (L1-10206B-FSGS-010-SS, L1-10206B-FSGS-012-SS and L1-10206B-FIGS-004-SS) were selected for HTD radionuclide analysis.

One (1) surface soil sample (L1-10206B-FQGS-005-SS) was selected randomly for QC sample analysis. Two (2) additional investigational soil samples (L1-10206B-QIGS-001-SS and L1-10206B-QIGS-001-SB) were also collected for split sample analysis.

7. SURVEY RESULTS

One hundred percent (100%) of the surface of the survey unit was scanned for elevated radiation levels. One hundred and thirty-one (131) 1-meter wide scan rows, as shown on the map in Attachment 1, were marked in the field and scanned with the 2350-1/44-10 using latching mode. Readings were recorded at approximately 10-meter intervals during the scans. Table 11 provides an overview of the scan results. Complete scan results are provided in Attachment 2.

Table 11 - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[1] (cpm)	# of Scan Alarms	Investigation Samples
Row 1	1898	2368	None	None
Row 2	2088	2368	None	None
Row 3	1786	2368	None	None
Row 4	1764	2368	None	None
Row 5	1903	2368	None	None
Row 6	1991	2368	None	None
Row 7	1918	2368	None	None
Row 8	1913	2368	None	None
Row 9	1922	2368	None	None
Row 10	1887	2368	None	None
Row 11	1848	2368	None	None
Row 12	1920	2368	None	None
Row 13	1957	2368	None	None
Row 14	1950	2368	None	None
Row 15	2094	2368	None	None
Row 16	2061	2570	None	None
Row 17	2122	2570	None	None
Row 18	1983	2570	None	None
Row 19	1932	2570	None	None
Row 20	2053	2570	None	None
Row 21	2356	2570	None	None
Row 22	2255	2570	None	None
Row 23	2163	2570	None	None
Row 24	2288	2570	None	None
Row 25	2449	2570	None	None
Row 26	2902	3284	None	None
Row 27	2895	3284	None	None
Row 28	2906	3284	None	None
Row 29	2843	3284	None	None
Row 30	2887	3284	None	None
Row 31	2889	3184	None	None
Row 32	2866	3184	None	None
Row 33	2777	3184	None	None
Row 34	2749	3184	None	None
Row 35	2663	3184	None	None
Row 36	2842	3184	None	None
Row 37	2767	3184	None	None
Row 38	2739	3184	None	None
Row 39	2818	3184	None	None
Row 40	3010	3184	None	None

Table 11 (continued) - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[1] (cpm)	# of Scan Alarms	Investigation Samples
Row 41	2702	3184	None	None
Row 42	2951	3184	None	None
Row 43	2954	3184	None	None
Row 44	2905	3184	None	None
Row 45	2979	3184	None	None
Row 46	2994	3281	None	None
Row 47	3048	3281	None	None
Row 48	3037	3281	None	None
Row 49	3076	3281	None	None
Row 50	2896	3281	None	None
Row 51	2873	3281	None	None
Row 52	2886	3281	None	None
Row 53	2986	3281	None	None
Row 54	3101	3281	None	None
Row 55	3676	3281	1	L1-10206B-FIGS-001SS, 002SS, 003SS, 004SS, 001SB, 002SB, 003SB, 004SB
Row 56	3210	3281	None	None
Row 57	3060	3281	None	None
Row 58	2962	3281	None	None
Row 59	2928	3281	None	None
Row 60	3175	3281	None	None
Row 61	2839	3013	None	None
Row 62	3006	3013	None	None
Row 63	2847	3013	None	None
Row 64	2921	3013	None	None
Row 65	2894	3013	None	None
Row 66	3004	3013	None	None
Row 67	2996	3013	None	None
Row 68	2843	3013	None	None
Row 69	2994	3013	None	None
Row 70	2820	3013	None	None
Row 71	2871	3013	None	None
Row 72	2789	3013	None	None
Row 73	2941	3013	None	None
Row 74	2892	3013	None	None
Row 75	2625	3013	None	None
Row 76	2597	2639	None	None
Row 77	2403	2639	None	None
Row 78	2539	2639	None	None
Row 79	2399	2639	None	None

Table 11 (continued) - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[1] (cpm)	# of Scan Alarms	Investigation Samples
Row 80	3013	3591	None	None
Row 81	2909	3591	None	None
Row 82	3113	3591	None	None
Row 83	3567	3591	None	None
Row 84	3065	3591	None	None
Row 85	3330	3591	None	None
Row 86	3202	3591	None	None
Row 87	3035	3591	None	None
Row 88	2114	2639	None	None
Row 89	2322	2639	None	None
Row 90	2370	2639	None	None
Row 91	2307	2349	None	None
Row 92	2163	2315	None	None
Row 93	2191	2315	None	None
Row 94	1928	2315	None	None
Row 95	1944	2315	None	None
Row 96	1883	2315	None	None
Row 97	1802	2315	None	None
Row 98	1766	2315	None	None
Row 99	1839	2315	None	None
Row 100	1871	2315	None	None
Row 101	1777	2315	None	None
Row 102	1845	2315	None	None
Row 103	1855	2315	None	None
Row 104	1859	2315	None	None
Row 105	1782	2315	None	None
Row 106	1798	2202	None	None
Row 107	2028	2202	None	None
Row 108	1845	2202	None	None
Row 109	1746	2202	None	None
Row 110	1739	2202	None	None
Row 111	1713	2202	None	None
Row 112	1682	2202	None	None
Row 113	1661	2202	None	None
Row 114	1734	2202	None	None
Row 115	2003	2202	None	None
Row 116	1947	2202	None	None
Row 117	1961	2202	None	None

Table 11 (continued) - Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level[1] (cpm)	# of Scan Alarms	Investigation Samples
Row 118	1977	2202	None	None
Row 119	1992	2202	None	None
Row 120	2095	2202	None	None
Row 121	2099	2644	None	None
Row 122	2384	2644	None	None
Row 123	2233	2644	None	None
Row 124	2310	2644	None	None
Row 125	2183	2644	None	None
Row 126	2084	2644	None	None
Row 127	2094	2644	None	None
Row 128	2143	2644	None	None
Row 129	2105	2644	None	None
Row 130	2212	2644	None	None
Row 131	2194	2644	None	None

1) The action level is based on the measurement Minimum Detectable Count Rate (MDCR) plus background in accordance with the FSS plan.
2) Could not sample the area due to it consisting of gravel and not soil. Could not reproduce the alarm when the area was re-scanned.

The seventeen (17) soil samples taken for non-parametric statistical testing, the eight (8) investigational samples, and the two (2) subsurface soil samples, were analyzed using the on-site gamma spectroscopy system. Summaries of the sample analysis results are provided in Tables 12, 13 and 14 respectively. The basic statistics for the systematic sample population are summarized in Table 21. The gamma spectroscopy results for systematic samples revealed seven (7) samples with activity level above MDC for Cs-137 and none above MDC for Co-60 or Cs-134. The gamma spectroscopy results for investigational surface soil samples revealed one (1) sample with activity level above MDC for Cs-137 and Co-60 and none above MDC for Cs-134. No ROC were identified at levels above MDC for the subsurface samples. The concentrations for Ni-63 and Sr-90 were inferred based on the maximum ratios as specified in Table 6. The mean of the gamma spectroscopic analysis results for the systematic sample population indicated that Cs-137 was present at levels lower than the concentrations of Cs-137 expected to be found in off-site soil in the vicinity of the ZNPS as presented in Zion*Solutions* TSD 13-004, "*Examination of Cs-137 Global Fallout In Soils At Zion Station*" (Reference 15). The complete gamma spectroscopy reports are presented in Attachment 7.

Table 12 - Summary of Gamma Spectroscopy Results for Surface Soil Samples Comprising the Statistical Sample Population

MEASUREMENT ID	Co-60[(1)] (pCi/g)	Cs-134[(1)] (pCi/g)	Cs-137[(1)] (pCi/g)	Ni-63[(2)] (pCi/g)	Sr-90[(2)] (pCi/g)
L1-10206B-FSGS-001-SS	1.53E-02	9.31E-03	3.93E-02	2.76E+00	7.86E-05
L1-10206B-FSGS-002-SS	6.57E-03	2.84E-03	3.20E-02	1.19E+00	6.40E-05
L1-10206B-FSGS-003-SS	4.72E-02	8.01E-03	**4.74E-02**	8.52E+00	9.48E-05
L1-10206B-FSGS-004-SS	3.55E-02	2.11E-02	**7.33E-02**	6.41E+00	1.47E-04
L1-10206B-FSGS-005-SS	5.26E-02	0.00E+00	1.98E-02	9.49E+00	3.96E-05
L1-10206B-FSGS-006-SS	5.84E-04	1.90E-02	**5.37E-02**	1.05E-01	1.07E-04
L1-10206B-FSGS-007-SS	0.00E+00	1.45E-02	3.12E-02	0.00E+00	6.24E-05
L1-10206B-FSGS-008-SS	6.13E-02	2.60E-02	4.14E-03	1.11E+01	8.28E-06
L1-10206B-FSGS-009-SS	1.57E-02	4.68E-03	**4.14E-02**	2.83E+00	8.28E-05
L1-10206B-FSGS-010-SS	3.15E-02	2.51E-02	**7.37E-02**	5.68E+00	1.47E-04
L1-10206B-FSGS-011-SS	1.01E-02	0.00E+00	3.50E-02	1.82E+00	7.00E-05
L1-10206B-FSGS-012-SS	6.61E-02	3.70E-02	**7.91E-02**	1.19E+01	1.58E-04
L1-10206B-FSGS-013-SS	0.00E+00	1.76E-02	**5.12E-02**	0.00E+00	1.02E-04
L1-10206B-FSGS-014-SS	1.67E-02	1.04E-02	2.90E-02	3.01E+00	5.80E-05
L1-10206B-FSGS-015-SS	4.43E-02	3.75E-02	3.25E-02	7.99E+00	6.50E-05
L1-10206B-FSGS-016-SS	4.48E-02	0.00E+00	3.17E-02	8.08E+00	6.34E-05
L1-10206B-FSGS-017-SS	0.00E+00	0.00E+00	1.14E-03	0.00E+00	2.28E-06

Note: (1) Bold font indicates ROC positively detected at concentration greater than MDC.
(2) Ni-63 and Sr-90 are inferred concentrations using the maximum HTD ratio.

Table 13 - Summary of Gamma Spectroscopy Results for Surface Soil Investigational Samples

MEASUREMENT ID	Co-60[(1)] (pCi/g)	Cs-134[(1)] (pCi/g)	Cs-137[(1)] (pCi/g)	Ni-63[(2)] (pCi/g)	Sr-90[(2)] (pCi/g)
L1-10206B-FIGS-001-SS	2.17E-02	5.01E-02	0.00E+00	3.92E+00	0.00E+00
L1-10206B-FIGS-002-SS	2.82E-02	1.21E-03	1.94E-03	5.09E+00	3.88E-06
L1-10206B-FIGS-003-SS	0.00E+00	0.00E+00	1.96E-02	0.00E+00	3.92E-05
L1-10206B-FIGS-004-SS	**6.87E-02**	5.60E-02	**9.74E-02**	1.24E+01	1.95E-04

Note: (1) Bold font indicates ROC positively detected at concentration greater than MDC.
(2) Ni-63 and Sr-90 are inferred concentrations using the maximum HTD ratio.

Table 14 - Summary of Gamma Spectroscopy Results for Subsurface Soil Samples

MEASUREMENT ID	Co-60[1] (pCi/g)	Cs-134[1] (pCi/g)	Cs-137[1] (pCi/g)	Ni-63[2] (pCi/g)	Sr-90[2] (pCi/g)
L1-10206B-FSGS-006-SB	0.00E+00	7.19E-03	3.28E-02	0.00E+00	6.56E-05
L1-10206B-FSGS-014-SB	6.27E-04	5.88E-03	1.91E-02	1.13E-01	3.82E-05
L1-10206B-FIGS-001-SB	1.34E-02	0.00E+00	1.16E-02	2.42E+00	2.32E-05
L1-10206B-FIGS-002-SB	1.80E-03	1.69E-02	2.04E-02	3.25E-01	4.08E-05
L1-10206B-FIGS-003-SB	4.99E-03	3.02E-02	1.56E-02	9.00E-01	3.12E-05
L1-10206B-FIGS-004-SB	0.00E+00	0.00E+00	2.22E-03	0.00E+00	4.44E-06
L1-10206B-QIGS-001-SB	0.00E+00	3.16E-02	7.99E-03	0.00E+00	1.60E-05

Note: (1) Bold font indicates ROC positively detected at concentration greater than MDC.
(2) Ni-63 and Sr-90 are inferred concentrations using the maximum HTD ratio.

The off-site laboratory, Eberline Analytical, processed the three (3) samples selected for HTD ROC analysis. Samples L1-10206B-FSGS-010-SS, L1-10206B-FSGS-012-SS and L1-10206B-004-FIGS-SS were selected. Only HTD radionuclides included as ROC (Ni-63 and Sr-90 for soils) were included in the analysis. All analyses met the required MDC. Only Cs-137 was detected in the samples at a concentration greater than MDC. Consequently, comparison of existing ratios versus the maximum ratios from Table 6 was not required. The off-site analysis results are provided in Table 15.

Table 15 - Off-Site Analysis Results

Sample # L1-10206B-FSGS-010-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	7.12E-02	5.01E-02	7.47E-02	No
Cs-134	-3.10E-04	2.90E-02	8.76E-02	No
Cs-137	1.70E-01	7.45E-02	1.10E-01	Yes
Ni-63	-3.65E-01	1.87E+00	3.25E+00	No
Sr-90	2.71E-01	2.76E-01	5.59E-01	No

Sample # L1-10206B-FSGS-012-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	-1.83E-02	7.20E-02	9.23E-02	No
Cs-134	-4.66E-01	1.62E-01	8.27E-02	No
Cs-137	2.41E-01	7.48E-02	1.79E-01	Yes
Ni-63	6.44E-01	1.92E+00	3.27E+00	No
Sr-90	-6.10E-02	3.44E-01	7.39E-01	No

Table 15 (continued) - Off-Site Analysis Results

Sample # L1-10206B-FIGS-004-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	1.55E-02	3.45E-02	5.34E-02	No
Cs-134	-5.02E-03	2.24E-02	7.64E-02	No
Cs-137	1.89E-01	7.34E-02	1.09E-01	Yes
Ni-63	3.62E-01	1.88E+00	3.22E+00	No
Sr-90	-1.30E-01	2.95E-01	6.51E-01	No

The implementation of survey specific QC measures included the collection of three (3) samples (L1-10206B-FQGS-005-SS, L1-10206B-QIGS-001-SS and L1-10206A-QIGS-001-SB) for "split sample" analysis. Gamma spectroscopy results (summarized in Table 16) indicate that concentrations for Cs-137, Co-60 and Cs-134 were less than MDC in the samples. The concentrations for Ni-63 and Sr-90 were inferred based on the maximum ratios as specified in Table 6.

Table 16 - Summary of Gamma Spectroscopy Results for QC Soil Samples

MEASUREMENT ID	Co-60[(1)] (pCi/g)	Cs-134[(1)] (pCi/g)	Cs-137[(1)] (pCi/g)	Ni-63[(2)] (pCi/g)	Sr-90[(2)] (pCi/g)
L1-10206B-FQGS-005-SS	0.00E+00	0.00E+00	2.34E-02	0.00E+00	4.68E-05
L1-10206B-QIGS-001-SS[(3)]	3.98E-02	3.88E-02	5.66E-02	7.18E+00	1.13E-04

Note: (1) Bold font indicates ROC positively detected at concentration greater than MDC.
(2) Ni-63 and Sr-90 are inferred concentrations using the maximum HTD ratio.
(3) The results for the subsurface sample collected along with L1-10206B-QIGS-001-SS are included in Table 14.

The SOF or "unity rule" is the mathematical test used to evaluate compliance with radiological criteria for license termination when more than one radionuclide has been determined to be potentially present. The equation for the unity rule is:

Equation 6

$$\frac{C_1}{DCGL_1} + \frac{C_2}{DCGL_2} + \ldots\ldots\ldots \frac{C_n}{DCGL_n} \leq 1$$

Where: C_n = concentration of radionuclide n

$DCGL_n$ = DCGL of radionuclide n.

The results of the unity rule calculations for the ROC in the systematic sample population when compared against the OpDCGLs for surface soils for survey unit 10206B are provided in Table 17. The results of the unity rule calculations for the ROC for the investigational samples are provided in Table 18. The OpSOF calculations for subsurface samples are provided in

Table 19, and the results for the QC samples are provided in Table 20. Basic statistical properties for the systematic samples are provided in Table 21.

Table 17 - Sum of Fractions for Systematic Surface Soil Samples compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10206B-FSGS-001-SS	1.40E-02	5.37E-03	1.08E-02	3.02E-03	2.54E-05	0.033
L1-10206B-FSGS-002-SS	6.02E-03	1.64E-03	8.82E-03	1.30E-03	2.07E-05	0.018
L1-10206B-FSGS-003-SS	4.33E-02	4.62E-03	1.31E-02	9.31E-03	3.06E-05	0.070
L1-10206B-FSGS-004-SS	3.25E-02	1.22E-02	2.02E-02	7.01E-03	4.74E-05	0.072
L1-10206B-FSGS-005-SS	4.82E-02	0.00E+00	5.45E-03	1.04E-02	1.28E-05	0.064
L1-10206B-FSGS-006-SS	5.35E-04	1.10E-02	1.48E-02	1.15E-04	3.47E-05	0.026
L1-10206B-FSGS-007-SS	0.00E+00	8.37E-03	8.60E-03	0.00E+00	2.02E-05	0.017
L1-10206B-FSGS-008-SS	5.62E-02	1.50E-02	1.14E-03	1.21E-02	2.68E-06	0.084
L1-10206B-FSGS-009-SS	1.44E-02	2.70E-03	1.14E-02	3.10E-03	2.68E-05	0.032
L1-10206B-FSGS-010-SS	2.89E-02	1.45E-02	2.03E-02	6.22E-03	4.76E-05	0.070
L1-10206B-FSGS-011-SS	9.26E-03	0.00E+00	9.64E-03	1.99E-03	2.26E-05	0.021
L1-10206B-FSGS-012-SS	6.06E-02	2.14E-02	2.18E-02	1.30E-02	5.11E-05	0.117
L1-10206B-FSGS-013-SS	0.00E+00	1.02E-02	1.41E-02	0.00E+00	3.31E-05	0.024
L1-10206B-FSGS-014-SS	1.53E-02	6.00E-03	7.99E-03	3.30E-03	1.87E-05	0.033
L1-10206B-FSGS-015-SS	4.06E-02	2.16E-02	8.95E-03	8.74E-03	2.10E-05	0.080
L1-10206B-FSGS-016-SS	4.11E-02	0.00E+00	8.73E-03	8.84E-03	2.05E-05	0.059
L1-10206B-FSGS-017-SS	0.00E+00	0.00E+00	3.14E-04	0.00E+00	7.37E-07	0.000

Systematic Measurements

Number of Systematic Measurements =	17
# of Systematic Measurements with OpSOF $\geq$ 1 =	0
# of Systematic Measurements with OpSOF > 0.1 (HTD Assessment) =	1
Max Individual Systematic Measurement OpSOF =	0.117
Mean Systematic Measurement OpSOF =	0.048

Table 18 - Sum of Fractions for Investigational Surface Soil Samples compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Soil Samples					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10206B-FIGS-001-SS	1.99E-02	2.89E-02	0.00E+00	4.28E-03	0.00E+00	0.053
L1-10206B-FIGS-002-SS	2.58E-02	6.98E-04	5.34E-04	5.56E-03	1.25E-06	0.033
L1-10206B-FIGS-003-SS	0.00E+00	0.00E+00	5.40E-03	0.00E+00	1.27E-05	0.005
L1-10206B-FIGS-004-SS	6.30E-02	3.23E-02	2.68E-02	1.36E-02	6.29E-05	0.136

Table 19 - Sum of Fractions for Random and Investigational Subsurface Soil Samples compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Soil Samples					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10206B-FSGS-006-SB	0.00E+00	6.32E-03	1.65E-02	0.00E+00	1.54E-04	0.023
L1-10206B-FSGS-014-SB	7.12E-04	5.17E-03	9.63E-03	5.79E-04	8.99E-05	0.016
L1-10206B-FIGS-001-SB	1.52E-02	0.00E+00	5.85E-03	1.24E-02	5.46E-05	0.033
L1-10206B-FIGS-002-SB	2.04E-03	1.49E-02	1.03E-02	1.66E-03	9.60E-05	0.029
L1-10206B-FIGS-003-SB	5.66E-03	2.66E-02	7.86E-03	4.61E-03	7.34E-05	0.045
L1-10206B-FIGS-004-SB	0.00E+00	0.00E+00	1.12E-03	0.00E+00	1.04E-05	0.001
L1-10206B-QIGS-001-SB	0.00E+00	2.78E-02	4.03E-03	0.00E+00	3.76E-05	0.032

Table 20 - Sum of Fractions for QC Soil Samples compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Soil Samples					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L1-10206B-FQGS-005-SS	0.00E+00	0.00E+00	6.45E-03	0.00E+00	1.51E-05	0.006
L1-10206B-QIGS-001-SS	3.65E-02	2.24E-02	1.56E-02	7.85E-03	3.66E-05	0.082

Table 21 - Basic Statistical Properties of Systematic Sample Population

ROC	Mean (pCi/g)	Median (pCi/g)	Max (pCi/g)	Min (pCi/g)	Std. Dev. (pCi/g)	BcDCGL (pCi/g)	Avg. SOF per ROC	Avg. Dose Per ROC
Co-60	2.64E-02	1.67E-02	6.61E-02	0.00E+00	0.023	4.26	6.19E-03	1.55E-01
Cs-134	1.37E-02	1.04E-02	3.75E-02	0.00E+00	0.013	6.77	2.02E-03	5.06E-02
Cs-137	3.97E-02	3.50E-02	7.91E-02	1.14E-03	0.022	14.18	2.80E-03	7.01E-02
Ni-63	4.76E+00	3.01E+00	1.19E+01	0.00E+00	4.142	3572.1	1.33E-03	3.33E-02
Sr-90	7.95E-05	7.00E-05	1.58E-04	2.28E-06	0.000	12.09	6.57E-06	1.64E-04

The mean BcSOF for survey unit 10206B is 0.012, which equates to a dose of 0.309 mrem/year TEDE.

The mean of all identified isotopes are less than the Consultation Triggers for Residential and Commercial/Industrial Soil Contamination depicted in Table H.1 of NUREG 1757, Vol. 1, (MOU Table 1). The full table is included in Attachment 3 of this Release Record.

8. QUALITY CONTROL

The on-site laboratory processed one (1) split sample, L1-10206B-FSGS-005-SS, from the systematic population using gamma spectroscopy analysis. An additional split sample (L1-10206B-QIGS-001-SB) was collected during survey unit investigations. The data was evaluated using acceptance criteria specified in ZS-LT-01, *"Quality Assurance Project Plan (for Characterization and FSS)."* For both QC split samples, the standard sample and QC sample did not both have a positive result for a gamma-emitting ROC, therefore K-40 was used in the

QC comparison. There was acceptable agreement between standard and comparison results when using K-40. Refer to Attachment 5 for data and QC analysis results.

9. INVESTIGATIONS AND RESULTS

Several investigations occurred throughout this survey unit. A scan alarm was observed in scan row #59. Investigation surface scans identified a 1 ft^2 area that was reading 3,676 cpm. A second scan alarm was observed at row #91 but was not logged and could not be reproduced on subsequent scans. Four (4) investigational surface samples L1-10206B-FIGS-001-SS through L1-10206B-FIGS-004-SS as a result of these elevated scans. In addition to the surface samples, four (4) investigational subsurface samples were also collected at the areas with elevated scans. Samples L1-10206B-FIGS-001-SB through L1-10206B-FIGS-004-SB were collected. The investigation was documented in an Attachment 13 (from ZS- LT-300-001-004), "Final Status Survey Investigation." The gamma spectroscopy results are summarized in Tables 13, 14 and 16. The Sum of Fractions are summarized in Tables 18, 19 and 20.

No additional investigations were conducted in this survey unit.

10. REMEDIATION AND RESULTS

No remediation was performed in this survey unit.

11. CHANGES FROM THE SURVEY PLAN

There were no addendums to the FSS plan.

12. DATA QUALITY ASSESSMENT

The DQO sample design and data were reviewed in accordance with Zion*Solutions* procedure ZS-LT-300-001-004, *"Final Status Survey Data Assessment"* (Reference 16) for completeness and consistency. Documentation was complete and legible. Surveys and sample collection were consistent with the DQOs. The sampling design had adequate power as indicated by the Retrospective Power Curve.

The analytical results of all samples were less than an OpSOF of one when compared to the OpDCGLs.

Although MARSSIM states that the Sign Test need not be performed in the instance that no measurements surpass the DCGL, the test was conducted to demonstrate coherence to the statistical principles of the DQO process. The Sign Test was performed on the data and compared to the original assumptions of the DQOs. The evaluation of the Sign Test results clearly demonstrates that the survey unit passes the unrestricted release criteria, thus, the null hypothesis is rejected. The Sign Test is included in Attachment 4.

The preliminary data review consisted of calculating basic statistical quantities (e.g., mean, median, standard deviation). All data was considered valid including negative values, zeros,

values reported below the MDC, and values with uncertainties greater than two standard deviations. The mean and median values for each ROC were well below the respective OpDCGLs. Also, the retrospective power curve shows that a sufficient number of samples were collected to achieve the desired power. Therefore, the survey unit meets the unrestricted release criteria with adequate power as required by the DQOs.

The data for Co-60 and Cs-137 is represented graphically through a frequency plot and a quantile plot. All graphical representations are provided in Attachment 6.

13. ANOMALIES

No anomalies were observed during the performance or analyses of the survey.

14. CONCLUSION

Survey unit 10206B has met the DQOs of the FSS plan. The ALARA criteria for soils as specified in Chapter 4 of the LTP were achieved. The EMC for soils was not needed for this survey unit.

All identified ROC were used for statistical testing to determine the adequacy of the survey unit for FSS. Evaluation of the data shows that none of the ROC concentration values exceeds the OpDCGL or any investigational levels; therefore, in accordance with the LTP Section 5.10, the survey unit meets the release criterion.

The sample data passed the Sign Test. The null hypothesis was rejected. The Retrospective Power Curve showed that adequate power was achieved.

The mean BcSOF, when the analytical results were compared to the BcDCGLs, was 0.012, which results in a dose contribution from soil in survey unit 10206B of 0.309 mrem/year TEDE, based on the average concentration of the ROC in samples used for non-parametric statistical sampling.

The conclusion of this Release Record is that survey unit 10206B is acceptable for unrestricted release.

15. REFERENCES

1. Zion*Solutions* procedure ZS-LT-300-001-005, “Final Status Survey Data Reporting”
2. Zion Station Restoration Project License Termination Plan
3. Zion*Solutions* procedure ZS-LT-300-001-001, “Final Status Survey Package Development”
4. NUREG-1575, “Multi-Agency Radiation Survey and Site Investigation Manual”
5. Zion*Solutions* procedure ZS-LT-300-001-002, “Survey Unit Classification”
6. “Zion Station Historical Site Assessment”

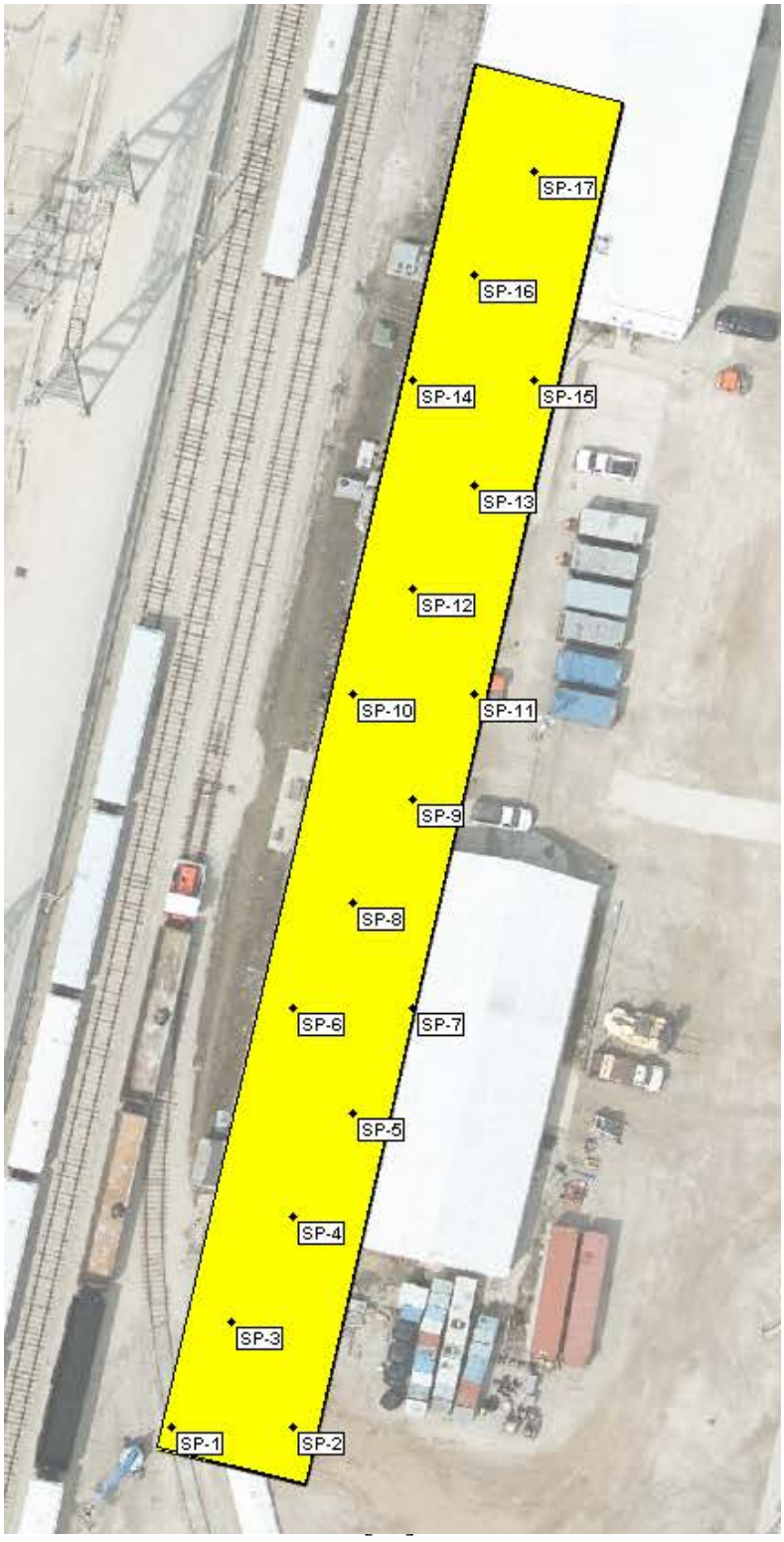
7. Zion*Solutions* TSD 11-001, "Technical Support Document for Potential Radionuclides of Concern During the Decommissioning of the Zion Station"
8. Zion*Solutions* TSD 14-019, "Radionuclides of Concern for Soil and Basement Fill Model Source Terms"
9. Zion*Solutions* TSD 14-011, "Soil Area Factors"
10. Zion*Solutions* TSD 17-004, "Operational Derived Concentration Guideline Levels for Final Status Survey"
11. Zion*Solutions* TSD 11-004, "Ludlum Model 44-10 Detector Sensitivity"
12. Zion*Solutions* procedure ZS-LT-01, "Quality Assurance Project Plan (for Characterization and FSS)"
13. Zion*Solutions* procedure ZS-LT-300-001-003, "Isolation and Control for Final Status Survey"
14. Zion*Solutions* procedure ZS-RP-108-004-011, "Operation of the Ludlum Model 2350-1 Data Logger"
15. Zion*Solutions* TSD 13-004, "Examination of Cs-137 Global Fallout In Soils At Zion Station"
16. Zion*Solutions* procedure ZS-LT-300-001-004, "Final Status Survey Data Assessment"

16. ATTACHMENTS

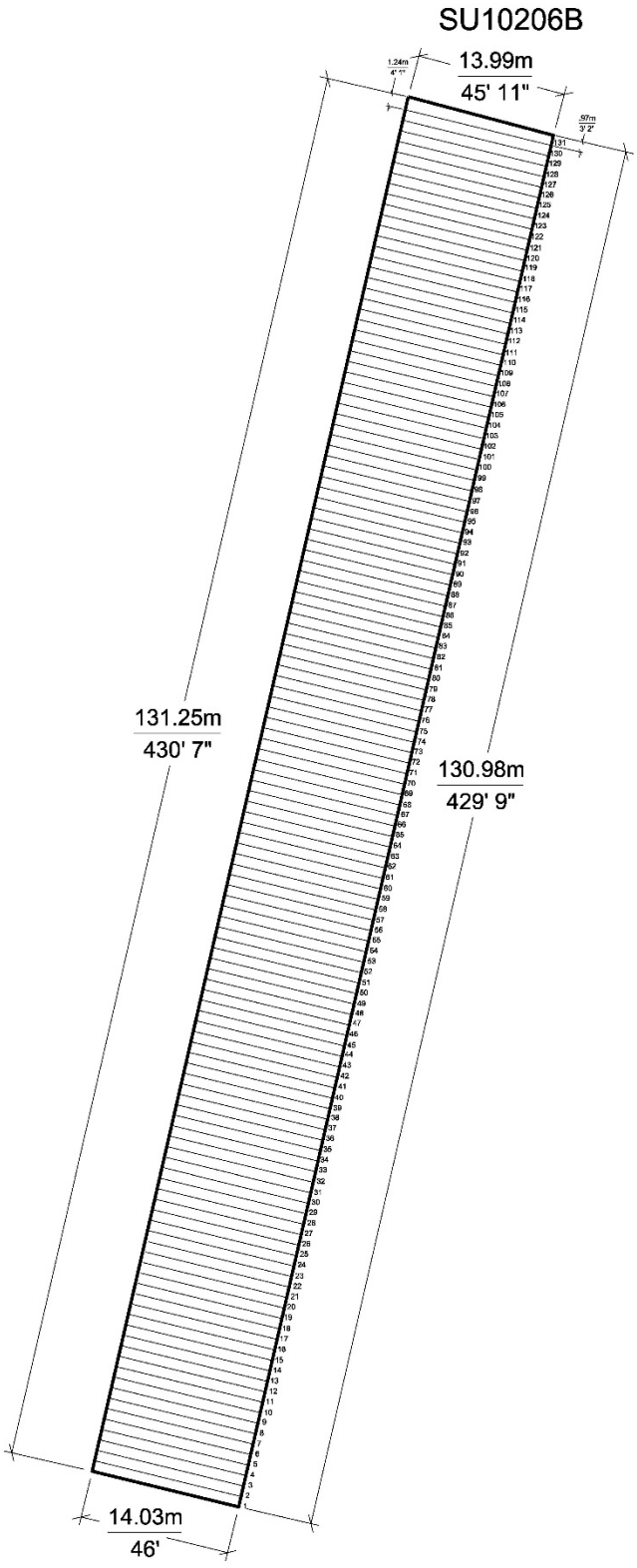
1. Attachment 1 - Figure and Map
2. Attachment 2 - Scan Data
3. Attachment 3 - Consultation Triggers for Residential and Commercial/Industrial Soil Contamination
4. Attachment 4 - Sign Test
5. Attachment 5 - QC Sample Assessment
6. Attachment 6 - Graphical Presentations
7. Attachment 7 - Sample Analytical Reports
8. Attachment 8 - Eberline Analytical Reports

ATTACHMENT 1
FIGURE AND MAP

Survey Unit 10206B Final Status Survey Boundaries and Systematic Sample Points



Survey Unit 10206B Final Status Survey Scan Rows



ATTACHMENT 2
SCAN DATA

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR311750	266656	10206B	GS001	11/6/2019 7:40	1898	1737	2368	No
44-10	PR311750	266656	10206B	GS001	11/6/2019 7:42	1815	1737	2368	No
44-10	PR311750	266656	10206B	GS002	11/6/2019 7:44	2088	1737	2368	No
44-10	PR311750	266656	10206B	GS002	11/6/2019 7:46	1887	1737	2368	No
44-10	PR311750	266656	10206B	GS003	11/6/2019 7:48	1781	1737	2368	No
44-10	PR311750	266656	10206B	GS003	11/6/2019 7:50	1786	1737	2368	No
44-10	PR311750	266656	10206B	GS004	11/6/2019 7:52	1748	1737	2368	No
44-10	PR311750	266656	10206B	GS004	11/6/2019 7:54	1764	1737	2368	No
44-10	PR311750	266656	10206B	GS005	11/6/2019 7:56	1903	1737	2368	No
44-10	PR311750	266656	10206B	GS005	11/6/2019 7:58	1892	1737	2368	No
44-10	PR311750	266656	10206B	GS006	11/6/2019 8:01	1802	1737	2368	No
44-10	PR311750	266656	10206B	GS006	11/6/2019 8:03	1991	1737	2368	No
44-10	PR311750	266656	10206B	GS007	11/6/2019 8:05	1829	1737	2368	No
44-10	PR311750	266656	10206B	GS007	11/6/2019 8:07	1918	1737	2368	No
44-10	PR311750	266656	10206B	GS008	11/6/2019 8:09	1913	1737	2368	No
44-10	PR311750	266656	10206B	GS008	11/6/2019 8:11	1897	1737	2368	No
44-10	PR311750	266656	10206B	GS009	11/6/2019 8:13	1922	1737	2368	No
44-10	PR311750	266656	10206B	GS009	11/6/2019 8:15	1812	1737	2368	No
44-10	PR311750	266656	10206B	GS010	11/6/2019 8:17	1810	1737	2368	No
44-10	PR311750	266656	10206B	GS010	11/6/2019 8:19	1887	1737	2368	No
44-10	PR311750	266656	10206B	GS011	11/6/2019 8:22	1848	1737	2368	No
44-10	PR311750	266656	10206B	GS011	11/6/2019 8:24	1841	1737	2368	No
44-10	PR311750	266656	10206B	GS012	11/6/2019 8:26	1807	1737	2368	No
44-10	PR311750	266656	10206B	GS012	11/6/2019 8:28	1920	1737	2368	No
44-10	PR311750	266656	10206B	GS013	11/6/2019 8:30	1947	1737	2368	No
44-10	PR311750	266656	10206B	GS013	11/6/2019 8:32	1957	1737	2368	No
44-10	PR311750	266656	10206B	GS014	11/6/2019 8:34	1838	1737	2368	No
44-10	PR311750	266656	10206B	GS014	11/6/2019 8:36	1950	1737	2368	No
44-10	PR311750	266656	10206B	GS015	11/6/2019 8:38	1869	1737	2368	No
44-10	PR311750	266656	10206B	GS015	11/6/2019 8:40	2094	1737	2368	No
44-10	ES0118	216173	10206B	GS016	11/6/2019 7:37	1996	1909	2570	No
44-10	ES0118	216173	10206B	GS016	11/6/2019 7:39	2061	1909	2570	No
44-10	ES0118	216173	10206B	GS017	11/6/2019 7:42	1976	1909	2570	No
44-10	ES0118	216173	10206B	GS017	11/6/2019 7:44	2122	1909	2570	No
44-10	ES0118	216173	10206B	GS018	11/6/2019 7:46	1968	1909	2570	No
44-10	ES0118	216173	10206B	GS018	11/6/2019 7:47	1983	1909	2570	No
44-10	ES0118	216173	10206B	GS019	11/6/2019 7:50	1932	1909	2570	No
44-10	ES0118	216173	10206B	GS019	11/6/2019 7:52	1911	1909	2570	No
44-10	ES0118	216173	10206B	GS020	11/6/2019 7:55	2024	1909	2570	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	ES0118	216173	10206B	GS020	11/6/2019 7:56	2053	1909	2570	No
44-10	ES0118	216173	10206B	GS021	11/6/2019 7:59	2356	1909	2570	No
44-10	ES0118	216173	10206B	GS021	11/6/2019 8:00	2092	1909	2570	No
44-10	ES0118	216173	10206B	GS022	11/6/2019 8:03	2255	1909	2570	No
44-10	ES0118	216173	10206B	GS022	11/6/2019 8:04	2219	1909	2570	No
44-10	ES0118	216173	10206B	GS023	11/6/2019 8:07	2163	1909	2570	No
44-10	ES0118	216173	10206B	GS023	11/6/2019 8:08	2094	1909	2570	No
44-10	ES0118	216173	10206B	GS024	11/6/2019 8:10	2288	1909	2570	No
44-10	ES0118	216173	10206B	GS024	11/6/2019 8:12	2180	1909	2570	No
44-10	ES0118	216173	10206B	GS025	11/6/2019 8:14	2273	1909	2570	No
44-10	ES0118	216173	10206B	GS025	11/6/2019 8:16	2449	1909	2570	No
44-10	ES0118	216173	10206B	GS026	11/6/2019 8:18	2902	2524	3284	No
44-10	ES0118	216173	10206B	GS026	11/6/2019 8:20	2541	2524	3284	No
44-10	ES0118	216173	10206B	GS027	11/6/2019 8:22	2524	2524	3284	No
44-10	ES0118	216173	10206B	GS027	11/6/2019 8:23	2895	2524	3284	No
44-10	ES0118	216173	10206B	GS028	11/6/2019 8:26	2906	2524	3284	No
44-10	ES0118	216173	10206B	GS028	11/6/2019 8:27	2566	2524	3284	No
44-10	ES0118	216173	10206B	GS029	11/6/2019 8:29	2733	2524	3284	No
44-10	ES0118	216173	10206B	GS029	11/6/2019 8:30	2843	2524	3284	No
44-10	ES0118	216173	10206B	GS030	11/6/2019 8:33	2887	2524	3284	No
44-10	ES0118	216173	10206B	GS030	11/6/2019 8:34	2556	2524	3284	No
44-10	PR321892	304708	10206B	GS031	11/6/2019 8:31	2889	2437	3184	No
44-10	PR321892	304708	10206B	GS031	11/6/2019 8:34	2635	2437	3184	No
44-10	PR321892	304708	10206B	GS032	11/6/2019 8:36	2694	2437	3184	No
44-10	PR321892	304708	10206B	GS032	11/6/2019 8:38	2866	2437	3184	No
44-10	PR321892	304708	10206B	GS033	11/6/2019 8:40	2777	2437	3184	No
44-10	PR321892	304708	10206B	GS033	11/6/2019 8:42	2471	2437	3184	No
44-10	PR321892	304708	10206B	GS034	11/6/2019 8:44	2585	2437	3184	No
44-10	PR321892	304708	10206B	GS034	11/6/2019 8:46	2749	2437	3184	No
44-10	PR321892	304708	10206B	GS035	11/6/2019 8:48	2663	2437	3184	No
44-10	PR321892	304708	10206B	GS035	11/6/2019 8:50	2628	2437	3184	No
44-10	PR321892	304708	10206B	GS036	11/6/2019 8:52	2667	2437	3184	No
44-10	PR321892	304708	10206B	GS036	11/6/2019 8:54	2842	2437	3184	No
44-10	PR321892	304708	10206B	GS037	11/6/2019 8:56	2767	2437	3184	No
44-10	PR321892	304708	10206B	GS037	11/6/2019 8:58	2636	2437	3184	No
44-10	PR321892	304708	10206B	GS038	11/6/2019 9:00	2690	2437	3184	No
44-10	PR321892	304708	10206B	GS038	11/6/2019 9:02	2739	2437	3184	No
44-10	PR321892	304708	10206B	GS039	11/6/2019 9:04	2818	2437	3184	No
44-10	PR321892	304708	10206B	GS039	11/6/2019 9:06	2703	2437	3184	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR321892	304708	10206B	GS040	11/6/2019 9:08	3010	2437	3184	No
44-10	PR321892	304708	10206B	GS040	11/6/2019 9:10	2843	2437	3184	No
44-10	PR321892	304708	10206B	GS041	11/6/2019 9:12	2702	2437	3184	No
44-10	PR321892	304708	10206B	GS041	11/6/2019 9:14	2485	2437	3184	No
44-10	PR321892	304708	10206B	GS042	11/6/2019 9:17	2912	2437	3184	No
44-10	PR321892	304708	10206B	GS042	11/6/2019 9:20	2951	2437	3184	No
44-10	PR321892	304708	10206B	GS043	11/6/2019 9:22	2954	2437	3184	No
44-10	PR321892	304708	10206B	GS043	11/6/2019 9:24	2521	2437	3184	No
44-10	PR321892	304708	10206B	GS044	11/6/2019 9:26	2905	2437	3184	No
44-10	PR321892	304708	10206B	GS044	11/6/2019 9:28	2804	2437	3184	No
44-10	PR321892	304708	10206B	GS045	11/6/2019 9:30	2979	2437	3184	No
44-10	PR321892	304708	10206B	GS045	11/6/2019 9:32	2674	2437	3184	No
44-10	PR308037	266657	10206B	GS046	11/6/2019 7:48	2994	2522	3281	No
44-10	PR308037	266657	10206B	GS046	11/6/2019 7:50	2744	2522	3281	No
44-10	PR308037	266657	10206B	GS047	11/6/2019 7:54	3048	2522	3281	No
44-10	PR308037	266657	10206B	GS047	11/6/2019 7:56	2824	2522	3281	No
44-10	PR308037	266657	10206B	GS048	11/6/2019 7:59	3037	2522	3281	No
44-10	PR308037	266657	10206B	GS048	11/6/2019 8:01	2783	2522	3281	No
44-10	PR308037	266657	10206B	GS049	11/6/2019 8:04	3076	2522	3281	No
44-10	PR308037	266657	10206B	GS049	11/6/2019 8:06	2759	2522	3281	No
44-10	PR308037	266657	10206B	GS050	11/6/2019 8:09	2801	2522	3281	No
44-10	PR308037	266657	10206B	GS050	11/6/2019 8:11	2896	2522	3281	No
44-10	PR308037	266657	10206B	GS051	11/6/2019 8:14	2873	2522	3281	No
44-10	PR308037	266657	10206B	GS051	11/6/2019 8:16	2750	2522	3281	No
44-10	PR308037	266657	10206B	GS052	11/6/2019 8:19	2886	2522	3281	No
44-10	PR308037	266657	10206B	GS052	11/6/2019 8:21	2775	2522	3281	No
44-10	PR308037	266657	10206B	GS053	11/6/2019 8:24	2986	2522	3281	No
44-10	PR308037	266657	10206B	GS053	11/6/2019 8:26	2818	2522	3281	No
44-10	PR308037	266657	10206B	GS054	11/6/2019 8:29	3101	2522	3281	No
44-10	PR308037	266657	10206B	GS054	11/6/2019 8:31	2725	2522	3281	No
44-10	PR308037	266657	10206B	GS055	11/6/2019 8:41	2879	2522	3281	No
44-10	PR308037	266657	10206B	GS055	11/6/2019 8:43	2569	2522	3281	No
44-10	PR308037	266657	10206B	GS056	11/6/2019 8:51	3210	2522	3281	No
44-10	PR308037	266657	10206B	GS056	11/6/2019 8:53	2884	2522	3281	No
44-10	PR308037	266657	10206B	GS057	11/6/2019 8:56	3060	2522	3281	No
44-10	PR308037	266657	10206B	GS057	11/6/2019 8:58	2621	2522	3281	No
44-10	PR308037	266657	10206B	GS058	11/6/2019 9:01	2962	2522	3281	No
44-10	PR308037	266657	10206B	GS058	11/6/2019 9:03	2702	2522	3281	No
44-10	PR308037	266657	10206B	GS059	11/6/2019 9:07	2928	2522	3281	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR308037	266657	10206B	GS059	11/6/2019 9:09	2797	2522	3281	No
44-10	PR308037	266657	10206B	GS060	11/6/2019 9:13	3175	2522	3281	No
44-10	PR308037	266657	10206B	GS060	11/6/2019 9:15	2632	2522	3281	No
44-10	PR363452	304726	10206B	GS061	11/6/2019 8:43	2839	2290	3013	No
44-10	PR363452	304726	10206B	GS061	11/6/2019 8:45	2737	2290	3013	No
44-10	PR363452	304726	10206B	GS062	11/6/2019 8:48	3006	2290	3013	No
44-10	PR363452	304726	10206B	GS062	11/6/2019 8:51	2988	2290	3013	No
44-10	PR363452	304726	10206B	GS063	11/6/2019 8:54	2847	2290	3013	No
44-10	PR363452	304726	10206B	GS063	11/6/2019 8:56	2770	2290	3013	No
44-10	PR363452	304726	10206B	GS064	11/6/2019 8:59	2862	2290	3013	No
44-10	PR363452	304726	10206B	GS064	11/6/2019 9:01	2921	2290	3013	No
44-10	PR363452	304726	10206B	GS065	11/6/2019 9:04	2894	2290	3013	No
44-10	PR363452	304726	10206B	GS065	11/6/2019 9:07	2877	2290	3013	No
44-10	PR363452	304726	10206B	GS066	11/6/2019 9:10	2687	2290	3013	No
44-10	PR363452	304726	10206B	GS066	11/6/2019 9:12	3004	2290	3013	No
44-10	PR363452	304726	10206B	GS067	11/6/2019 9:15	2824	2290	3013	No
44-10	PR363452	304726	10206B	GS067	11/6/2019 9:17	2996	2290	3013	No
44-10	PR363452	304726	10206B	GS068	11/6/2019 9:21	2843	2290	3013	No
44-10	PR363452	304726	10206B	GS068	11/6/2019 9:25	2808	2290	3013	No
44-10	PR363452	304726	10206B	GS069	11/6/2019 9:28	2994	2290	3013	No
44-10	PR363452	304726	10206B	GS069	11/6/2019 9:31	2718	2290	3013	No
44-10	PR363452	304726	10206B	GS070	11/6/2019 9:34	2746	2290	3013	No
44-10	PR363452	304726	10206B	GS070	11/6/2019 9:37	2820	2290	3013	No
44-10	PR363452	304726	10206B	GS071	11/6/2019 9:40	2871	2290	3013	No
44-10	PR363452	304726	10206B	GS071	11/6/2019 9:42	2677	2290	3013	No
44-10	PR363452	304726	10206B	GS072	11/6/2019 9:48	2653	2290	3013	No
44-10	PR363452	304726	10206B	GS072	11/6/2019 9:50	2789	2290	3013	No
44-10	PR363452	304726	10206B	GS073	11/6/2019 9:53	2941	2290	3013	No
44-10	PR363452	304726	10206B	GS073	11/6/2019 9:56	2590	2290	3013	No
44-10	PR363452	304726	10206B	GS074	11/6/2019 9:59	2672	2290	3013	No
44-10	PR363452	304726	10206B	GS074	11/6/2019 10:02	2892	2290	3013	No
44-10	PR363452	304726	10206B	GS075	11/6/2019 10:05	2625	2290	3013	No
44-10	PR363452	304726	10206B	GS075	11/6/2019 10:07	2343	2290	3013	No
44-10	PR375273	304730	10206B	GS076	11/6/2019 9:13	2597	1969	2639	No
44-10	PR375273	304730	10206B	GS076	11/6/2019 9:15	2304	1969	2639	No
44-10	PR375273	304730	10206B	GS077	11/6/2019 9:17	2403	1969	2639	No
44-10	PR375273	304730	10206B	GS077	11/6/2019 9:19	2239	1969	2639	No
44-10	PR375273	304730	10206B	GS078	11/6/2019 9:21	2539	1969	2639	No
44-10	PR375273	304730	10206B	GS078	11/6/2019 9:23	2211	1969	2639	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR375273	304730	10206B	GS079	11/6/2019 9:25	2399	1969	2639	No
44-10	PR375273	304730	10206B	GS079	11/6/2019 9:27	2254	1969	2639	No
44-10	PR375273	304730	10206B	GS080	11/6/2019 9:29	3013	2793	3591	No
44-10	PR375273	304730	10206B	GS080	11/6/2019 9:31	2925	2793	3591	No
44-10	PR375273	304730	10206B	GS081	11/6/2019 9:33	2967	2793	3591	No
44-10	PR375273	304730	10206B	GS081	11/6/2019 9:35	2909	2793	3591	No
44-10	PR375273	304730	10206B	GS082	11/6/2019 9:37	3113	2793	3591	No
44-10	PR375273	304730	10206B	GS082	11/6/2019 9:41	3063	2793	3591	No
44-10	PR375273	304730	10206B	GS083	11/6/2019 9:43	3021	2793	3591	No
44-10	PR375273	304730	10206B	GS083	11/6/2019 9:45	3567	2793	3591	No
44-10	PR375273	304730	10206B	GS084	11/6/2019 9:47	3065	2793	3591	No
44-10	PR375273	304730	10206B	GS084	11/6/2019 9:49	2964	2793	3591	No
44-10	PR375273	304730	10206B	GS085	11/6/2019 9:51	3330	2793	3591	No
44-10	PR375273	304730	10206B	GS085	11/6/2019 9:53	3100	2793	3591	No
44-10	PR375273	304730	10206B	GS086	11/6/2019 9:55	3202	2793	3591	No
44-10	PR375273	304730	10206B	GS086	11/6/2019 9:57	2998	2793	3591	No
44-10	PR375273	304730	10206B	GS087	11/6/2019 9:59	2864	2793	3591	No
44-10	PR375273	304730	10206B	GS087	11/6/2019 10:01	3035	2793	3591	No
44-10	PR375273	304730	10206B	GS088	11/6/2019 10:03	1992	1969	2639	No
44-10	PR375273	304730	10206B	GS088	11/6/2019 10:05	2114	1969	2639	No
44-10	PR375273	304730	10206B	GS089	11/6/2019 10:07	2129	1969	2639	No
44-10	PR375273	304730	10206B	GS089	11/6/2019 10:09	2322	1969	2639	No
44-10	PR375273	304730	10206B	GS090	11/6/2019 10:11	2076	1969	2639	No
44-10	PR375273	304730	10206B	GS090	11/6/2019 10:13	2370	1969	2639	No
44-10	PR363311	304718	10206B	GS092	11/6/2019 8:04	1718	1693	2315	No
44-10	PR363311	304718	10206B	GS092	11/6/2019 8:06	2163	1693	2315	No
44-10	PR363311	304718	10206B	GS093	11/6/2019 8:08	2191	1693	2315	No
44-10	PR363311	304718	10206B	GS093	11/6/2019 8:10	1954	1693	2315	No
44-10	PR363311	304718	10206B	GS094	11/6/2019 8:12	1751	1693	2315	No
44-10	PR363311	304718	10206B	GS094	11/6/2019 8:14	1928	1693	2315	No
44-10	PR363311	304718	10206B	GS095	11/6/2019 8:16	1944	1693	2315	No
44-10	PR363311	304718	10206B	GS095	11/6/2019 8:18	1788	1693	2315	No
44-10	PR363311	304718	10206B	GS096	11/6/2019 8:21	1773	1693	2315	No
44-10	PR363311	304718	10206B	GS096	11/6/2019 8:23	1883	1693	2315	No
44-10	PR363311	304718	10206B	GS097	11/6/2019 8:26	1802	1693	2315	No
44-10	PR363311	304718	10206B	GS097	11/6/2019 8:28	1716	1693	2315	No
44-10	PR363311	304718	10206B	GS098	11/6/2019 8:30	1714	1693	2315	No
44-10	PR363311	304718	10206B	GS098	11/6/2019 8:32	1766	1693	2315	No
44-10	PR363311	304718	10206B	GS099	11/6/2019 8:34	1839	1693	2315	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR363311	304718	10206B	GS099	11/6/2019 8:36	1674	1693	2315	No
44-10	PR363311	304718	10206B	GS100	11/6/2019 8:40	1851	1693	2315	No
44-10	PR363311	304718	10206B	GS100	11/6/2019 8:42	1871	1693	2315	No
44-10	PR363311	304718	10206B	GS101	11/6/2019 8:44	1777	1693	2315	No
44-10	PR363311	304718	10206B	GS101	11/6/2019 8:50	1745	1693	2315	No
44-10	PR363311	304718	10206B	GS102	11/6/2019 8:52	1845	1693	2315	No
44-10	PR363311	304718	10206B	GS102	11/6/2019 8:54	1822	1693	2315	No
44-10	PR363311	304718	10206B	GS103	11/6/2019 8:57	1701	1693	2315	No
44-10	PR363311	304718	10206B	GS103	11/6/2019 8:59	1855	1693	2315	No
44-10	PR363311	304718	10206B	GS104	11/6/2019 9:03	1859	1693	2315	No
44-10	PR363311	304718	10206B	GS104	11/6/2019 9:06	1751	1693	2315	No
44-10	PR363311	304718	10206B	GS105	11/6/2019 9:09	1755	1693	2315	No
44-10	PR363311	304718	10206B	GS105	11/6/2019 9:12	1782	1693	2315	No
44-10	PR363311	304718	10206B	GS091	11/6/2019 13:34	2307	1722	2349	No
44-10	PR363311	304718	10206B	GS091	11/6/2019 13:36	1736	1722	2349	No
44-10	PR321902	304711	10206B	GS106	11/6/2019 8:37	1798	1598	2202	No
44-10	PR321902	304711	10206B	GS106	11/6/2019 8:39	1641	1598	2202	No
44-10	PR321902	304711	10206B	GS107	11/6/2019 8:42	1601	1598	2202	No
44-10	PR321902	304711	10206B	GS107	11/6/2019 8:44	2028	1598	2202	No
44-10	PR321902	304711	10206B	GS108	11/6/2019 8:46	1845	1598	2202	No
44-10	PR321902	304711	10206B	GS108	11/6/2019 8:48	1752	1598	2202	No
44-10	PR321902	304711	10206B	GS109	11/6/2019 8:50	1746	1598	2202	No
44-10	PR321902	304711	10206B	GS109	11/6/2019 8:52	1723	1598	2202	No
44-10	PR321902	304711	10206B	GS110	11/6/2019 8:55	1739	1598	2202	No
44-10	PR321902	304711	10206B	GS110	11/6/2019 8:57	1607	1598	2202	No
44-10	PR321902	304711	10206B	GS111	11/6/2019 8:59	1634	1598	2202	No
44-10	PR321902	304711	10206B	GS111	11/6/2019 9:01	1713	1598	2202	No
44-10	PR321902	304711	10206B	GS112	11/6/2019 9:03	1665	1598	2202	No
44-10	PR321902	304711	10206B	GS112	11/6/2019 9:05	1682	1598	2202	No
44-10	PR321902	304711	10206B	GS113	11/6/2019 9:07	1661	1598	2202	No
44-10	PR321902	304711	10206B	GS113	11/6/2019 9:09	1637	1598	2202	No
44-10	PR321902	304711	10206B	GS114	11/6/2019 9:12	1718	1598	2202	No
44-10	PR321902	304711	10206B	GS114	11/6/2019 9:14	1734	1598	2202	No
44-10	PR321902	304711	10206B	GS115	11/6/2019 9:16	2003	1598	2202	No
44-10	PR321902	304711	10206B	GS115	11/6/2019 9:18	1852	1598	2202	No
44-10	PR321902	304711	10206B	GS116	11/6/2019 9:22	1907	1598	2202	No
44-10	PR321902	304711	10206B	GS116	11/6/2019 9:24	1947	1598	2202	No
44-10	PR321902	304711	10206B	GS117	11/6/2019 9:26	1958	1598	2202	No
44-10	PR321902	304711	10206B	GS117	11/6/2019 9:28	1961	1598	2202	No

Detector Type	Detector ID	M2350-1 ID	Survey Unit	Location	Date/Time	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	PR321902	304711	10206B	GS118	11/6/2019 9:30	1906	1598	2202	No
44-10	PR321902	304711	10206B	GS118	11/6/2019 9:32	1977	1598	2202	No
44-10	PR321902	304711	10206B	GS119	11/6/2019 9:35	1992	1598	2202	No
44-10	PR321902	304711	10206B	GS119	11/6/2019 9:37	1924	1598	2202	No
44-10	PR321902	304711	10206B	GS120	11/6/2019 9:39	1916	1598	2202	No
44-10	PR321902	304711	10206B	GS120	11/6/2019 9:41	2095	1598	2202	No
44-10	PR372152	2161188	10206B	GS121	11/6/2019 7:19	2099	1973	2644	No
44-10	PR372152	2161188	10206B	GS121	11/6/2019 7:21	2041	1973	2644	No
44-10	PR372152	2161188	10206B	GS122	11/6/2019 7:23	2014	1973	2644	No
44-10	PR372152	2161188	10206B	GS122	11/6/2019 7:25	2384	1973	2644	No
44-10	PR372152	2161188	10206B	GS123	11/6/2019 7:27	2233	1973	2644	No
44-10	PR372152	2161188	10206B	GS123	11/6/2019 7:29	2035	1973	2644	No
44-10	PR372152	2161188	10206B	GS124	11/6/2019 7:31	2310	1973	2644	No
44-10	PR372152	2161188	10206B	GS124	11/6/2019 7:33	2216	1973	2644	No
44-10	PR372152	2161188	10206B	GS125	11/6/2019 7:35	2183	1973	2644	No
44-10	PR372152	2161188	10206B	GS125	11/6/2019 7:37	2010	1973	2644	No
44-10	PR372152	2161188	10206B	GS126	11/6/2019 7:39	1932	1973	2644	No
44-10	PR372152	2161188	10206B	GS126	11/6/2019 7:41	2084	1973	2644	No
44-10	PR372152	2161188	10206B	GS127	11/6/2019 7:43	2069	1973	2644	No
44-10	PR372152	2161188	10206B	GS127	11/6/2019 7:45	2094	1973	2644	No
44-10	PR372152	2161188	10206B	GS128	11/6/2019 7:47	1971	1973	2644	No
44-10	PR372152	2161188	10206B	GS128	11/6/2019 7:49	2143	1973	2644	No
44-10	PR372152	2161188	10206B	GS129	11/6/2019 7:51	2105	1973	2644	No
44-10	PR372152	2161188	10206B	GS129	11/6/2019 7:53	2035	1973	2644	No
44-10	PR372152	2161188	10206B	GS130	11/6/2019 7:55	2047	1973	2644	No
44-10	PR372152	2161188	10206B	GS130	11/6/2019 7:57	2212	1973	2644	No
44-10	PR372152	2161188	10206B	GS131	11/6/2019 7:59	2194	1973	2644	No
44-10	PR372152	2161188	10206B	GS131	11/6/2019 8:01	2130	1973	2644	No

ATTACHMENT 3

CONSULTATION TRIGGERS FOR RESIDENTIAL AND COMMERCIAL/INDUSTRIAL SOIL CONTAMINATION

Table H.1 Consultation Triggers for Residential and Commercial/Industrial Soil Contamination (MOU Table 1)

Except for radium-226, thorium-232, or total uranium, concentrations should be aggregated using a sum of the fraction approach to determine site-specific consultation trigger concentrations. This table is based on single contaminant concentrations for residential and commercial/industrial land use when using generally accepted exposure parameters. Table users should select the appropriate column based on the site's reasonably anticipated land use.

Radionuclide	Residential Soil Concentration	Industrial/Commercial Soil Concentration
H-3	228 pCi/g	423 pCi/g
C-14	46 pCi/g	123,000 pCi/g
Na-22	9 pCi/g	14 pCi/g
S-35	19,600 pCi/g	32,200,000 pCi/g
Cl-36	6 pCi/g	10,700 pCi/g
Ca-45	13,500 pCi/g	3,740,000 pCi/g
Sc-46	105 pCi/g	169 pCi/g
Mn-54	69 pCi/g	112 pCi/g
Fe-55	269,000 pCi/g	2,210,000 pCi/g
Co-57	873 pCi/g	1,420 pCi/g
Co-60	4 pCi/g	6 pCi/g
Ni-59	20,800 pCi/g	1,230,000 pCi/g
Ni-63	9,480 pCi/g	555,000 pCi/g
Sr-90+D	23 pCi/g	1,070 pCi/g
Nb-94	2 pCi/g	3 pCi/g
Tc-99	25 pCi/g	89,400 pCi/g
I-129	60 pCi/g	1,080 pCi/g
Cs-134	16 pCi/g	26 pCi/g
Cs-137+D	6 pCi/g	11 pCi/g
Eu-152	4 pCi/g	7 pCi/g
Eu-154	5 pCi/g	8 pCi/g
Ir-192	336 pCi/g	544 pCi/g
Pb-210+D	15 pCi/g	123 pCi/g
Ra-226	5 pCi/g	5 pCi/g
Ac-227+D	10 pCi/g	21 pCi/g
Th-228+D	15 pCi/g	25 pCi/g
Th-232	5 pCi/g	5 pCi/g
U-234	401 pCi/g	3,310 pCi/g
U-235+D	20 pCi/g	39 pCi/g
U-238+D	74 pCi/g	179 pCi/g
total uranium	47 mg/kg	1230 mg/kg
Pu-238	297 pCi/g	1,640 pCi/g
Pu-239	259 pCi/g	1,430 pCi/g
Pu-241	40,600 pCi/g	172,000 pCi/g
Am-241	187 pCi/g	568 pCi/g
Cm-242	32,200 pCi/g	344,000 pCi/g
Cm-243	35 pCi/g	67 pCi/g

ATTACHMENT 4
SIGN TEST

Survey Area: No. 10200
Survey Unit: No. 10206B

Description: Radiological Restricted Area Grounds

Description: Station Construction Area

Classification: 1

Type I (α) Error: 0.05

Number of Samples: 17

#	Fraction of the Release Criterion						Weighted Sum (W_s)	1-W_s	Sign
	Radionuclides of Concern					Activity or SOF			
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	(as applicable)			
1	1.40E-02	5.37E-03	1.08E-02	3.02E-03	2.54E-05	SOF	0.033	0.967	+
2	6.02E-03	1.64E-03	8.82E-03	1.30E-03	2.07E-05	SOF	0.018	0.982	+
3	4.33E-02	4.62E-03	1.31E-02	9.31E-03	3.06E-05	SOF	0.070	0.930	+
4	3.25E-02	1.22E-02	2.02E-02	7.01E-03	4.74E-05	SOF	0.072	0.928	+
5	4.82E-02	0.00E+00	5.45E-03	1.04E-02	1.28E-05	SOF	0.064	0.936	+
6	5.35E-04	1.10E-02	1.48E-02	1.15E-04	3.47E-05	SOF	0.026	0.974	+
7	0.00E+00	8.37E-03	8.60E-03	0.00E+00	2.02E-05	SOF	0.017	0.983	+
8	5.62E-02	1.50E-02	1.14E-03	1.21E-02	2.68E-06	SOF	0.084	0.916	+
9	1.44E-02	2.70E-03	1.14E-02	3.10E-03	2.68E-05	SOF	0.032	0.968	+
10	2.89E-02	1.45E-02	2.03E-02	6.22E-03	4.76E-05	SOF	0.070	0.930	+
11	9.26E-03	0.00E+00	9.64E-03	1.99E-03	2.26E-05	SOF	0.021	0.979	+
12	6.06E-02	2.14E-02	2.18E-02	1.30E-02	5.11E-05	SOF	0.117	0.883	+
13	0.00E+00	1.02E-02	1.41E-02	0.00E+00	3.31E-05	SOF	0.024	0.976	+
14	1.53E-02	6.00E-03	7.99E-03	3.30E-03	1.87E-05	SOF	0.033	0.967	+
15	4.06E-02	2.16E-02	8.95E-03	8.74E-03	2.10E-05	SOF	0.080	0.920	+
16	4.11E-02	0.00E+00	8.73E-03	8.84E-03	2.05E-05	SOF	0.059	0.941	+
17	0.00E+00	0.00E+00	3.14E-04	0.00E+00	7.37E-07	SOF	0.000	1.000	+

Critical Value (Table I.3 of MARSSIM) = **12**

Number of Positive Differences (S+) = **17**

The survey unit ☑ (meets) ☐ (does not meet) the acceptance criteria.

ATTACHMENT 5

QC SAMPLE ASSESSMENT

Duplicate Sample Assessment Form

Survey Area #: 10200	Survey Unit #: 10206B	Survey Unit Name: Station Construction Area

Sample plan#: L1-10206B-F

Sample Description: Comparison of split samples collected from surface soil sample location #5 and analyzed using gamma spectroscopy by on-site HPGe system. The standard sample was L1-10206B-FSGS-005SS, the comparison sample was L1-10206B-FQGS-005SS.

Comparison of split samples collected from investigation subsurface soil sample location #1 and analyzed using gamma spectroscopy by on-site HPGe system. The standard sample was L1-10206B-FIGS-001SB, the comparison sample was L1-10206B-QIGS-001SB.

	STANDARD				COMPARISON			
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)
Systematic Sample #5								
K-40	1.03E+01	6.74E-01	15.28	0.6-1.66	9.33E+00	6.21E-01	1.10	Y
Investigation Sample #1								
K-40	1.05E+01	6.46E-01	16.25	0.75-1.33	8.90E+00	5.69E-01	1.18	Y

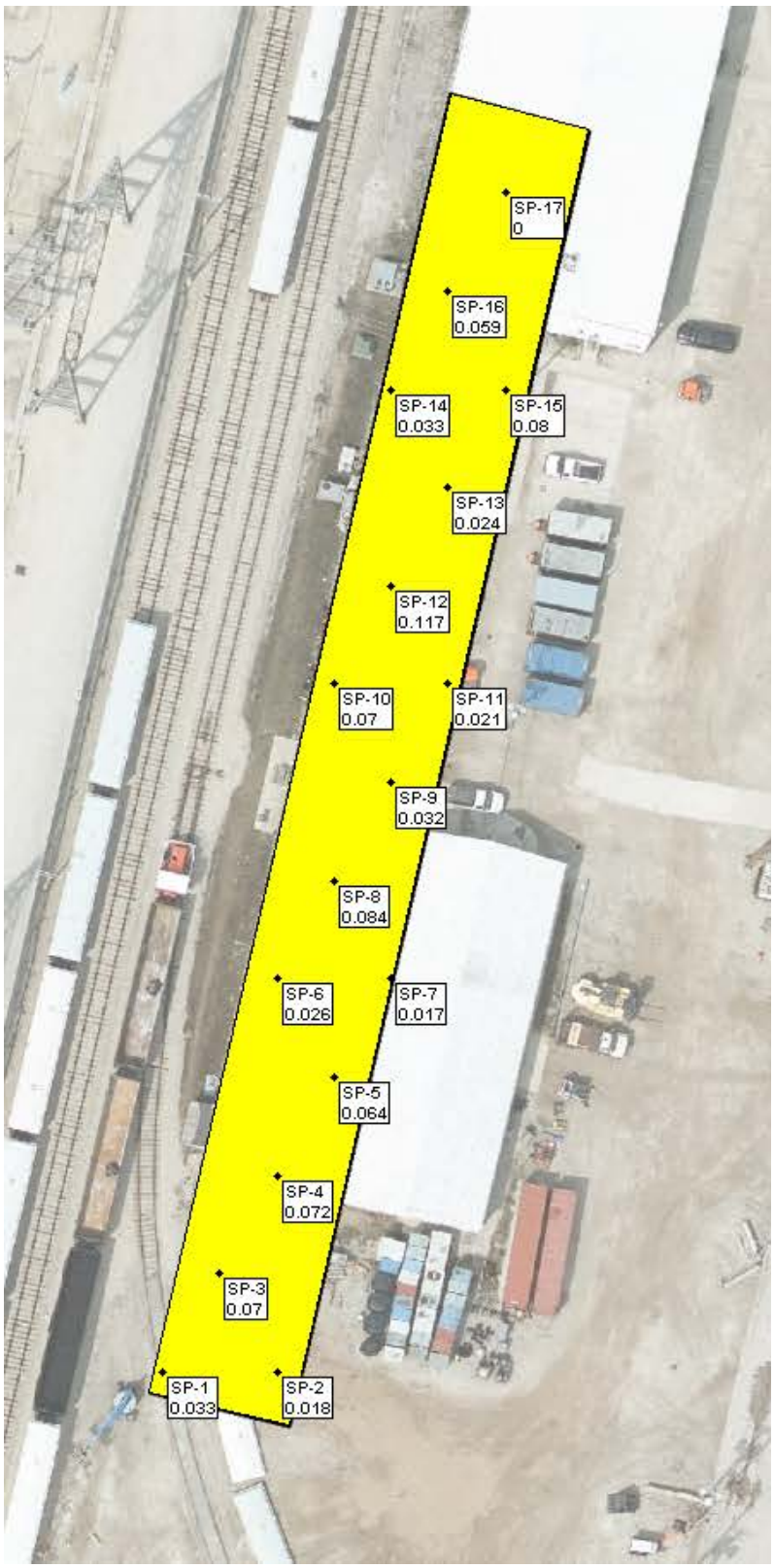
Comments/Corrective Actions:
For both the Systematic and the Investigational samples, the standard sample and QC sample did not both have a positive result for a gamma emitting ROC. Therefore, K-40 was used in the QC comparison. There was acceptable agreement when using K-40. No further action is necessary.

Table 4-1 from ZS-LT-01 is reproduced below to show acceptance criteria used to assess split samples.

Resolution	Acceptable Ratio
<4	not comparable
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.80-1.25
>200	0.85-1.18

ATTACHMENT 6
GRAPHICAL PRESENTATIONS

Posting Plot

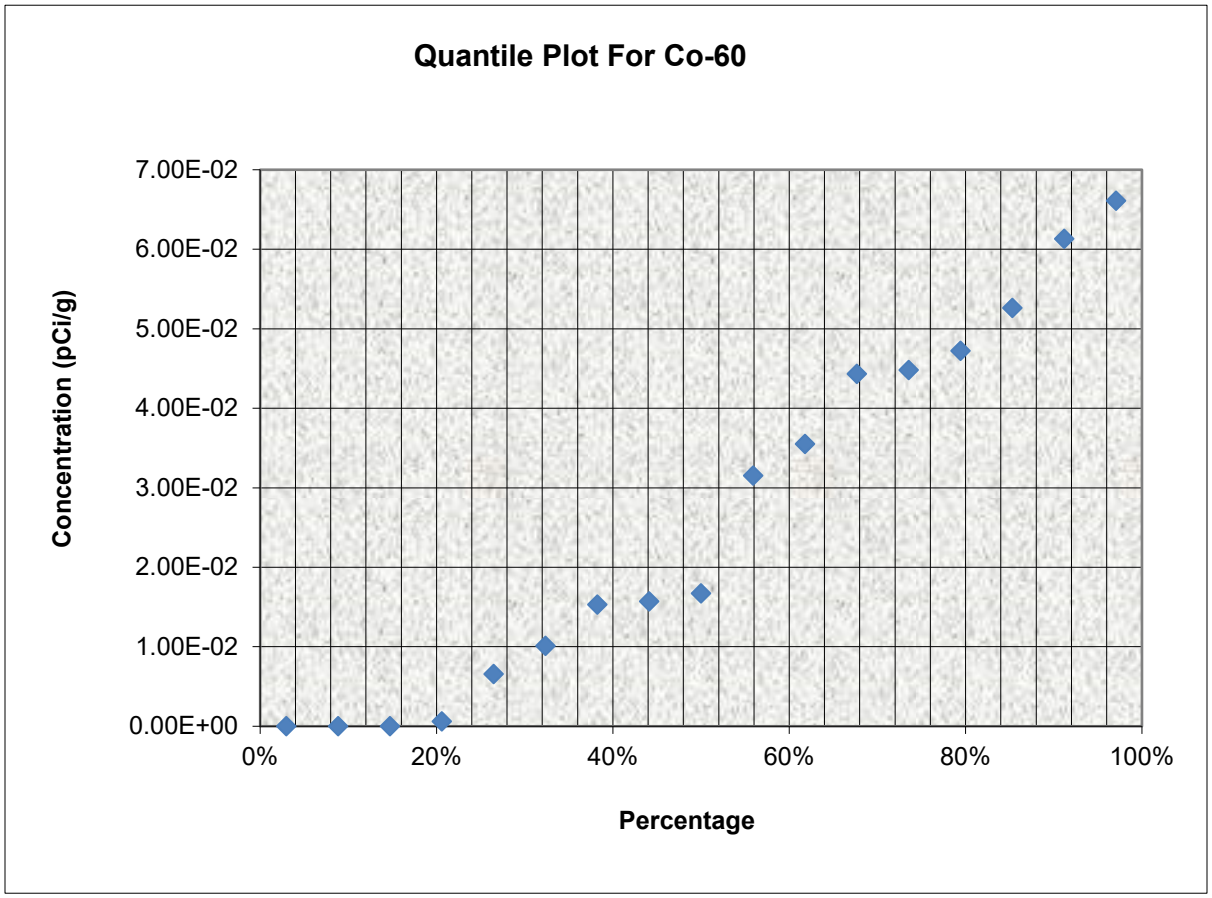


QUANTILE PLOT FOR Co-60

Survey Unit: 10206B

Survey Unit Name: Station Construction Area

Mean: 2.64E-02 pCi/g

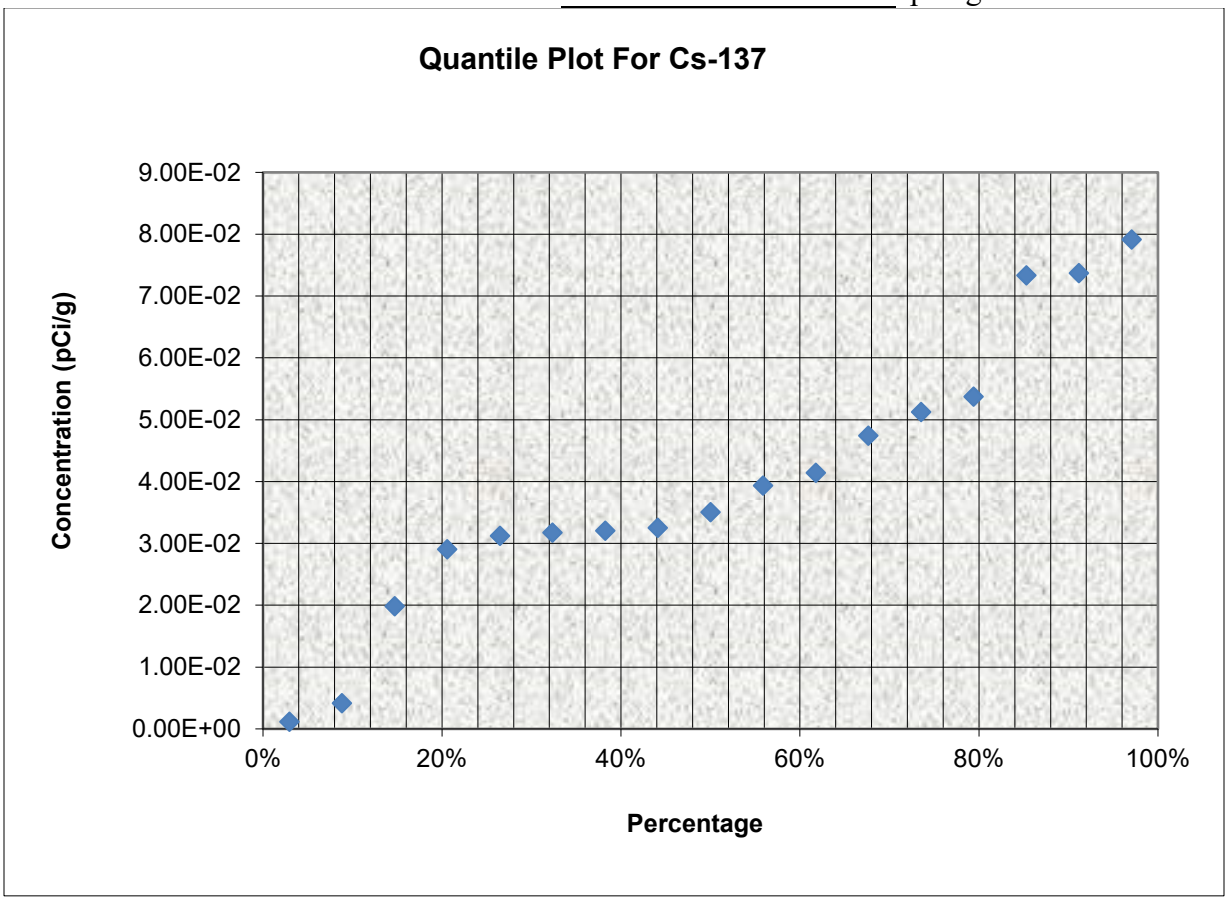


QUANTILE PLOT FOR Cs-137

Survey Unit: 10206B

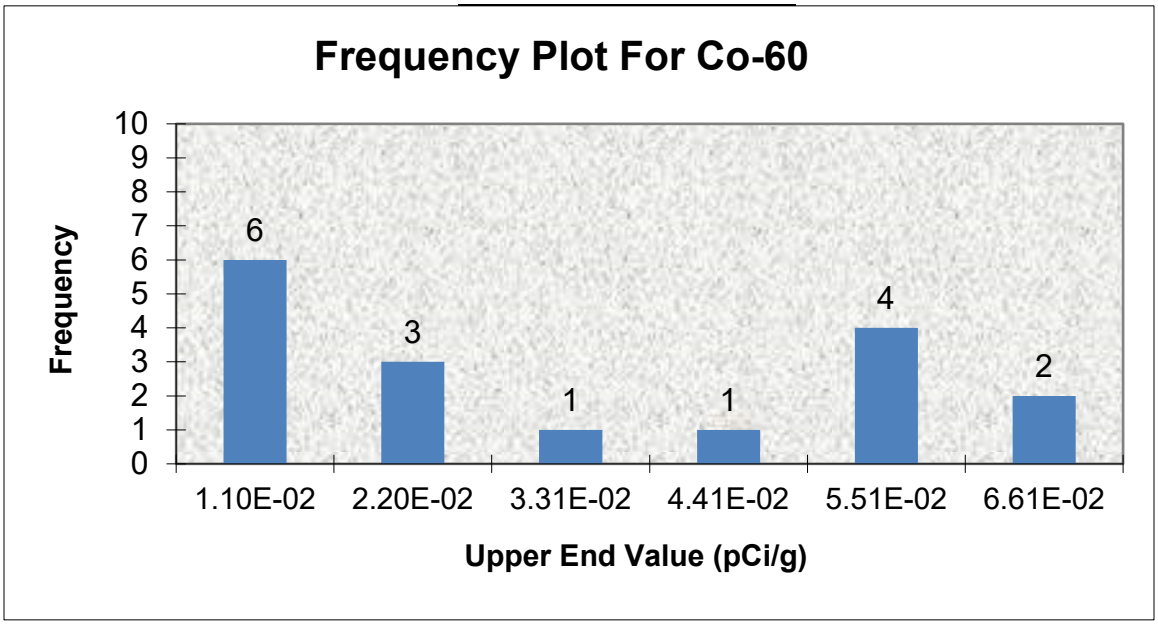
Survey Unit Name: Station Construction Area

Mean: 3.97E-02 pCi/g



HISTOGRAM FOR Co-60

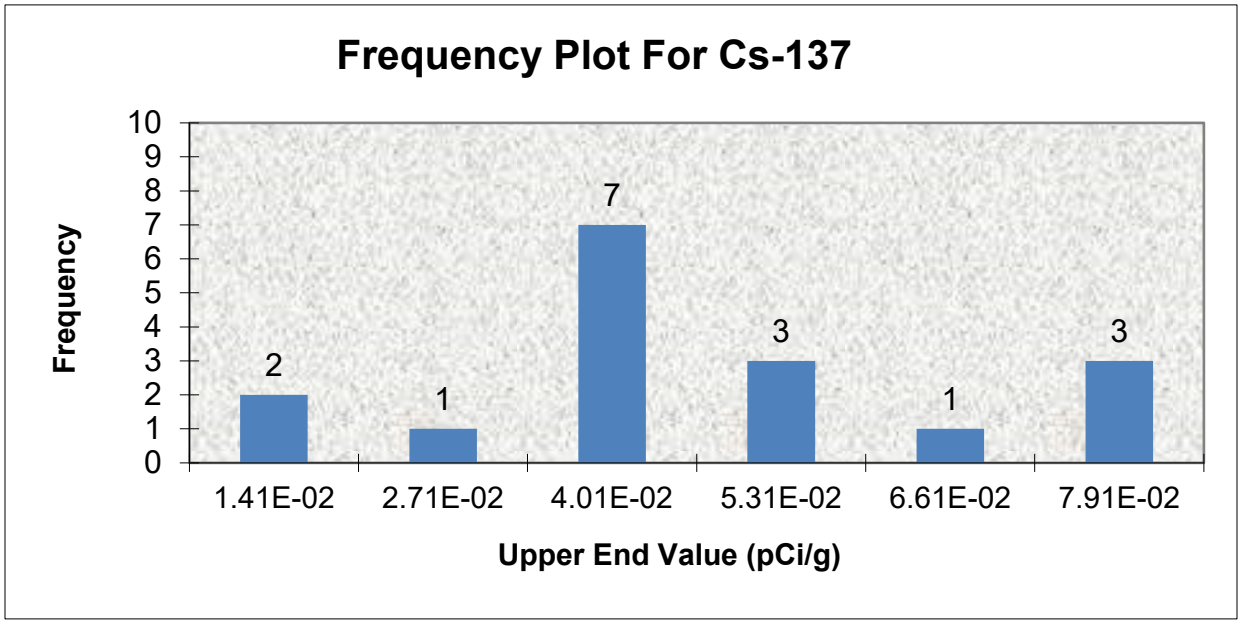
Survey Unit:	10206B	
Survey Unit Name:	Station Construction Area	
Mean:	2.64E-02	pCi/g
Median:	1.67E-02	pCi/g
ST DEV:	0.023	
Skew:	0.338	



Upper Value	Observation Frequency	Observation %
1.10E-02	6	35%
2.20E-02	3	18%
3.31E-02	1	6%
4.41E-02	1	6%
5.51E-02	4	24%
6.61E-02	2	12%
TOTAL	17	100%

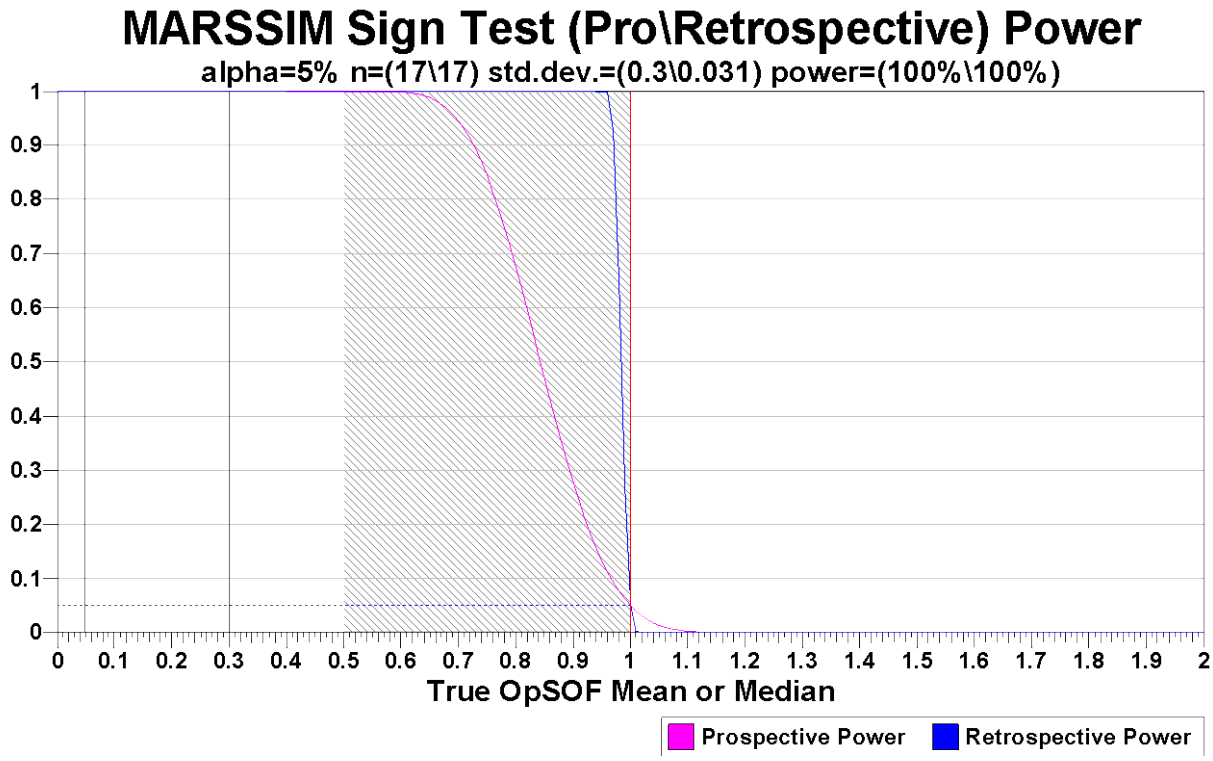
HISTOGRAM FOR Cs-137

Survey Unit:	10206B	
Survey Unit Name:	Station Construction Area	
Mean:	3.97E-02	pCi/g
Median:	3.50E-02	pCi/g
ST DEV:	0.022	
Skew:	0.191	



Upper Value	Observation Frequency	Observation %
1.41E-02	2	12%
2.71E-02	1	6%
4.01E-02	7	41%
5.31E-02	3	18%
6.61E-02	1	6%
7.91E-02	3	18%
TOTAL	17	100%

Prospective and Retrospective Power Curves for Survey Unit 10206B



ATTACHMENT 7
SAMPLE ANALYTICAL REPORTS

Apex-Gamma

Analysis Report for 29-Oct-19-10029

L1-10206B-FSGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10029
Sample Description	: L1-10206B-FSGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.451E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:00:00PM
Acquisition Started	: 10/29/2019 11:13:41AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80815
Fill Height	: 1450.68 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 11:28:51AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10029

L1-10206B-FSGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	239.06	948 -	961	955.83	8.90E+01	14.30	4.20E+01	1.07
2	352.18	1402 -	1415	1407.72	6.60E+01	9.57	9.00E+00	0.83
3	477.66	1905 -	1914	1909.11	2.51E+01	7.33	1.19E+01	0.82
4	583.30	2325 -	2337	2331.33	3.95E+01	7.52	6.50E+00	0.97
5	609.30	2429 -	2441	2435.22	3.37E+01	7.96	1.13E+01	0.77
6	1460.43	5830 -	5849	5839.67	1.43E+02	13.34	1.00E+01	1.25

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	1.00	477.60	*	10.44	2.75E-01	8.28E-02
K-40	0.97	1460.82	*	10.66	3.26E+00	3.36E-01
Tl-208	0.99	583.19	*	85.00	6.03E-02	1.20E-02
Pb-212	0.97	115.18		0.60		
		238.63	*	43.60	1.43E-01	2.57E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	9.89E-02	2.41E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 29-Oct-19-10029

L1-10206B-FSGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.68E-01	2.79E-02
		785.96		1.06		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BE-7	1.000	2.75E-01	8.28E-02	
K-40	0.976	3.26E+00	3.36E-01	
Tl-208	0.998	6.03E-02	1.20E-02	
Pb-212	0.973	1.43E-01	2.57E-02	
Bi-214	1.000	9.89E-02	2.41E-02	
Pb-214	0.994	1.68E-01	2.79E-02	

Analysis Report for 29-Oct-19-10029

L1-10206B-FSGS-001SS

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10029

L1-10206B-FSGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 11:28:51AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.54E-02	5.36E-02	5.36E-02
+	BE-7	477.60	*	10.44	2.75E-01	2.31E-01	2.31E-01
+	K-40	1460.82	*	10.66	3.26E+00	5.23E-01	5.23E-01
	Mn-54	834.85		99.98	-3.21E-02	3.76E-02	3.76E-02
	Co-60	1173.23		99.85	1.53E-02	4.84E-02	4.84E-02
		1332.49		99.98	-8.88E-03		4.86E-02
	Nb-94	702.65		99.81	-8.37E-03	2.80E-02	2.98E-02
		871.09		99.89	-4.51E-02		2.80E-02
	Ag-108m	79.13		6.60	7.37E-01	3.24E-02	1.03E+00
		433.94		90.50	8.75E-04		3.24E-02
		614.28		89.80	-4.55E-02		4.62E-02
		722.94		90.80	-2.30E-02		4.02E-02
	Sb-125	176.31		6.84	-1.38E-02	1.15E-01	3.93E-01
		380.45		1.52	4.65E-01		1.90E+00
		427.87		29.60	2.72E-02		1.15E-01
		463.36		10.49	-2.29E-01		2.73E-01
		600.60		17.65	-1.15E-01		1.98E-01
		606.71		4.98	1.36E+00		1.10E+00
		635.95		11.22	5.72E-02		2.71E-01

Analysis Report for 29-Oct-19-10029

L1-10206B-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.04E+00	1.15E-01	1.56E+00
Ba-133	79.61	2.65	1.42E+00	6.08E-02	2.47E+00
	81.00	32.90	-3.02E-01		1.56E-01
	276.40	7.16	2.12E-01		4.28E-01
	302.85	18.34	7.01E-02		1.52E-01
	356.01	62.05	-1.25E-02		6.08E-02
	383.85	8.94	-9.03E-02		3.47E-01
Cs-134	475.36	1.48	1.96E+00	4.57E-02	2.96E+00
	563.25	8.34	-6.91E-01		4.56E-01
	569.33	15.37	6.85E-02		2.38E-01
	604.72	97.62	-4.80E-03		4.83E-02
	795.86	85.46	9.31E-03		4.57E-02
	801.95	8.69	2.66E-01		4.51E-01
	1038.61	0.99	-3.82E-01		4.17E+00
	1167.97	1.79	9.07E-01		2.49E+00
	1365.19	3.02	-5.17E-01		1.12E+00
Cs-137	661.66	85.10	3.93E-02	5.39E-02	5.39E-02
Eu-152	121.78	28.67	-1.82E-02	9.26E-02	9.26E-02
	244.70	7.61	3.27E-01		4.07E-01
	295.94	0.45	6.17E+00		8.16E+00
	344.28	26.60	1.98E-02		1.13E-01
	367.79	0.86	1.28E+00		3.40E+00
	411.12	2.24	1.59E-01		1.11E+00
	443.96	2.83	-2.25E-01		1.02E+00
	488.68	0.42	-8.03E-01		6.51E+00
	563.99	0.49	-7.12E+00		7.53E+00
	586.26	0.46	-2.97E+00		1.13E+01
	678.62	0.47	1.91E+00		6.73E+00
	688.67	0.86	4.23E-01		4.29E+00
	719.35	0.28	-1.08E+01		1.18E+01
	778.90	12.96	1.05E-01		3.15E-01
	810.45	0.32	-1.27E+01		9.50E+00
	867.37	4.26	-2.19E-01		8.04E-01
	919.33	0.43	1.55E+00		8.88E+00
	964.08	14.65	2.09E-01		3.53E-01
	1085.87	10.24	1.98E-01		4.15E-01
	1089.74	1.73	1.03E+00		2.46E+00
	1112.07	13.69	-3.45E-01		2.96E-01
	1212.95	1.43	-1.27E+00		3.29E+00
	1249.94	0.19	8.94E+00		2.47E+01
	1299.14	1.63	1.37E+00		2.47E+00
	1408.01	21.07	-6.17E-02		2.02E-01
	1457.64	0.50	7.67E+01		3.06E+01
	1528.10	0.28	2.68E+00		9.99E+00
Eu-154	123.07	40.40	1.72E-02	6.45E-02	6.45E-02
	247.93	6.89	1.29E-01		3.76E-01
	591.76	4.95	3.67E-01		7.36E-01
	692.42	1.78	1.33E+00		2.24E+00
	723.30	20.06	-9.02E-03		1.90E-01
	756.80	4.52	-9.83E-02		7.77E-01
	873.18	12.08	-1.26E-01		2.75E-01

Analysis Report for 29-Oct-19-10029

L1-10206B-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	6.25E-02	6.45E-02	3.35E-01
	1004.76	18.01	2.47E-02		2.24E-01
	1274.43	34.80	7.90E-03		1.32E-01
	1596.48	1.80	-1.79E+00		1.62E+00
Eu-155	45.30	1.31	2.56E+00	1.56E-01	9.75E+00
	60.01	1.22	8.27E-01		1.02E+01
	86.55	30.70	-7.04E-02		1.57E-01
	105.31	21.10	-1.31E-01		1.56E-01
Ra-226	186.21	3.64	4.97E-01	7.90E-01	7.90E-01
Pa-231	27.36	10.30	8.58E-01	1.16E+00	1.16E+00
	283.69	1.70	6.93E-02		1.62E+00
	300.07	2.47	-1.36E+00		1.27E+00
	302.65	2.20	6.82E-01		1.31E+00
	330.06	1.40	7.48E-02		2.30E+00
U-235	143.76	10.96	-2.73E-02	4.93E-02	2.44E-01
	163.33	5.08	-1.77E-02		5.52E-01
	185.71	57.20	2.70E-02		4.93E-02
	202.11	1.08	-1.51E+00		2.41E+00
	205.31	5.01	-1.97E-01		5.40E-01
Am-241	59.54	35.90	-2.62E-02	3.57E-01	3.57E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10030

L1-10206B-FSGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10030
Sample Description	: L1-10206B-FSGS-002SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.452E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:02:00PM
Acquisition Started	: 10/29/2019 11:13:49AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80816
Fill Height	: 1452.27 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 11:28:51AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10030
L1-10206B-FSGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.65	948 -	960	955.06	1.02E+02	13.83	3.40E+01	0.60
2	351.89	1400 -	1415	1407.55	7.01E+01	12.16	2.59E+01	1.64
3	583.14	2325 -	2337	2331.89	3.99E+01	7.86	8.13E+00	0.64
4	609.38	2430 -	2443	2436.80	4.50E+01	10.27	2.20E+01	0.34
5	969.03	3870 -	3881	3875.19	2.30E+01	6.17	6.00E+00	1.17
6	1460.74	5832 -	5855	5843.33	2.32E+02	17.06	1.48E+01	2.04

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	4.93E+00	4.21E-01
Tl-208	1.00	583.19	*	85.00	5.77E-02	1.19E-02
Bi-211	0.89	351.07	*	13.02	4.72E-01	9.01E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.61E-01	2.55E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.25E-01	2.96E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 29-Oct-19-10030

L1-10206B-FSGS-002SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.72E-01	3.29E-02
		785.96		1.06		
Ac-228	0.57	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20		25.80		
		964.77		4.99		
		968.97	*	15.80	2.51E-01	6.81E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-Oct-19-10030

L1-10206B-FSGS-002SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	4.93E+00	4.21E-01	
	Tl-208	1.000	5.77E-02	1.19E-02	
?	Bi-211	0.898	4.72E-01	9.01E-02	
	Pb-212	1.000	1.61E-01	2.55E-02	
	Bi-214	1.000	1.25E-01	2.96E-02	
?	Pb-214	1.000	1.72E-01	3.29E-02	
	Ac-228	0.571	2.51E-01	6.81E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10030

L1-10206B-FSGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 11:28:51AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.07E-02	5.22E-02	5.22E-02
	BE-7	477.60		10.44	3.52E-01	3.62E-01	3.62E-01
+	K-40	1460.82	*	10.66	4.93E+00	6.13E-01	6.13E-01
	Mn-54	834.85		99.98	6.33E-03	4.75E-02	4.75E-02
	Co-60	1173.23		99.85	6.57E-03	3.30E-02	5.24E-02
		1332.49		99.98	-2.30E-02		3.30E-02
	Nb-94	702.65		99.81	-4.64E-02	3.61E-02	3.61E-02
		871.09		99.89	1.56E-02		4.07E-02
	Ag-108m	79.13		6.60	-4.99E-01	3.35E-02	1.37E+00
		433.94		90.50	-2.41E-02		3.35E-02
		614.28		89.80	-2.48E-02		6.57E-02
		722.94		90.80	1.34E-02		4.48E-02
	Sb-125	176.31		6.84	2.02E-01	1.11E-01	4.44E-01
		380.45		1.52	-7.62E-02		2.14E+00
		427.87		29.60	3.21E-02		1.11E-01
		463.36		10.49	-2.02E-01		2.94E-01
		600.60		17.65	8.89E-02		2.16E-01
		606.71		4.98	1.78E+00		1.27E+00
		635.95		11.22	1.45E-01		3.63E-01

Analysis Report for 29-Oct-19-10030

L1-10206B-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.18E-01	1.11E-01	1.80E+00
Ba-133	79.61	2.65	9.90E-01	6.78E-02	3.25E+00
	81.00	32.90	-2.16E-02		2.23E-01
	276.40	7.16	9.58E-02		4.96E-01
	302.85	18.34	8.76E-02		1.78E-01
	356.01	62.05	-1.70E-02		6.78E-02
	383.85	8.94	6.06E-02		3.38E-01
Cs-134	475.36	1.48	-1.38E+00	4.58E-02	2.30E+00
	563.25	8.34	6.31E-02		3.88E-01
	569.33	15.37	2.11E-01		2.53E-01
	604.72	97.62	-4.75E-02		6.02E-02
	795.86	85.46	2.84E-03		4.58E-02
	801.95	8.69	-4.09E-01		3.96E-01
	1038.61	0.99	-1.48E+00		4.71E+00
	1167.97	1.79	3.80E-01		3.21E+00
	1365.19	3.02	-5.14E-01		1.29E+00
Cs-137	661.66	85.10	3.20E-02	5.68E-02	5.68E-02
Eu-152	121.78	28.67	-5.81E-03	1.12E-01	1.29E-01
	244.70	7.61	2.18E-01		4.74E-01
	295.94	0.45	-1.10E+00		8.50E+00
	344.28	26.60	-1.15E-01		1.12E-01
	367.79	0.86	2.83E+00		3.67E+00
	411.12	2.24	-7.06E-01		1.40E+00
	443.96	2.83	5.00E-02		1.22E+00
	488.68	0.42	3.63E+00		8.45E+00
	563.99	0.49	3.23E+00		6.81E+00
	586.26	0.46	1.25E+01		1.11E+01
	678.62	0.47	-1.46E+01		7.31E+00
	688.67	0.86	3.32E+00		4.80E+00
	719.35	0.28	-1.65E+01		1.18E+01
	778.90	12.96	-1.54E-01		3.03E-01
	810.45	0.32	1.24E+01		1.45E+01
	867.37	4.26	-1.62E+00		8.92E-01
	919.33	0.43	-1.36E+01		1.02E+01
	964.08	14.65	-3.02E-01		4.06E-01
	1085.87	10.24	-7.57E-02		4.68E-01
	1089.74	1.73	-1.27E+00		2.61E+00
	1112.07	13.69	-4.84E-01		3.49E-01
	1212.95	1.43	-2.04E+00		3.88E+00
	1249.94	0.19	1.82E+01		2.88E+01
	1299.14	1.63	-6.55E-01		3.50E+00
	1408.01	21.07	1.19E-01		2.49E-01
	1457.64	0.50	1.08E+02		3.61E+01
	1528.10	0.28	-2.12E+01		1.13E+01
Eu-154	123.07	40.40	1.88E-02	9.42E-02	9.42E-02
	247.93	6.89	-1.44E-01		4.58E-01
	591.76	4.95	-6.56E-02		6.98E-01
	692.42	1.78	-1.11E+00		2.08E+00
	723.30	20.06	1.52E-01		2.09E-01
	756.80	4.52	-6.35E-02		8.99E-01
	873.18	12.08	1.96E-02		3.23E-01

Analysis Report for 29-Oct-19-10030

L1-10206B-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	4.18E-02	9.42E-02	4.73E-01
	1004.76	18.01	5.14E-03		2.38E-01
	1274.43	34.80	-1.08E-01		1.30E-01
	1596.48	1.80	8.68E-01		2.72E+00
Eu-155	45.30	1.31	5.76E+00	1.75E-01	1.79E+01
	60.01	1.22	8.59E+00		1.95E+01
	86.55	30.70	-2.28E-02		1.99E-01
	105.31	21.10	-1.22E-01		1.75E-01
Ra-226	186.21	3.64	4.53E-01	9.09E-01	9.09E-01
Pa-231	27.36	10.30	1.19E+00	1.30E+00	2.00E+00
	283.69	1.70	-9.13E-01		1.89E+00
	300.07	2.47	-2.07E+00		1.30E+00
	302.65	2.20	1.36E+00		1.49E+00
	330.06	1.40	-7.95E-01		2.37E+00
U-235	143.76	10.96	-1.92E-01	5.73E-02	2.93E-01
	163.33	5.08	-2.10E-01		6.22E-01
	185.71	57.20	2.67E-02		5.73E-02
	202.11	1.08	-1.17E+00		2.70E+00
	205.31	5.01	-4.86E-01		5.68E-01
Am-241	59.54	35.90	3.77E-02	6.80E-01	6.80E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10031

L1-10206B-FSGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10031
Sample Description	: L1-10206B-FSGS-003SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.454E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:04:00PM
Acquisition Started	: 10/29/2019 11:32:35AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80817
Fill Height	: 1453.56 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 11:47:38AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10031

L1-10206B-FSGS-003SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.61	475 -	480	477.40	1.21E+02	15.76	6.97E+01	1.22
2	351.90	698 -	708	703.74	1.09E+02	13.79	3.42E+01	1.08
3	510.38	1016 -	1025	1020.45	4.78E+01	10.92	3.13E+01	1.11
4	583.10	1160 -	1169	1165.80	6.13E+01	10.33	1.97E+01	1.55
5	609.19	1215 -	1222	1217.97	8.29E+01	11.02	1.81E+01	1.51
6	661.65	1318 -	1327	1322.84	3.35E+01	9.02	2.05E+01	1.38
7	911.25	1818 -	1827	1821.94	5.37E+01	8.66	9.31E+00	1.27
8	1460.45	2914 -	2928	2920.96	2.91E+02	17.77	8.78E+00	1.36
9	1763.81	3525 -	3533	3528.48	1.58E+01	4.54	2.25E+00	1.39

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.94	511.00	*	100.00	4.92E-02	1.17E-02
K-40	0.97	1460.82	*	10.66	5.55E+00	4.16E-01
Cs-137	1.00	661.66	*	85.10	4.74E-02	1.31E-02
Tl-208	0.99	583.19	*	85.00	8.00E-02	1.43E-02
Bi-211	0.89	351.07	*	13.02	6.58E-01	9.89E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.72E-01	2.63E-02
		300.09		3.30		

Analysis Report for 29-Oct-19-10031

L1-10206B-FSGS-003SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.98	609.32	*	45.49	2.08E-01	3.03E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49	*	15.30	2.41E-01	7.02E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.51	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.41E-01	3.61E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.10E-01	5.17E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-Oct-19-10031

L1-10206B-FSGS-003SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.940	4.92E-02	1.17E-02	
	K-40	0.978	5.55E+00	4.16E-01	
	Cs-137	1.000	4.74E-02	1.31E-02	
	Tl-208	0.999	8.00E-02	1.43E-02	
?	Bi-211	0.896	6.58E-01	9.89E-02	
	Pb-212	1.000	1.72E-01	2.63E-02	
	Bi-214	0.989	2.13E-01	2.79E-02	
?	Pb-214	0.513	2.41E-01	3.61E-02	
	Ac-228	1.000	3.10E-01	5.17E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10031

L1-10206B-FSGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 11:47:38AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	4.92E-02	3.25E-02	3.25E-02
	BE-7	477.60		10.44	7.83E-02	3.37E-01	3.37E-01
+	K-40	1460.82	*	10.66	5.55E+00	3.76E-01	3.76E-01
	Mn-54	834.85		99.98	-1.32E-02	3.71E-02	3.71E-02
	Co-60	1173.23		99.85	4.72E-02	5.62E-02	6.33E-02
		1332.49		99.98	1.24E-02		5.62E-02
	Nb-94	702.65		99.81	1.44E-02	3.43E-02	3.55E-02
		871.09		99.89	2.96E-03		3.43E-02
	Ag-108m	79.13		6.60	3.63E-01	3.42E-02	1.09E+00
		433.94		90.50	1.06E-02		3.42E-02
		614.28		89.80	-6.60E-02		5.57E-02
		722.94		90.80	3.46E-02		4.98E-02
	Sb-125	176.31		6.84	1.83E-01	9.66E-02	4.66E-01
		380.45		1.52	5.96E-01		2.06E+00
		427.87		29.60	-3.70E-02		9.66E-02
		463.36		10.49	1.04E-01		3.34E-01
		600.60		17.65	1.53E-02		2.00E-01
		606.71		4.98	-1.91E+00		1.26E+00
		635.95		11.22	-1.69E-02		3.32E-01

Analysis Report for 29-Oct-19-10031

L1-10206B-FSGS-003SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-4.39E-03	9.66E-02	2.01E+00
	Ba-133	79.61		2.65	9.53E-01	7.10E-02	2.57E+00
		81.00		32.90	-1.26E-01		1.75E-01
		276.40		7.16	-2.82E-02		4.65E-01
		302.85		18.34	1.15E-01		1.85E-01
		356.01		62.05	-3.20E-02		7.10E-02
		383.85		8.94	-1.78E-01		3.22E-01
	Cs-134	475.36		1.48	1.84E-01	4.78E-02	2.25E+00
		563.25		8.34	1.65E-01		4.12E-01
		569.33		15.37	-1.74E-01		1.84E-01
		604.72		97.62	-1.39E-01		5.57E-02
		795.86		85.46	8.01E-03		4.78E-02
		801.95		8.69	-2.49E-01		3.28E-01
		1038.61		0.99	-3.12E+00		4.07E+00
		1167.97		1.79	1.98E+00		3.27E+00
		1365.19		3.02	3.08E-01		1.34E+00
+	Cs-137	661.66	*	85.10	4.74E-02	3.73E-02	3.73E-02
	Eu-152	121.78		28.67	-7.93E-03	1.09E-01	1.09E-01
		244.70		7.61	4.35E-02		4.49E-01
		295.94		0.45	6.35E+00		8.85E+00
		344.28		26.60	-1.07E-01		1.13E-01
		367.79		0.86	9.87E-01		3.53E+00
		411.12		2.24	7.56E-01		1.48E+00
		443.96		2.83	3.88E-01		1.18E+00
		488.68		0.42	9.41E-01		6.86E+00
		563.99		0.49	1.58E+00		6.91E+00
		586.26		0.46	-5.84E+00		1.22E+01
		678.62		0.47	-1.41E+00		7.34E+00
		688.67		0.86	2.04E+00		4.68E+00
		719.35		0.28	8.18E+00		1.44E+01
		778.90		12.96	5.22E-02		3.02E-01
		810.45		0.32	5.03E-01		1.17E+01
		867.37		4.26	-1.77E-01		8.03E-01
		919.33		0.43	-1.33E+00		8.32E+00
		964.08		14.65	8.83E-02		3.77E-01
		1085.87		10.24	1.10E-01		4.29E-01
		1089.74		1.73	1.36E+00		2.59E+00
		1112.07		13.69	-2.99E-01		3.00E-01
		1212.95		1.43	-9.40E-01		3.31E+00
		1249.94		0.19	-1.12E+01		2.40E+01
		1299.14		1.63	1.72E-01		2.39E+00
		1408.01		21.07	5.40E-02		1.83E-01
		1457.64		0.50	-1.63E+00		3.50E+01
		1528.10		0.28	-1.24E+00		1.09E+01
	Eu-154	123.07		40.40	6.74E-03	7.75E-02	7.75E-02
		247.93		6.89	-2.43E-01		4.30E-01
		591.76		4.95	-2.09E-01		6.69E-01
		692.42		1.78	-3.50E-01		2.13E+00
		723.30		20.06	1.73E-01		2.26E-01
		756.80		4.52	2.43E-01		8.74E-01
		873.18		12.08	-6.88E-02		2.78E-01

Analysis Report for 29-Oct-19-10031

L1-10206B-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-2.37E-01	7.75E-02	3.74E-01
	1004.76	18.01	-1.13E-02		2.41E-01
	1274.43	34.80	4.71E-02		1.42E-01
	1596.48	1.80	8.47E-01		1.88E+00
Eu-155	45.30	1.31	-3.83E+00	1.66E-01	1.05E+01
	60.01	1.22	-1.74E+00		1.21E+01
	86.55	30.70	-1.49E-03		1.66E-01
	105.31	21.10	3.22E-02		1.87E-01
Ra-226	186.21	3.64	5.91E-01	9.61E-01	9.61E-01
Pa-231	27.36	10.30	5.66E-01	1.07E+00	1.07E+00
	283.69	1.70	1.67E-01		1.91E+00
	300.07	2.47	-1.12E+00		1.40E+00
	302.65	2.20	9.62E-01		1.54E+00
	330.06	1.40	8.38E-01		2.53E+00
U-235	143.76	10.96	8.40E-03	6.07E-02	2.72E-01
	163.33	5.08	7.29E-02		6.95E-01
	185.71	57.20	4.10E-02		6.07E-02
	202.11	1.08	-2.05E+00		3.12E+00
	205.31	5.01	1.66E-01		7.12E-01
Am-241	59.54	35.90	3.98E-02	4.25E-01	4.25E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10032

L1-10206B-FSGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10032
Sample Description	: L1-10206B-FSGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.339E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:06:00PM
Acquisition Started	: 10/29/2019 11:32:41AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.3 seconds
Dead Time	: 0.15 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80818
Fill Height	: 1338.73 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 11:47:45AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10032

L1-10206B-FSGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.63	948 -	961	954.62	1.44E+02	18.72	7.48E+01	0.80
2	295.10	1174 -	1185	1180.31	4.10E+01	10.77	3.00E+01	1.03
3	351.98	1402 -	1411	1407.64	9.16E+01	11.84	2.14E+01	1.13
4	583.19	2324 -	2337	2331.96	4.17E+01	8.03	8.33E+00	0.51
5	609.06	2428 -	2444	2435.40	7.90E+01	11.51	1.70E+01	0.86
6	661.78	2640 -	2652	2646.22	3.88E+01	7.95	9.17E+00	1.05
7	910.88	3634 -	3649	3642.49	4.31E+01	7.42	3.91E+00	0.81
8	1460.26	5831 -	5850	5840.85	2.21E+02	15.78	7.70E+00	0.93

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.95	1460.82	*	10.66	5.76E+00	4.81E-01
Cs-137	0.99	661.66	*	85.10	7.33E-02	1.56E-02
Tl-208	1.00	583.19	*	85.00	7.22E-02	1.46E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.66E-01	4.06E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.63E-01	4.15E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 29-Oct-19-10032

L1-10206B-FSGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.02E-01	5.54E-02
		351.93	*	35.60	2.65E-01	4.03E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.34E-01	5.94E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-Oct-19-10032

L1-10206B-FSGS-004SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.950	5.76E+00	4.81E-01	
	Cs-137	0.998	7.33E-02	1.56E-02	
	Tl-208	1.000	7.22E-02	1.46E-02	
X	Bi-211	0.877			
	Pb-212	1.000	2.66E-01	4.06E-02	
	Bi-214	0.995	2.63E-01	4.15E-02	
	Pb-214	0.999	2.43E-01	3.26E-02	
	Ac-228	0.995	3.34E-01	5.94E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10032

L1-10206B-FSGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 11:47:45AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	8.11E-02	6.33E-02	6.33E-02
	BE-7	477.60		10.44	2.18E-01	4.65E-01	4.65E-01
+	K-40	1460.82	*	10.66	5.76E+00	5.40E-01	5.40E-01
	Mn-54	834.85		99.98	-2.40E-03	4.97E-02	4.97E-02
	Co-60	1173.23		99.85	2.72E-02	6.30E-02	7.34E-02
		1332.49		99.98	3.55E-02		6.30E-02
	Nb-94	702.65		99.81	-2.88E-02	4.61E-02	4.81E-02
		871.09		99.89	-7.22E-02		4.61E-02
	Ag-108m	79.13		6.60	2.68E+00	4.91E-02	2.10E+00
		433.94		90.50	2.25E-02		4.91E-02
		614.28		89.80	-4.11E-03		6.19E-02
		722.94		90.80	5.91E-02		5.95E-02
	Sb-125	176.31		6.84	4.93E-01	1.46E-01	6.28E-01
		380.45		1.52	-1.22E+00		2.47E+00
		427.87		29.60	3.72E-03		1.46E-01
		463.36		10.49	-5.98E-02		4.23E-01
		600.60		17.65	-6.60E-02		2.86E-01
		606.71		4.98	1.51E+00		1.66E+00
		635.95		11.22	4.57E-02		3.88E-01

Analysis Report for 29-Oct-19-10032

L1-10206B-FSGS-004SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	8.90E-01	1.46E-01	2.94E+00
	Ba-133	79.61		2.65	2.99E+00	9.10E-02	4.87E+00
		81.00		32.90	-4.49E-01		3.21E-01
		276.40		7.16	-5.23E-02		5.99E-01
		302.85		18.34	4.65E-02		2.35E-01
		356.01		62.05	-2.91E-01		9.10E-02
		383.85		8.94	-4.85E-02		4.52E-01
	Cs-134	475.36		1.48	1.45E+00	6.67E-02	3.21E+00
		563.25		8.34	-1.71E-01		5.03E-01
		569.33		15.37	3.16E-02		2.98E-01
		604.72		97.62	-3.18E-02		7.91E-02
		795.86		85.46	2.11E-02		6.67E-02
		801.95		8.69	-4.09E-01		4.90E-01
		1038.61		0.99	-6.42E-01		5.38E+00
		1167.97		1.79	3.39E+00		4.59E+00
		1365.19		3.02	3.13E-01		1.58E+00
+	Cs-137	661.66	*	85.10	7.33E-02	3.71E-02	3.71E-02
	Eu-152	121.78		28.67	6.63E-02	1.63E-01	1.68E-01
		244.70		7.61	2.58E-01		6.10E-01
		295.94		0.45	4.41E+00		1.11E+01
		344.28		26.60	-1.69E-02		1.63E-01
		367.79		0.86	-1.97E+00		4.83E+00
		411.12		2.24	7.28E-01		1.90E+00
		443.96		2.83	6.78E-01		1.52E+00
		488.68		0.42	1.88E+00		1.04E+01
		563.99		0.49	-7.36E+00		8.28E+00
		586.26		0.46	-3.24E+00		1.37E+01
		678.62		0.47	-5.63E+00		9.78E+00
		688.67		0.86	1.73E+00		6.80E+00
		719.35		0.28	1.03E+01		1.69E+01
		778.90		12.96	-2.37E-01		3.22E-01
		810.45		0.32	6.18E+00		1.43E+01
		867.37		4.26	5.72E-01		1.15E+00
		919.33		0.43	-5.65E+00		1.22E+01
		964.08		14.65	6.66E-01		5.77E-01
		1085.87		10.24	-4.53E-02		5.47E-01
		1089.74		1.73	1.15E+00		3.57E+00
		1112.07		13.69	-2.09E-01		4.33E-01
		1212.95		1.43	4.61E-01		5.25E+00
		1249.94		0.19	2.79E+01		4.04E+01
		1299.14		1.63	-1.71E+00		3.45E+00
		1408.01		21.07	-5.62E-02		2.21E-01
		1457.64		0.50	1.24E+02		4.24E+01
		1528.10		0.28	5.10E+00		1.39E+01
	Eu-154	123.07		40.40	6.63E-02	1.24E-01	1.24E-01
		247.93		6.89	2.08E-01		5.73E-01
		591.76		4.95	-3.08E-02		8.63E-01
		692.42		1.78	4.30E-02		3.49E+00
		723.30		20.06	1.62E-01		2.66E-01
		756.80		4.52	-1.08E-02		1.08E+00
		873.18		12.08	2.41E-02		4.24E-01

Analysis Report for 29-Oct-19-10032

L1-10206B-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-3.77E-02	1.24E-01	5.55E-01
	1004.76	18.01	2.73E-01		3.08E-01
	1274.43	34.80	-1.90E-04		1.72E-01
	1596.48	1.80	2.15E+00		3.34E+00
Eu-155	45.30	1.31	1.19E+00	2.80E-01	3.04E+01
	60.01	1.22	5.22E+00		3.39E+01
	86.55	30.70	1.37E-02		2.80E-01
	105.31	21.10	8.04E-02		2.94E-01
Ra-226	186.21	3.64	5.13E-01	1.20E+00	1.20E+00
Pa-231	27.36	10.30	3.46E+00	1.72E+00	3.75E+00
	283.69	1.70	-1.01E+00		2.20E+00
	300.07	2.47	-4.22E-02		1.72E+00
	302.65	2.20	1.98E-01		1.95E+00
	330.06	1.40	-1.03E+00		3.06E+00
U-235	143.76	10.96	1.64E-02	7.63E-02	4.38E-01
	163.33	5.08	8.78E-02		7.76E-01
	185.71	57.20	5.87E-02		7.63E-02
	202.11	1.08	-6.30E-01		3.93E+00
	205.31	5.01	-4.61E-01		8.35E-01
Am-241	59.54	35.90	-5.01E-01	1.19E+00	1.19E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10033

L1-10206B-FSGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10033
Sample Description	: L1-10206B-FSGS-005SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.397E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:08:00PM
Acquisition Started	: 10/29/2019 11:32:48AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.4 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80819
Fill Height	: 1396.78 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 11:47:58AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10033

L1-10206B-FSGS-005SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	186.30	739 -	752	745.07	7.47E+01	16.97	7.73E+01	1.18
M	2	238.87	948 -	974	955.07	2.47E+02	41.76	7.26E+01	0.99
m	3	242.20	948 -	974	968.37	4.68E+01	11.09	8.68E+01	0.99
	4	295.30	1173 -	1188	1180.47	8.53E+01	15.72	5.27E+01	0.96
	5	328.22	1306 -	1318	1311.99	1.90E+01	9.35	2.60E+01	0.75
	6	338.30	1347 -	1357	1352.26	2.99E+01	10.08	3.01E+01	0.60
	7	352.09	1402 -	1413	1407.35	1.43E+02	15.10	3.41E+01	1.31
	8	583.00	2322 -	2337	2330.13	6.80E+01	12.33	2.80E+01	1.39
	9	609.32	2430 -	2443	2435.32	1.06E+02	12.10	1.50E+01	1.09
	10	911.18	3634 -	3649	3642.19	6.10E+01	9.22	8.00E+00	0.41
	11	969.22	3870 -	3880	3874.30	1.90E+01	6.95	1.20E+01	0.44
	12	1460.41	5827 -	5851	5839.60	4.48E+02	21.76	6.25E+00	1.62

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82	*	10.66	1.03E+01	6.74E-01
Tl-208	0.99	583.19	*	85.00	1.05E-01	2.00E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	4.00E-01	7.49E-02
		300.09		3.30		

Analysis Report for 29-Oct-19-10033

L1-10206B-FSGS-005SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	609.32	*	45.49	3.15E-01	4.06E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	4.59E-01	1.15E-01
		295.22	*	18.42	3.72E-01	7.48E-02
		351.93	*	35.60	3.68E-01	4.87E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.27E+00	3.06E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00	*	2.95	5.60E-01	2.80E-01
		338.32	*	11.27	2.35E-01	8.18E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	4.21E-01	6.61E-02
		964.77		4.99		
		968.97	*	15.80	2.23E-01	8.23E-02
		1588.20		3.22		
U-235	0.96	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	8.08E-02	1.95E-02
		202.11		1.08		
		205.31		5.01		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10033

L1-10206B-FSGS-005SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.974	1.03E+01	6.74E-01	
	Tl-208	0.995	1.05E-01	2.00E-02	
	Pb-212	0.992	4.00E-01	7.49E-02	
	Bi-214	1.000	3.15E-01	4.06E-02	
	Pb-214	0.997	3.79E-01	3.85E-02	
?	Ra-226	0.999	1.27E+00	3.06E-01	
	Ac-228	0.998	3.18E-01	4.31E-02	
?	U-235	0.961	8.08E-02	1.95E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10033

L1-10206B-FSGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 11:47:58AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	8.18E-02	6.09E-02	6.09E-02
	BE-7	477.60		10.44	4.20E-02	4.17E-01	4.17E-01
+	K-40	1460.82	*	10.66	1.03E+01	4.64E-01	4.64E-01
	Mn-54	834.85		99.98	-1.31E-02	5.51E-02	5.51E-02
	Co-60	1173.23		99.85	5.26E-02	5.94E-02	8.38E-02
		1332.49		99.98	3.64E-02		5.94E-02
	Nb-94	702.65		99.81	-1.32E-03	4.54E-02	4.54E-02
		871.09		99.89	1.01E-02		5.46E-02
	Ag-108m	79.13		6.60	1.61E+00	4.64E-02	1.55E+00
		433.94		90.50	-4.73E-03		4.64E-02
		614.28		89.80	-1.43E-02		7.51E-02
		722.94		90.80	3.76E-02		6.54E-02
	Sb-125	176.31		6.84	-1.42E-01	1.35E-01	5.25E-01
		380.45		1.52	7.86E-01		2.82E+00
		427.87		29.60	4.76E-02		1.35E-01
		463.36		10.49	3.81E-02		4.19E-01
		600.60		17.65	1.46E-02		2.63E-01
		606.71		4.98	-1.13E+00		1.69E+00
		635.95		11.22	1.16E-02		3.88E-01

Analysis Report for 29-Oct-19-10033

L1-10206B-FSGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	5.89E-01	1.35E-01	2.24E+00
Ba-133	79.61	2.65	3.63E+00	8.94E-02	3.72E+00
	81.00	32.90	-4.89E-01		2.36E-01
	276.40	7.16	9.40E-02		5.48E-01
	302.85	18.34	1.16E-01		2.27E-01
	356.01	62.05	-1.23E-01		8.94E-02
	383.85	8.94	-2.73E-01		4.54E-01
Cs-134	475.36	1.48	9.25E-01	6.16E-02	2.86E+00
	563.25	8.34	-3.46E-01		5.65E-01
	569.33	15.37	1.50E-01		3.03E-01
	604.72	97.62	-9.37E-02		7.10E-02
	795.86	85.46	-5.44E-03		6.16E-02
	801.95	8.69	-1.68E-01		6.01E-01
	1038.61	0.99	-1.74E+00		5.64E+00
	1167.97	1.79	-3.37E+00		4.28E+00
	1365.19	3.02	1.01E+00		1.56E+00
Cs-137	661.66	85.10	1.98E-02	7.03E-02	7.03E-02
Eu-152	121.78	28.67	5.36E-02	1.43E-01	1.43E-01
	244.70	7.61	-9.20E-02		6.14E-01
	295.94	0.45	7.53E+00		1.20E+01
	344.28	26.60	1.89E-02		1.54E-01
	367.79	0.86	2.87E+00		4.15E+00
	411.12	2.24	-4.95E-01		1.97E+00
	443.96	2.83	3.39E-01		1.48E+00
	488.68	0.42	-1.48E+00		9.76E+00
	563.99	0.49	-8.69E+00		9.14E+00
	586.26	0.46	-2.69E+00		1.60E+01
	678.62	0.47	-3.86E+00		8.85E+00
	688.67	0.86	2.72E+00		5.06E+00
	719.35	0.28	8.57E+00		1.82E+01
	778.90	12.96	-6.50E-02		3.85E-01
	810.45	0.32	-6.05E+00		1.60E+01
	867.37	4.26	-8.60E-02		1.24E+00
	919.33	0.43	3.15E+00		1.22E+01
	964.08	14.65	-3.06E-01		5.40E-01
	1085.87	10.24	-3.08E-02		6.42E-01
	1089.74	1.73	-1.23E+00		3.48E+00
	1112.07	13.69	-1.28E-02		4.94E-01
	1212.95	1.43	-2.85E+00		5.76E+00
	1249.94	0.19	-4.33E+00		3.59E+01
	1299.14	1.63	-2.78E+00		4.11E+00
	1408.01	21.07	5.33E-02		2.29E-01
	1457.64	0.50	2.15E+02		5.16E+01
	1528.10	0.28	1.81E-01		1.23E+01
Eu-154	123.07	40.40	-2.05E-02	9.99E-02	9.99E-02
	247.93	6.89	3.19E-02		5.62E-01
	591.76	4.95	3.70E-02		9.18E-01
	692.42	1.78	4.63E-01		2.42E+00
	723.30	20.06	2.52E-01		2.98E-01
	756.80	4.52	8.60E-01		1.16E+00
	873.18	12.08	2.16E-01		4.52E-01

Analysis Report for 29-Oct-19-10033

L1-10206B-FSGS-005SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-1.35E-01	9.99E-02	6.33E-01
		1004.76		18.01	-2.96E-01		3.30E-01
		1274.43		34.80	5.12E-02		2.22E-01
		1596.48		1.80	1.21E+00		3.06E+00
	Eu-155	45.30		1.31	-6.22E+00	2.30E-01	1.31E+01
		60.01		1.22	9.37E+00		1.45E+01
		86.55		30.70	7.01E-02		2.31E-01
		105.31		21.10	-9.04E-02		2.30E-01
+	Ra-226	186.21	*	3.64	1.27E+00	8.91E-01	8.91E-01
	Pa-231	27.36		10.30	1.55E+00	1.51E+00	1.51E+00
		283.69		1.70	1.41E+00		2.14E+00
		300.07		2.47	2.38E-01		1.74E+00
		302.65		2.20	-3.75E-01		1.85E+00
		330.06		1.40	5.47E-01		2.97E+00
+	U-235	143.76		10.96	3.69E-02	5.67E-02	3.97E-01
		163.33		5.08	3.62E-03		7.50E-01
		185.71	*	57.20	8.08E-02		5.67E-02
		202.11		1.08	1.75E+00		3.54E+00
		205.31		5.01	-3.50E-01		7.35E-01
	Am-241	59.54		35.90	3.20E-01	5.14E-01	5.14E-01

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10034

L1-10206B-FQGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10034
Sample Description	: L1-10206B-FQGS-005SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.403E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:08:00PM
Acquisition Started	: 10/29/2019 12:02:41PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80821
Fill Height	: 1402.77 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 12:17:44PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10034

L1-10206B-FQGS-005SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.39	307 -	316	310.10	4.03E+01	15.56	8.77E+01	0.75
2	238.83	948 -	961	954.89	1.76E+02	20.88	9.27E+01	1.14
3	295.39	1173 -	1188	1180.86	7.20E+01	15.36	5.40E+01	1.10
4	352.14	1399 -	1414	1407.55	1.52E+02	16.30	3.79E+01	1.10
5	583.07	2322 -	2340	2330.39	9.78E+01	11.61	1.12E+01	0.44
6	609.11	2428 -	2443	2434.49	1.08E+02	12.82	1.90E+01	0.54
7	1460.40	5827 -	5851	5839.56	4.05E+02	20.43	3.09E+00	1.83

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.82	*	10.66	9.33E+00	6.21E-01
Tl-208	0.99	583.19	*	85.00	1.51E-01	2.00E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.85E-01	4.09E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	2.85E-01	1.14E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	3.20E-01	4.26E-02

Analysis Report for 29-Oct-19-10034

L1-10206B-FQGS-005SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	3.14E-01	7.15E-02
		351.93	*	35.60	3.91E-01	5.23E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	5.02E-01	2.02E-01
		87.35		2.24		
		89.78		0.82		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.972	9.33E+00	6.21E-01	
Tl-208	0.998	1.51E-01	2.00E-02	

Analysis Report for 29-Oct-19-10034

L1-10206B-FQGS-005SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	Pb-212	0.994	2.85E-01	4.09E-02	
?	Pb212-XR	0.993	2.85E-01	1.14E-01	
	Bi-214	0.997	3.20E-01	4.26E-02	
	Pb-214	0.995	3.64E-01	4.22E-02	
?	Pb214-XR	0.993	5.02E-01	2.02E-01	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10034

L1-10206B-FQGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 12:17:44PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.92E-02	5.93E-02	5.93E-02
	BE-7	477.60		10.44	6.65E-02	4.48E-01	4.48E-01
+	K-40	1460.82	*	10.66	9.33E+00	3.45E-01	3.45E-01
	Mn-54	834.85		99.98	2.26E-02	5.50E-02	5.50E-02
	Co-60	1173.23		99.85	-1.39E-02	5.70E-02	7.61E-02
		1332.49		99.98	-3.58E-02		5.70E-02
	Nb-94	702.65		99.81	-2.06E-03	4.66E-02	4.66E-02
		871.09		99.89	-1.11E-02		5.72E-02
	Ag-108m	79.13		6.60	-1.09E-01	4.44E-02	1.26E+00
		433.94		90.50	-2.60E-02		4.44E-02
		614.28		89.80	-2.04E-02		7.19E-02
		722.94		90.80	6.18E-02		6.48E-02
	Sb-125	176.31		6.84	9.47E-02	1.39E-01	5.45E-01
		380.45		1.52	7.18E-01		2.58E+00
		427.87		29.60	-1.21E-02		1.39E-01
		463.36		10.49	2.31E-01		4.15E-01
		600.60		17.65	2.58E-01		2.49E-01
		606.71		4.98	-4.93E-01		1.66E+00
		635.95		11.22	-1.97E-01		3.50E-01

Analysis Report for 29-Oct-19-10034

L1-10206B-FQGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.02E+00	1.39E-01	2.58E+00
Ba-133	79.61	2.65	-1.47E-01	9.30E-02	3.14E+00
	81.00	32.90	-5.24E-02		2.12E-01
	276.40	7.16	1.51E-01		5.50E-01
	302.85	18.34	1.91E-02		2.18E-01
	356.01	62.05	-5.72E-03		9.30E-02
	383.85	8.94	-8.47E-02		4.26E-01
Cs-134	475.36	1.48	1.62E+00	6.15E-02	3.19E+00
	563.25	8.34	2.74E-02		6.14E-01
	569.33	15.37	2.81E-01		3.14E-01
	604.72	97.62	-2.44E-02		7.32E-02
	795.86	85.46	-6.98E-03		6.15E-02
	801.95	8.69	1.52E-01		5.78E-01
	1038.61	0.99	-7.23E-01		5.72E+00
	1167.97	1.79	-4.47E-01		4.19E+00
	1365.19	3.02	-4.77E-01		1.51E+00
Cs-137	661.66	85.10	2.34E-02	7.82E-02	7.82E-02
Eu-152	121.78	28.67	5.90E-02	1.33E-01	1.33E-01
	244.70	7.61	3.32E-01		5.76E-01
	295.94	0.45	1.22E+01		1.18E+01
	344.28	26.60	-9.40E-03		1.42E-01
	367.79	0.86	5.30E-02		4.45E+00
	411.12	2.24	-2.73E-01		1.97E+00
	443.96	2.83	-9.37E-01		1.52E+00
	488.68	0.42	3.44E-01		9.65E+00
	563.99	0.49	-6.11E+00		9.93E+00
	586.26	0.46	-1.14E+00		1.63E+01
	678.62	0.47	-4.76E+00		8.84E+00
	688.67	0.86	2.14E+00		5.13E+00
	719.35	0.28	-8.70E+00		1.60E+01
	778.90	12.96	-3.58E-02		3.48E-01
	810.45	0.32	-2.74E+00		1.55E+01
	867.37	4.26	-1.63E+00		1.00E+00
	919.33	0.43	-1.06E+01		1.12E+01
	964.08	14.65	1.73E-01		5.42E-01
	1085.87	10.24	2.83E-01		6.34E-01
	1089.74	1.73	8.56E-01		3.71E+00
	1112.07	13.69	-4.14E-01		3.99E-01
	1212.95	1.43	-2.34E+00		5.40E+00
	1249.94	0.19	-5.90E+00		3.44E+01
	1299.14	1.63	1.84E+00		3.79E+00
	1408.01	21.07	-1.61E-01		2.63E-01
	1457.64	0.50	2.02E+02		4.90E+01
	1528.10	0.28	9.03E+00		1.63E+01
Eu-154	123.07	40.40	1.01E-02	9.46E-02	9.46E-02
	247.93	6.89	-2.21E-01		5.27E-01
	591.76	4.95	7.29E-02		8.46E-01
	692.42	1.78	1.37E+00		2.62E+00
	723.30	20.06	3.20E-01		2.98E-01
	756.80	4.52	8.57E-01		1.08E+00
	873.18	12.08	4.26E-01		5.10E-01

Analysis Report for 29-Oct-19-10034

L1-10206B-FQGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-5.86E-02	9.46E-02	5.41E-01
	1004.76	18.01	3.94E-02		3.42E-01
	1274.43	34.80	-1.22E-01		1.94E-01
	1596.48	1.80	-1.16E+00		2.86E+00
Eu-155	45.30	1.31	-1.38E+00	2.13E-01	1.31E+01
	60.01	1.22	1.34E+00		1.54E+01
	86.55	30.70	-1.74E-02		2.19E-01
	105.31	21.10	-4.67E-02		2.13E-01
Ra-226	186.21	3.64	5.51E-01	1.14E+00	1.14E+00
Pa-231	27.36	10.30	8.96E-01	1.34E+00	1.34E+00
	283.69	1.70	-8.64E-01		2.01E+00
	300.07	2.47	7.06E-01		1.74E+00
	302.65	2.20	7.67E-01		1.84E+00
	330.06	1.40	1.01E+00		2.97E+00
U-235	143.76	10.96	9.29E-04	7.39E-02	3.34E-01
	163.33	5.08	5.32E-02		7.23E-01
	185.71	57.20	7.39E-02		7.39E-02
	202.11	1.08	1.27E+00		3.35E+00
	205.31	5.01	-2.96E-01		7.11E-01
Am-241	59.54	35.90	1.09E-01	5.40E-01	5.40E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10035

L1-10206B-FSGS-006SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10035
Sample Description	: L1-10206B-FSGS-006SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.423E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:10:00PM
Acquisition Started	: 10/29/2019 11:32:56AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80820
Fill Height	: 1423.44 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 11:48:17AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10035

L1-10206B-FSGS-006SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	185.78	740 -	751	743.86	5.66E+01	14.78	6.24E+01	0.82
M	2	238.64	948 -	972	955.02	1.64E+02	37.89	6.06E+01	0.96
m	3	241.80	948 -	972	967.64	3.40E+01	10.48	6.36E+01	0.97
	4	295.19	1173 -	1188	1180.99	8.23E+01	13.97	3.77E+01	1.02
	5	338.16	1345 -	1359	1352.67	4.34E+01	12.18	3.56E+01	1.20
	6	351.84	1400 -	1415	1407.34	1.11E+02	13.42	2.33E+01	1.05
	7	510.88	2037 -	2048	2043.01	3.44E+01	10.67	3.16E+01	0.43
	8	583.26	2325 -	2340	2332.37	7.64E+01	10.24	9.56E+00	1.36
	9	609.43	2429 -	2444	2436.98	9.10E+01	11.80	1.60E+01	1.56
	10	661.82	2640 -	2653	2646.45	3.40E+01	9.30	1.90E+01	0.75
	11	911.04	3636 -	3650	3643.20	4.51E+01	9.68	1.69E+01	1.31
	12	1120.12	4473 -	4485	4479.77	2.08E+01	6.58	8.16E+00	0.55
	13	1460.72	5830 -	5854	5843.26	4.07E+02	21.15	9.53E+00	2.06

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	3.96E-02	1.25E-02
K-40	0.99	1460.82	*	10.66	8.71E+00	5.90E-01
Cs-137	0.99	661.66	*	85.10	5.37E-02	1.50E-02
Tl-208	0.99	583.19	*	85.00	1.11E-01	1.63E-02

Analysis Report for 29-Oct-19-10035

L1-10206B-FSGS-006SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.60E-01	6.37E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.55E-01	3.64E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	2.66E-01	8.45E-02
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	3.26E-01	1.04E-01
		295.22	*	18.42	3.47E-01	6.52E-02
		351.93	*	35.60	2.73E-01	3.97E-02
		785.96		1.06		
Ra-226	0.97	186.21	*	3.64	9.62E-01	2.63E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	3.29E-01	9.62E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.91E-01	6.36E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	6.12E-02	1.68E-02
		202.11		1.08		
		205.31		5.01		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10035

L1-10206B-FSGS-006SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.998	3.96E-02	1.25E-02	
	K-40	0.998	8.71E+00	5.90E-01	
	Cs-137	0.996	5.37E-02	1.50E-02	
	Tl-208	0.999	1.11E-01	1.63E-02	
X	Bi-211	0.911			
	Pb-212	1.000	2.60E-01	6.37E-02	
	Bi-214	0.999	2.56E-01	3.34E-02	
	Pb-214	0.998	2.97E-01	3.23E-02	
?	Ra-226	0.971	9.62E-01	2.63E-01	
	Ac-228	0.998	3.02E-01	5.31E-02	
?	U-235	0.999	6.12E-02	1.68E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10035

L1-10206B-FSGS-006SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 11:48:17AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	3.96E-02	3.80E-02	3.80E-02
	BE-7	477.60		10.44	2.33E-02	4.40E-01	4.40E-01
+	K-40	1460.82	*	10.66	8.71E+00	5.20E-01	5.20E-01
	Mn-54	834.85		99.98	-1.89E-02	5.56E-02	5.56E-02
	Co-60	1173.23		99.85	-8.72E-02	6.30E-02	6.87E-02
		1332.49		99.98	5.84E-04		6.30E-02
	Nb-94	702.65		99.81	-1.57E-02	4.65E-02	4.65E-02
		871.09		99.89	-1.69E-02		5.23E-02
	Ag-108m	79.13		6.60	6.40E-01	4.32E-02	1.71E+00
		433.94		90.50	-2.97E-02		4.32E-02
		614.28		89.80	-1.99E-02		7.90E-02
		722.94		90.80	1.26E-02		5.72E-02
	Sb-125	176.31		6.84	-2.14E-01	1.35E-01	5.44E-01
		380.45		1.52	1.96E+00		2.62E+00
		427.87		29.60	7.29E-02		1.35E-01
		463.36		10.49	1.01E-01		4.15E-01
		600.60		17.65	-5.36E-02		2.58E-01
		606.71		4.98	3.23E+00		1.52E+00
		635.95		11.22	2.81E-02		3.74E-01

Analysis Report for 29-Oct-19-10035

L1-10206B-FSGS-006SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	1.56E-01	1.35E-01	2.74E+00
	Ba-133	79.61		2.65	3.74E+00	8.14E-02	4.19E+00
		81.00		32.90	-3.96E-01		2.85E-01
		276.40		7.16	-2.05E-01		5.28E-01
		302.85		18.34	1.32E-01		2.17E-01
		356.01		62.05	-2.66E-02		8.14E-02
		383.85		8.94	6.33E-02		4.34E-01
	Cs-134	475.36		1.48	9.62E-01	5.97E-02	3.09E+00
		563.25		8.34	-1.44E-01		5.44E-01
		569.33		15.37	1.08E-01		2.84E-01
		604.72		97.62	-2.91E-02		6.97E-02
		795.86		85.46	1.90E-02		5.97E-02
		801.95		8.69	-6.67E-01		5.27E-01
		1038.61		0.99	3.04E-01		6.08E+00
		1167.97		1.79	3.55E-01		3.86E+00
		1365.19		3.02	7.91E-01		1.35E+00
+	Cs-137	661.66	*	85.10	5.37E-02	4.34E-02	4.34E-02
	Eu-152	121.78		28.67	-6.59E-02	1.45E-01	1.51E-01
		244.70		7.61	-2.94E-01		5.59E-01
		295.94		0.45	6.99E+00		1.15E+01
		344.28		26.60	-2.54E-02		1.45E-01
		367.79		0.86	3.16E+00		4.59E+00
		411.12		2.24	-1.03E+00		1.75E+00
		443.96		2.83	-1.29E+00		1.38E+00
		488.68		0.42	2.43E+00		8.71E+00
		563.99		0.49	2.53E+00		9.64E+00
		586.26		0.46	1.09E+01		1.41E+01
		678.62		0.47	4.13E+00		1.05E+01
		688.67		0.86	4.28E-01		5.09E+00
		719.35		0.28	-6.11E+00		1.55E+01
		778.90		12.96	-7.10E-01		3.75E-01
		810.45		0.32	-1.40E+01		1.50E+01
		867.37		4.26	-1.68E+00		1.18E+00
		919.33		0.43	-1.65E+01		1.01E+01
		964.08		14.65	3.97E-01		5.13E-01
		1085.87		10.24	-1.86E-01		5.69E-01
		1089.74		1.73	1.93E+00		3.51E+00
		1112.07		13.69	-8.22E-02		4.54E-01
		1212.95		1.43	-4.00E+00		4.55E+00
		1249.94		0.19	2.77E+00		3.71E+01
		1299.14		1.63	1.06E+00		3.40E+00
		1408.01		21.07	-7.12E-02		2.26E-01
		1457.64		0.50	1.92E+02		4.62E+01
		1528.10		0.28	7.53E+00		1.44E+01
	Eu-154	123.07		40.40	-1.03E-02	1.10E-01	1.10E-01
		247.93		6.89	-6.21E-01		5.01E-01
		591.76		4.95	7.19E-01		9.20E-01
		692.42		1.78	1.37E+00		2.37E+00
		723.30		20.06	2.21E-01		2.66E-01
		756.80		4.52	-2.74E-02		1.02E+00
		873.18		12.08	4.46E-01		4.43E-01

Analysis Report for 29-Oct-19-10035

L1-10206B-FSGS-006SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-2.35E-01	1.10E-01	5.39E-01
		1004.76		18.01	2.66E-01		3.31E-01
		1274.43		34.80	1.20E-01		1.71E-01
		1596.48		1.80	-3.04E+00		2.99E+00
	Eu-155	45.30		1.31	-1.39E+01	2.43E-01	2.35E+01
		60.01		1.22	6.66E+00		2.46E+01
		86.55		30.70	-6.47E-02		2.58E-01
		105.31		21.10	9.24E-02		2.43E-01
+	Ra-226	186.21	*	3.64	9.62E-01	7.83E-01	7.83E-01
	Pa-231	27.36		10.30	6.69E-01	1.66E+00	2.49E+00
		283.69		1.70	2.14E-02		2.22E+00
		300.07		2.47	1.21E-01		1.66E+00
		302.65		2.20	4.07E-01		1.79E+00
		330.06		1.40	-7.13E-01		2.70E+00
+	U-235	143.76		10.96	-7.89E-02	4.98E-02	3.74E-01
		163.33		5.08	5.39E-01		8.07E-01
		185.71	*	57.20	6.12E-02		4.98E-02
		202.11		1.08	-9.17E-01		3.77E+00
		205.31		5.01	-9.52E-01		7.96E-01
	Am-241	59.54		35.90	1.62E-01	8.58E-01	8.58E-01

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10036

L1-10206B-FSGS-007SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10036
Sample Description	: L1-10206B-FSGS-007SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.471E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:12:00PM
Acquisition Started	: 10/29/2019 1:04:43PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.7 seconds
Dead Time	: 0.19 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80833
Fill Height	: 1470.80 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 1:19:47PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 [111] 10-30-19

Analysis Report for 29-Oct-19-10036

L1-10206B-FSGS-007SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.33	306 -	314	310.03	2.95E+01	13.76	7.45E+01	0.65
2	238.63	949 -	961	954.61	1.87E+02	20.10	8.16E+01	0.85
3	295.24	1174 -	1188	1180.86	9.17E+01	14.52	4.03E+01	0.72
4	338.29	1348 -	1358	1352.94	3.30E+01	10.12	2.90E+01	0.45
5	351.82	1401 -	1416	1407.01	1.51E+02	15.94	3.44E+01	1.01
6	582.96	2323 -	2340	2331.05	7.45E+01	12.42	2.45E+01	1.00
7	609.03	2428 -	2443	2435.30	8.40E+01	11.50	1.60E+01	0.89
8	661.47	2640 -	2649	2644.96	1.70E+01	7.15	1.50E+01	0.35
9	910.74	3634 -	3650	3641.91	6.47E+01	9.19	6.34E+00	1.49
10	968.51	3868 -	3879	3873.02	2.64E+01	7.79	1.36E+01	0.46
11	1460.29	5830 -	5851	5840.98	4.07E+02	20.67	5.50E+00	1.55

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.95	1460.82	*	10.66	1.03E+01	6.86E-01
Cs-137	0.99	661.66	*	85.10	3.12E-02	1.33E-02
Tl-208	0.99	583.19	*	85.00	1.26E-01	2.23E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	3.38E-01	4.53E-02
		300.09		3.30		

Analysis Report for 29-Oct-19-10036

L1-10206B-FSGS-007SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	3.59E-01	1.71E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.73E-01	4.08E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	4.41E-01	7.82E-02
		351.93	*	35.60	4.25E-01	5.64E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	6.33E-01	3.04E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.98	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	2.86E-01	9.08E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	4.87E-01	7.24E-02
		964.77		4.99		
		968.97	*	15.80	3.39E-01	1.01E-01
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10036

L1-10206B-FSGS-007SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.955	1.03E+01	6.86E-01	
	Cs-137	0.994	3.12E-02	1.33E-02	
	Tl-208	0.992	1.26E-01	2.23E-02	
X	Bi-211	0.914			
	Pb-212	1.000	3.38E-01	4.53E-02	
?	Pb212-XR	0.996	3.59E-01	1.71E-01	
	Bi-214	0.995	2.73E-01	4.08E-02	
	Pb-214	0.999	4.30E-01	4.57E-02	
?	Pb214-XR	0.996	6.33E-01	3.04E-01	
	Ac-228	0.983	3.92E-01	4.94E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10036

L1-10206B-FSGS-007SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 1:19:47PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	8.13E-02	7.04E-02	7.04E-02
	BE-7	477.60		10.44	6.56E-02	4.92E-01	4.92E-01
+	K-40	1460.82	*	10.66	1.03E+01	4.61E-01	4.61E-01
	Mn-54	834.85		99.98	1.55E-02	5.50E-02	5.50E-02
	Co-60	1173.23		99.85	-1.74E-02	6.49E-02	7.30E-02
		1332.49		99.98	-5.16E-02		6.49E-02
	Nb-94	702.65		99.81	1.38E-02	5.29E-02	5.29E-02
		871.09		99.89	-2.12E-02		5.41E-02
	Ag-108m	79.13		6.60	-2.72E-01	4.79E-02	2.02E+00
		433.94		90.50	-2.79E-02		4.79E-02
		614.28		89.80	2.54E-04		6.97E-02
		722.94		90.80	4.40E-02		7.43E-02
	Sb-125	176.31		6.84	7.77E-03	1.54E-01	6.93E-01
		380.45		1.52	1.57E+00		2.96E+00
		427.87		29.60	-6.37E-02		1.54E-01
		463.36		10.49	-3.67E-01		4.52E-01
		600.60		17.65	1.79E-01		2.78E-01
		606.71		4.98	1.54E+00		1.66E+00
		635.95		11.22	2.62E-01		4.66E-01

Analysis Report for 29-Oct-19-10036

L1-10206B-FSGS-007SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-2.04E+00	1.54E-01	3.00E+00
	Ba-133	79.61		2.65	-4.09E-01	9.37E-02	4.86E+00
		81.00		32.90	-3.62E-01		3.22E-01
		276.40		7.16	-5.00E-02		6.09E-01
		302.85		18.34	-6.39E-02		2.37E-01
		356.01		62.05	1.59E-02		9.37E-02
		383.85		8.94	-3.05E-01		4.68E-01
	Cs-134	475.36		1.48	7.95E-01	6.22E-02	3.32E+00
		563.25		8.34	-3.15E-01		5.04E-01
		569.33		15.37	6.70E-02		2.87E-01
		604.72		97.62	-2.44E-02		8.08E-02
		795.86		85.46	1.45E-02		6.22E-02
		801.95		8.69	-3.89E-01		5.20E-01
		1038.61		0.99	-8.30E+00		6.80E+00
		1167.97		1.79	1.67E+00		4.45E+00
		1365.19		3.02	-1.46E+00		1.92E+00
+	Cs-137	661.66	*	85.10	3.12E-02	4.17E-02	4.17E-02
	Eu-152	121.78		28.67	-1.91E-02	1.55E-01	1.81E-01
		244.70		7.61	4.85E-01		6.89E-01
		295.94		0.45	4.77E+00		1.31E+01
		344.28		26.60	-2.90E-02		1.55E-01
		367.79		0.86	2.31E+00		5.18E+00
		411.12		2.24	1.48E+00		2.29E+00
		443.96		2.83	-1.92E-01		1.58E+00
		488.68		0.42	-2.03E+00		1.17E+01
		563.99		0.49	-4.50E+00		9.03E+00
		586.26		0.46	3.21E+00		1.67E+01
		678.62		0.47	-6.51E+00		1.12E+01
		688.67		0.86	9.35E-02		5.92E+00
		719.35		0.28	-8.25E+00		2.01E+01
		778.90		12.96	3.86E-02		3.80E-01
		810.45		0.32	3.38E+00		1.68E+01
		867.37		4.26	-1.96E+00		1.26E+00
		919.33		0.43	3.14E+00		1.27E+01
		964.08		14.65	1.81E-01		6.31E-01
		1085.87		10.24	3.13E-03		6.13E-01
		1089.74		1.73	1.68E+00		4.01E+00
		1112.07		13.69	-4.37E-02		5.33E-01
		1212.95		1.43	-2.59E+00		5.85E+00
		1249.94		0.19	3.75E+01		4.59E+01
		1299.14		1.63	1.55E+00		3.93E+00
		1408.01		21.07	1.29E-01		2.81E-01
		1457.64		0.50	2.25E+02		5.41E+01
		1528.10		0.28	-9.54E+00		1.86E+01
	Eu-154	123.07		40.40	-6.81E-02	1.28E-01	1.28E-01
		247.93		6.89	-8.66E-03		6.46E-01
		591.76		4.95	-3.60E-01		8.26E-01
		692.42		1.78	9.28E-01		2.60E+00
		723.30		20.06	1.38E-01		3.29E-01
		756.80		4.52	-1.03E+00		1.18E+00
		873.18		12.08	1.33E-01		4.62E-01

Analysis Report for 29-Oct-19-10036

L1-10206B-FSGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.94E-01	1.28E-01	5.75E-01
	1004.76	18.01	-1.42E-02		3.51E-01
	1274.43	34.80	1.39E-02		2.19E-01
	1596.48	1.80	-3.93E+00		2.64E+00
Eu-155	45.30	1.31	1.50E+01	3.08E-01	3.93E+01
	60.01	1.22	1.01E+01		3.51E+01
	86.55	30.70	2.90E-01		3.37E-01
	105.31	21.10	-1.13E-02		3.08E-01
Ra-226	186.21	3.64	9.13E-02	1.31E+00	1.31E+00
Pa-231	27.36	10.30	3.48E+00	1.87E+00	4.08E+00
	283.69	1.70	1.53E+00		2.71E+00
	300.07	2.47	1.03E+00		1.87E+00
	302.65	2.20	-2.19E-01		2.00E+00
	330.06	1.40	2.25E+00		3.69E+00
U-235	143.76	10.96	-2.74E-01	8.36E-02	4.57E-01
	163.33	5.08	1.68E-01		9.23E-01
	185.71	57.20	3.23E-02		8.36E-02
	202.11	1.08	9.40E-01		4.37E+00
	205.31	5.01	-9.88E-01		9.19E-01
Am-241	59.54	35.90	-2.39E-01	1.21E+00	1.21E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10037

L1-10206B-FSGS-008SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10037
Sample Description	: L1-10206B-FSGS-008SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.457E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:14:00PM
Acquisition Started	: 10/29/2019 12:02:55PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.7 seconds
Dead Time	: 0.19 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80823
Fill Height	: 1456.99 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 12:18:05PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10037

L1-10206B-FSGS-008SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.82	293 -	313	300.02	4.00E+01	8.86	6.53E+01	0.52
m	2	77.11	293 -	313	309.16	3.63E+01	8.55	5.89E+01	0.53
	3	186.05	736 -	748	744.50	6.61E+01	18.08	9.89E+01	1.09
	4	238.58	946 -	960	954.40	1.76E+02	21.72	1.03E+02	0.44
	5	295.23	1175 -	1187	1180.81	7.12E+01	13.38	4.08E+01	1.31
	6	338.30	1347 -	1360	1352.96	4.69E+01	12.55	4.01E+01	1.06
	7	351.89	1400 -	1412	1407.31	1.38E+02	14.84	3.11E+01	1.08
	8	582.89	2324 -	2338	2330.75	6.72E+01	11.29	2.08E+01	1.09
	9	609.18	2428 -	2442	2435.88	1.17E+02	12.89	1.69E+01	1.41
	10	911.06	3634 -	3651	3643.21	6.34E+01	10.41	1.36E+01	0.46
	11	968.64	3868 -	3879	3873.55	2.04E+01	6.29	7.56E+00	0.54
	12	1460.33	5829 -	5853	5841.14	4.22E+02	21.16	6.25E+00	1.65
	13	1763.88	7050 -	7063	7056.52	2.01E+01	5.06	1.86E+00	0.27

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82	*	10.66	1.07E+01	7.08E-01
Tl-208	0.98	583.19	*	85.00	1.14E-01	2.03E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	3.17E-01	4.69E-02

Analysis Report for 29-Oct-19-10037

L1-10206B-FSGS-008SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	1.00	300.09		3.30		
Pb212-XR	1.00	74.82	*	10.28	9.31E-01	2.27E-01
		77.11	*	17.10	4.47E-01	1.15E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	3.81E-01	4.78E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49	*	15.30	4.11E-01	1.05E-01
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	3.43E-01	7.00E-02
		351.93	*	35.60	3.90E-01	5.23E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.27E+00	3.63E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	4.08E-01	1.14E-01
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	4.79E-01	8.13E-02
		964.77		4.99		
		968.97	*	15.80	2.63E-01	8.17E-02
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	8.11E-02	2.31E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 29-Oct-19-10037

L1-10206B-FSGS-008SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.962	1.07E+01	7.08E-01	
	Tl-208	0.986	1.14E-01	2.03E-02	
X	Bi-211	0.897			
	Pb-212	1.000	3.17E-01	4.69E-02	
	Pb212-XR	1.000	5.46E-01	1.03E-01	
	Bi-214	0.990	3.86E-01	4.35E-02	
	Pb-214	1.000	3.73E-01	4.19E-02	
X	Pb214-XR	1.000			
?	Ra-226	0.996	1.27E+00	3.63E-01	
	Ac-228	0.996	3.79E-01	5.14E-02	
?	U-235	0.987	8.11E-02	2.31E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10037

L1-10206B-FSGS-008SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 12:18:05PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.67E-02	6.87E-02	6.87E-02
	BE-7	477.60		10.44	3.39E-01	4.97E-01	4.97E-01
+	K-40	1460.82	*	10.66	1.07E+01	5.09E-01	5.09E-01
	Mn-54	834.85		99.98	3.35E-02	6.70E-02	6.70E-02
	Co-60	1173.23		99.85	6.13E-02	6.87E-02	8.59E-02
		1332.49		99.98	-1.58E-02		6.87E-02
	Nb-94	702.65		99.81	4.27E-02	5.24E-02	5.24E-02
		871.09		99.89	1.17E-02		6.27E-02
	Ag-108m	79.13		6.60	2.95E-01	5.13E-02	2.17E+00
		433.94		90.50	8.40E-03		5.13E-02
		614.28		89.80	-5.67E-02		7.32E-02
		722.94		90.80	-2.60E-02		6.80E-02
	Sb-125	176.31		6.84	3.67E-01	1.71E-01	7.05E-01
		380.45		1.52	2.98E+00		3.20E+00
		427.87		29.60	-8.61E-02		1.71E-01
		463.36		10.49	-1.57E-01		4.64E-01
		600.60		17.65	-3.94E-02		3.30E-01
		606.71		4.98	4.59E+00		1.95E+00
		635.95		11.22	-5.84E-02		4.57E-01

Analysis Report for 29-Oct-19-10037

L1-10206B-FSGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.02E+00	1.71E-01	2.62E+00
Ba-133	79.61	2.65	1.72E+00	9.63E-02	5.29E+00
	81.00	32.90	-1.67E-01		3.75E-01
	276.40	7.16	-2.00E-01		6.72E-01
	302.85	18.34	9.80E-02		2.67E-01
	356.01	62.05	-1.91E-01		9.63E-02
	383.85	8.94	-1.75E-01		5.09E-01
Cs-134	475.36	1.48	1.79E+00	6.58E-02	3.51E+00
	563.25	8.34	2.66E-01		6.63E-01
	569.33	15.37	5.60E-02		3.60E-01
	604.72	97.62	-1.39E-02		9.06E-02
	795.86	85.46	2.60E-02		6.58E-02
	801.95	8.69	6.99E-01		6.34E-01
	1038.61	0.99	-8.13E+00		5.35E+00
	1167.97	1.79	-2.78E+00		4.37E+00
	1365.19	3.02	1.27E+00		1.82E+00
Cs-137	661.66	85.10	4.14E-03	6.84E-02	6.84E-02
Eu-152	121.78	28.67	-1.26E-02	1.78E-01	1.88E-01
	244.70	7.61	-3.95E-02		6.84E-01
	295.94	0.45	-4.72E+00		1.26E+01
	344.28	26.60	7.27E-02		1.78E-01
	367.79	0.86	2.87E+00		5.46E+00
	411.12	2.24	4.36E-01		2.06E+00
	443.96	2.83	-1.64E-01		1.77E+00
	488.68	0.42	5.62E+00		1.15E+01
	563.99	0.49	1.94E+00		1.12E+01
	586.26	0.46	-7.61E+00		1.70E+01
	678.62	0.47	-2.57E+00		9.54E+00
	688.67	0.86	-1.55E-01		6.43E+00
	719.35	0.28	-6.75E+00		1.86E+01
	778.90	12.96	-2.24E-01		4.48E-01
	810.45	0.32	1.15E+01		1.63E+01
	867.37	4.26	-1.62E+00		1.34E+00
	919.33	0.43	6.37E+00		1.43E+01
	964.08	14.65	2.80E-01		5.87E-01
	1085.87	10.24	-2.50E-01		6.78E-01
	1089.74	1.73	1.46E+00		3.97E+00
	1112.07	13.69	-4.22E-01		5.02E-01
	1212.95	1.43	3.09E-01		5.68E+00
	1249.94	0.19	6.05E+00		4.38E+01
	1299.14	1.63	1.41E+00		4.30E+00
	1408.01	21.07	-1.38E-03		2.89E-01
	1457.64	0.50	2.34E+02		5.52E+01
	1528.10	0.28	9.91E+00		1.79E+01
Eu-154	123.07	40.40	3.01E-02	1.34E-01	1.34E-01
	247.93	6.89	7.44E-03		6.57E-01
	591.76	4.95	-4.99E-01		1.04E+00
	692.42	1.78	5.16E-01		3.05E+00
	723.30	20.06	1.11E-01		3.22E-01
	756.80	4.52	6.57E-01		1.30E+00
	873.18	12.08	4.92E-01		5.31E-01

Analysis Report for 29-Oct-19-10037

L1-10206B-FSGS-008SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	1.01E-01	1.34E-01	6.57E-01
		1004.76		18.01	1.45E-02		3.62E-01
		1274.43		34.80	-6.72E-02		2.07E-01
		1596.48		1.80	-1.50E+00		2.90E+00
	Eu-155	45.30		1.31	1.26E+01	3.34E-01	3.88E+01
		60.01		1.22	1.57E+01		3.97E+01
		86.55		30.70	9.85E-03		3.34E-01
		105.31		21.10	5.64E-02		3.34E-01
+	Ra-226	186.21	*	3.64	1.27E+00	1.11E+00	1.11E+00
	Pa-231	27.36		10.30	3.62E+00	1.89E+00	4.06E+00
		283.69		1.70	9.52E-01		2.81E+00
		300.07		2.47	-1.99E-01		1.89E+00
		302.65		2.20	1.32E+00		2.26E+00
		330.06		1.40	2.26E+00		3.59E+00
+	U-235	143.76		10.96	-4.43E-02	7.07E-02	4.61E-01
		163.33		5.08	1.50E-02		9.25E-01
		185.71	*	57.20	8.11E-02		7.07E-02
		202.11		1.08	2.33E+00		4.51E+00
		205.31		5.01	-1.06E+00		9.00E-01
	Am-241	59.54		35.90	-3.95E-02	1.39E+00	1.39E+00

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10038

L1-10206B-FSGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10038
Sample Description	: L1-10206B-FSGS-009SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.344E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:16:00PM
Acquisition Started	: 10/29/2019 12:03:02PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80824
Fill Height	: 1343.56 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 12:18:05PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10038
L1-10206B-FSGS-009SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	238.68	948 -	973	955.17	2.10E+02	39.40	6.65E+01	0.99
m	2	241.90	948 -	973	968.06	3.42E+01	9.66	7.13E+01	1.00
	3	295.08	1171 -	1188	1180.55	8.84E+01	14.85	4.06E+01	1.52
	4	338.15	1348 -	1361	1352.65	4.91E+01	11.89	3.29E+01	0.67
	5	351.88	1401 -	1416	1407.52	1.43E+02	16.23	4.04E+01	1.08
	6	510.73	2038 -	2050	2042.40	4.45E+01	10.28	2.15E+01	0.80
	7	583.06	2325 -	2338	2331.54	6.00E+01	9.94	1.40E+01	0.81
	8	609.19	2427 -	2444	2436.01	1.09E+02	11.76	9.00E+00	1.72
	9	661.36	2638 -	2649	2644.61	2.58E+01	7.17	1.02E+01	0.54
	10	727.29	2903 -	2914	2908.24	2.78E+01	6.63	6.18E+00	1.28
	11	911.03	3636 -	3650	3643.16	5.96E+01	10.06	1.44E+01	0.78
	12	1120.13	4474 -	4485	4479.78	3.10E+01	6.21	3.00E+00	0.36
	13	1460.73	5832 -	5854	5843.29	4.25E+02	22.10	1.66E+01	2.00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.98	511.00	*	100.00	5.19E-02	1.25E-02
K-40	0.99	1460.82	*	10.66	9.27E+00	6.27E-01
Cs-137	0.98	661.66	*	85.10	4.14E-02	1.18E-02
Tl-208	0.99	583.19	*	85.00	8.87E-02	1.56E-02

Analysis Report for 29-Oct-19-10038

L1-10206B-FSGS-009SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-212	1.00	39.86		1.06		
		727.33	*	6.67	6.07E-01	1.49E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	3.37E-01	6.90E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	3.10E-01	3.83E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	4.02E-01	8.22E-02
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	3.33E-01	9.77E-02
		295.22	*	18.42	3.78E-01	7.04E-02
		351.93	*	35.60	3.57E-01	4.97E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	3.78E-01	9.65E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.90E-01	6.80E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10038

L1-10206B-FSGS-009SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.988	5.19E-02	1.25E-02	
	K-40	0.999	9.27E+00	6.27E-01	
	Cs-137	0.986	4.14E-02	1.18E-02	
	Tl-208	0.997	8.87E-02	1.56E-02	
X	Bi-211	0.900			
	Bi-212	1.000	6.07E-01	1.49E-01	
	Pb-212	1.000	3.37E-01	6.90E-02	
	Bi-214	0.998	3.26E-01	3.47E-02	
	Pb-214	0.999	3.60E-01	3.75E-02	
	Ac-228	0.998	3.86E-01	5.56E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10038

L1-10206B-FSGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 12:18:05PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	5.19E-02	3.43E-02	3.43E-02
	BE-7	477.60		10.44	7.36E-02	4.34E-01	4.34E-01
+	K-40	1460.82	*	10.66	9.27E+00	6.50E-01	6.50E-01
	Mn-54	834.85		99.98	2.35E-02	5.87E-02	5.87E-02
	Co-60	1173.23		99.85	1.41E-02	5.72E-02	6.71E-02
		1332.49		99.98	1.57E-02		5.72E-02
	Nb-94	702.65		99.81	4.63E-03	4.57E-02	4.57E-02
		871.09		99.89	3.93E-02		5.63E-02
	Ag-108m	79.13		6.60	-3.48E-02	4.87E-02	1.77E+00
		433.94		90.50	-1.12E-02		4.87E-02
		614.28		89.80	-4.70E-02		8.09E-02
		722.94		90.80	-1.88E-02		6.54E-02
	Sb-125	176.31		6.84	2.40E-01	1.41E-01	6.09E-01
		380.45		1.52	-1.55E+00		2.71E+00
		427.87		29.60	1.33E-02		1.41E-01
		463.36		10.49	3.18E-01		4.68E-01
		600.60		17.65	2.11E-01		2.70E-01
		606.71		4.98	2.91E+00		1.56E+00
		635.95		11.22	-9.59E-02		4.16E-01

Analysis Report for 29-Oct-19-10038

L1-10206B-FSGS-009SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	5.59E-01	1.41E-01	2.59E+00
	Ba-133	79.61		2.65	-5.67E-01	9.56E-02	4.20E+00
		81.00		32.90	-5.91E-01		2.78E-01
		276.40		7.16	6.35E-02		5.76E-01
		302.85		18.34	7.23E-02		2.32E-01
		356.01		62.05	4.35E-03		9.56E-02
		383.85		8.94	6.83E-02		4.86E-01
	Cs-134	475.36		1.48	-2.25E+00	5.79E-02	2.66E+00
		563.25		8.34	-4.79E-02		5.32E-01
		569.33		15.37	2.45E-01		3.27E-01
		604.72		97.62	3.93E-03		7.25E-02
		795.86		85.46	4.68E-03		5.79E-02
		801.95		8.69	-3.56E-01		5.73E-01
		1038.61		0.99	-6.06E-01		5.82E+00
		1167.97		1.79	-7.13E-01		3.73E+00
		1365.19		3.02	-1.16E+00		1.57E+00
+	Cs-137	661.66	*	85.10	4.14E-02	3.22E-02	3.22E-02
	Eu-152	121.78		28.67	1.19E-01	1.38E-01	1.61E-01
		244.70		7.61	-1.85E-01		6.00E-01
		295.94		0.45	1.59E+01		1.21E+01
		344.28		26.60	-5.30E-02		1.38E-01
		367.79		0.86	-1.20E-01		4.37E+00
		411.12		2.24	7.79E-01		1.94E+00
		443.96		2.83	-5.99E-01		1.47E+00
		488.68		0.42	-2.86E+00		1.07E+01
		563.99		0.49	7.37E-01		9.13E+00
		586.26		0.46	1.16E+01		1.36E+01
		678.62		0.47	4.80E-01		8.45E+00
		688.67		0.86	-2.59E+00		4.97E+00
		719.35		0.28	9.32E+00		1.72E+01
		778.90		12.96	-1.64E-01		3.62E-01
		810.45		0.32	4.78E+00		1.67E+01
		867.37		4.26	-1.06E+00		1.32E+00
		919.33		0.43	-1.44E+01		1.27E+01
		964.08		14.65	4.11E-01		5.77E-01
		1085.87		10.24	2.15E-01		5.48E-01
		1089.74		1.73	1.31E-01		3.30E+00
		1112.07		13.69	-5.86E-01		4.17E-01
		1212.95		1.43	9.11E-01		5.49E+00
		1249.94		0.19	-1.33E+01		3.44E+01
		1299.14		1.63	1.47E+00		3.12E+00
		1408.01		21.07	-1.77E-01		1.94E-01
		1457.64		0.50	2.03E+02		4.88E+01
		1528.10		0.28	4.08E+00		1.72E+01
	Eu-154	123.07		40.40	5.58E-02	1.14E-01	1.14E-01
		247.93		6.89	-3.52E-01		5.50E-01
		591.76		4.95	-6.20E-01		8.52E-01
		692.42		1.78	-3.96E-01		2.63E+00
		723.30		20.06	-1.11E-01		2.94E-01
		756.80		4.52	-4.76E-01		1.07E+00
		873.18		12.08	2.38E-01		4.61E-01

Analysis Report for 29-Oct-19-10038

L1-10206B-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.00E-01	1.14E-01	5.88E-01
	1004.76	18.01	1.65E-01		3.13E-01
	1274.43	34.80	-2.06E-01		2.03E-01
	1596.48	1.80	3.07E-01		2.27E+00
Eu-155	45.30	1.31	4.47E+00	2.46E-01	2.28E+01
	60.01	1.22	-2.42E+01		2.39E+01
	86.55	30.70	4.36E-02		2.46E-01
	105.31	21.10	2.47E-02		2.47E-01
Ra-226	186.21	3.64	1.29E+00	1.30E+00	1.30E+00
Pa-231	27.36	10.30	3.54E+00	1.80E+00	2.69E+00
	283.69	1.70	-2.39E+00		2.39E+00
	300.07	2.47	5.35E-01		1.80E+00
	302.65	2.20	5.65E-01		1.92E+00
	330.06	1.40	6.04E-01		2.96E+00
U-235	143.76	10.96	5.40E-02	8.22E-02	3.82E-01
	163.33	5.08	1.72E-01		7.80E-01
	185.71	57.20	1.20E-01		8.22E-02
	202.11	1.08	-1.80E+00		3.69E+00
	205.31	5.01	-2.30E-01		7.71E-01
Am-241	59.54	35.90	-4.78E-01	8.56E-01	8.56E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10039

L1-10206B-FSGS-010SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10039
Sample Description	: L1-10206B-FSGS-010SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.373E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:18:00PM
Acquisition Started	: 10/29/2019 12:23:12PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80825
Fill Height	: 1372.51 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 12:38:15PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated

0730 [132] 30-19

Analysis Report for 29-Oct-19-10039

L1-10206B-FSGS-010SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.50	472 -	481	477.18	1.49E+02	21.34	1.33E+02	1.44
2	295.25	585 -	595	590.55	7.69E+01	15.06	6.31E+01	1.27
3	351.66	698 -	708	703.26	1.18E+02	16.53	6.49E+01	1.14
4	477.58	952 -	959	954.90	1.52E+01	7.59	2.08E+01	0.60
5	583.13	1160 -	1169	1165.86	5.60E+01	11.11	3.00E+01	1.31
6	609.13	1212 -	1223	1217.83	9.47E+01	13.39	3.33E+01	1.52
7	661.65	1318 -	1327	1322.84	5.12E+01	11.29	3.38E+01	1.32
8	911.27	1816 -	1828	1821.99	5.20E+01	9.30	1.30E+01	1.43
9	1460.49	2913 -	2928	2921.04	4.26E+02	21.07	5.94E+00	1.86

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
BE-7	1.00	477.60	*	10.44	1.46E-01	7.35E-02
K-40	0.98	1460.82	*	10.66	8.28E+00	5.45E-01
Cs-137	1.00	661.66	*	85.10	7.37E-02	1.68E-02
Tl-208	0.99	583.19	*	85.00	7.42E-02	1.54E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.13E-01	3.51E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.41E-01	3.71E-02

Analysis Report for 29-Oct-19-10039

L1-10206B-FSGS-010SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.94E-01	6.23E-02
		351.93	*	35.60	2.65E-01	4.27E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.05E-01	5.61E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-Oct-19-10039

L1-10206B-FSGS-010SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	BE-7	1.000	1.46E-01	7.35E-02	
	K-40	0.983	8.28E+00	5.45E-01	
	Cs-137	1.000	7.37E-02	1.68E-02	
	Tl-208	0.999	7.42E-02	1.54E-02	
X	Bi-211	0.946			
	Pb-212	0.997	2.13E-01	3.51E-02	
	Bi-214	0.998	2.41E-01	3.71E-02	
	Pb-214	0.993	2.74E-01	3.52E-02	
	Ac-228	1.000	3.05E-01	5.61E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10039

L1-10206B-FSGS-010SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 12:38:15PM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	8.60E-02	5.56E-02	5.56E-02
+	BE-7	477.60	*	10.44	1.46E-01	2.39E-01	2.39E-01
+	K-40	1460.82	*	10.66	8.28E+00	3.34E-01	3.34E-01
	Mn-54	834.85		99.98	3.49E-03	4.41E-02	4.41E-02
	Co-60	1173.23		99.85	1.72E-02	5.81E-02	6.56E-02
		1332.49		99.98	3.15E-02		5.81E-02
	Nb-94	702.65		99.81	-2.61E-02	3.24E-02	3.24E-02
		871.09		99.89	3.67E-04		3.87E-02
	Ag-108m	79.13		6.60	1.24E+00	3.89E-02	1.32E+00
		433.94		90.50	-1.91E-02		3.89E-02
		614.28		89.80	-9.17E-03		5.94E-02
		722.94		90.80	-1.37E-02		4.91E-02
	Sb-125	176.31		6.84	1.22E-01	1.06E-01	5.13E-01
		380.45		1.52	-2.03E-01		2.26E+00
		427.87		29.60	-9.72E-02		1.06E-01
		463.36		10.49	1.48E-01		3.46E-01
		600.60		17.65	2.02E-02		2.42E-01
		606.71		4.98	-1.09E-01		1.41E+00
		635.95		11.22	1.90E-01		3.84E-01

Analysis Report for 29-Oct-19-10039

L1-10206B-FSGS-010SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-7.82E-01	1.06E-01	1.89E+00
	Ba-133	79.61		2.65	7.99E-01	7.45E-02	3.00E+00
		81.00		32.90	-3.86E-01		1.89E-01
		276.40		7.16	7.10E-02		4.96E-01
		302.85		18.34	9.42E-02		2.00E-01
		356.01		62.05	-3.44E-02		7.45E-02
		383.85		8.94	-7.53E-02		3.95E-01
	Cs-134	475.36		1.48	-1.17E+00	5.62E-02	2.56E+00
		563.25		8.34	-1.76E-01		4.13E-01
		569.33		15.37	9.60E-02		2.37E-01
		604.72		97.62	-5.65E-03		6.42E-02
		795.86		85.46	2.51E-02		5.62E-02
		801.95		8.69	1.63E-01		5.19E-01
		1038.61		0.99	-3.30E-01		4.55E+00
		1167.97		1.79	1.23E+00		3.55E+00
		1365.19		3.02	4.60E-02		1.66E+00
+	Cs-137	661.66	*	85.10	7.37E-02	4.67E-02	4.67E-02
	Eu-152	121.78		28.67	2.44E-02	1.28E-01	1.28E-01
		244.70		7.61	-6.44E-02		5.35E-01
		295.94		0.45	-1.95E+00		9.60E+00
		344.28		26.60	-9.45E-02		1.29E-01
		367.79		0.86	-1.90E+00		3.52E+00
		411.12		2.24	2.90E-01		1.62E+00
		443.96		2.83	-7.95E-01		1.15E+00
		488.68		0.42	9.12E-02		9.02E+00
		563.99		0.49	-3.69E+00		6.92E+00
		586.26		0.46	-1.14E+01		1.27E+01
		678.62		0.47	-4.02E+00		6.13E+00
		688.67		0.86	1.04E+00		4.45E+00
		719.35		0.28	6.72E+00		1.59E+01
		778.90		12.96	-4.66E-03		3.11E-01
		810.45		0.32	1.51E+00		1.19E+01
		867.37		4.26	-2.38E-01		8.88E-01
		919.33		0.43	4.62E+00		1.01E+01
		964.08		14.65	-4.14E-02		3.83E-01
		1085.87		10.24	5.71E-02		5.17E-01
		1089.74		1.73	-7.07E-02		3.03E+00
		1112.07		13.69	-1.38E-01		3.93E-01
		1212.95		1.43	-3.43E+00		4.04E+00
		1249.94		0.19	2.03E+01		3.18E+01
		1299.14		1.63	-1.29E-01		3.56E+00
		1408.01		21.07	-2.07E-02		1.99E-01
		1457.64		0.50	-5.71E-01		4.26E+01
		1528.10		0.28	2.83E+00		1.43E+01
	Eu-154	123.07		40.40	2.61E-02	8.88E-02	8.88E-02
		247.93		6.89	2.47E-01		5.32E-01
		591.76		4.95	-3.45E-01		7.80E-01
		692.42		1.78	9.00E-01		2.28E+00
		723.30		20.06	1.24E-01		2.31E-01
		756.80		4.52	-4.18E-02		9.25E-01
		873.18		12.08	1.88E-02		3.15E-01

Analysis Report for 29-Oct-19-10039

L1-10206B-FSGS-010SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.03E-01	8.88E-02	4.46E-01
	1004.76	18.01	-1.67E-01		2.45E-01
	1274.43	34.80	-1.93E-04		1.53E-01
	1596.48	1.80	1.09E+00		2.40E+00
Eu-155	45.30	1.31	1.37E+00	1.89E-01	1.24E+01
	60.01	1.22	-4.95E+00		1.24E+01
	86.55	30.70	1.94E-02		1.92E-01
	105.31	21.10	-8.63E-02		1.89E-01
Ra-226	186.21	3.64	4.38E-01	1.04E+00	1.04E+00
Pa-231	27.36	10.30	1.21E+00	1.33E+00	1.33E+00
	283.69	1.70	-3.50E-01		1.88E+00
	300.07	2.47	-3.85E-01		1.39E+00
	302.65	2.20	7.85E-01		1.67E+00
	330.06	1.40	-1.47E-01		2.54E+00
U-235	143.76	10.96	4.48E-02	6.73E-02	3.09E-01
	163.33	5.08	3.29E-01		7.52E-01
	185.71	57.20	6.12E-02		6.73E-02
	202.11	1.08	7.93E-01		3.48E+00
	205.31	5.01	-6.24E-01		7.14E-01
Am-241	59.54	35.90	-2.98E-01	4.20E-01	4.20E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10040

L1-10206B-FSGS-011SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10040
Sample Description	: L1-10206B-FSGS-011SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.555E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:20:00PM
Acquisition Started	: 10/29/2019 12:23:19PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.4 seconds
Dead Time	: 0.16 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80826
Fill Height	: 1554.67 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 12:38:23PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10040

L1-10206B-FSGS-011SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.14	305 -	314	309.27	3.57E+01	14.41	7.53E+01	0.83
2	238.66	949 -	960	954.73	1.53E+02	18.05	6.90E+01	1.06
3	295.19	1172 -	1188	1180.66	7.05E+01	12.99	3.15E+01	0.90
4	351.83	1398 -	1414	1407.05	1.21E+02	15.08	3.40E+01	1.08
5	583.10	2323 -	2339	2331.60	6.26E+01	9.10	6.42E+00	0.43
6	609.18	2428 -	2443	2435.88	8.92E+01	10.02	3.80E+00	1.33
7	910.91	3635 -	3648	3642.59	4.15E+01	8.40	1.05E+01	1.54
8	968.72	3868 -	3880	3873.86	2.15E+01	6.22	6.50E+00	0.41
9	1460.34	5830 -	5853	5841.18	3.17E+02	18.68	8.43E+00	2.00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.82	*	10.66	7.85E+00	5.75E-01
Tl-208	0.99	583.19	*	85.00	1.04E-01	1.64E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.73E-01	3.90E-02
		300.09		3.30		
Pb212-XR	1.00	74.82		10.28		
		77.11	*	17.10	4.35E-01	1.81E-01
		87.35		3.97		

Analysis Report for 29-Oct-19-10040

L1-10206B-FSGS-011SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	1.00	89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.85E-01	3.64E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	3.35E-01	6.73E-02
		351.93	*	35.60	3.38E-01	5.00E-02
		785.96		1.06		
Pb214-XR	1.00	74.82		5.80		
		77.11	*	9.70	7.68E-01	3.22E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.08E-01	6.38E-02
		964.77		4.99		
		968.97	*	15.80	2.72E-01	7.94E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10040

L1-10206B-FSGS-011SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.963	7.85E+00	5.75E-01	
	Tl-208	0.999	1.04E-01	1.64E-02	
X	Bi-211	0.912			
	Pb-212	1.000	2.73E-01	3.90E-02	
?	Pb212-XR	1.000	4.35E-01	1.81E-01	
	Bi-214	0.999	2.85E-01	3.64E-02	
	Pb-214	0.999	3.37E-01	4.01E-02	
?	Pb214-XR	1.000	7.68E-01	3.22E-01	
	Ac-228	0.994	2.94E-01	4.97E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10040

L1-10206B-FSGS-011SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 12:38:23PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	2.81E-02	6.08E-02	6.08E-02
	BE-7	477.60		10.44	2.57E-01	4.63E-01	4.63E-01
+	K-40	1460.82	*	10.66	7.85E+00	5.51E-01	5.51E-01
	Mn-54	834.85		99.98	-9.51E-03	4.93E-02	4.93E-02
	Co-60	1173.23		99.85	-1.69E-02	6.13E-02	6.62E-02
		1332.49		99.98	1.01E-02		6.13E-02
	Nb-94	702.65		99.81	1.67E-02	4.20E-02	5.69E-02
		871.09		99.89	1.05E-02		4.20E-02
	Ag-108m	79.13		6.60	3.14E-01	5.02E-02	1.97E+00
		433.94		90.50	-1.98E-02		5.02E-02
		614.28		89.80	-1.15E-02		6.58E-02
		722.94		90.80	-1.80E-03		5.98E-02
	Sb-125	176.31		6.84	2.12E-01	1.48E-01	6.82E-01
		380.45		1.52	9.02E-01		2.66E+00
		427.87		29.60	-8.28E-02		1.48E-01
		463.36		10.49	7.12E-02		4.67E-01
		600.60		17.65	2.34E-01		2.81E-01
		606.71		4.98	2.92E+00		1.59E+00
		635.95		11.22	-3.42E-01		4.01E-01

Analysis Report for 29-Oct-19-10040

L1-10206B-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.49E+00	1.48E-01	2.72E+00
Ba-133	79.61	2.65	-7.22E-01	8.25E-02	4.57E+00
	81.00	32.90	-9.92E-02		3.14E-01
	276.40	7.16	1.57E-01		5.99E-01
	302.85	18.34	1.11E-01		2.38E-01
	356.01	62.05	-7.47E-03		8.25E-02
	383.85	8.94	1.61E-01		4.88E-01
Cs-134	475.36	1.48	1.97E-01	5.77E-02	3.17E+00
	563.25	8.34	8.24E-02		5.38E-01
	569.33	15.37	3.85E-02		2.72E-01
	604.72	97.62	-2.15E-02		7.55E-02
	795.86	85.46	-3.14E-02		5.77E-02
	801.95	8.69	7.87E-02		5.33E-01
	1038.61	0.99	-5.89E+00		5.88E+00
	1167.97	1.79	-3.96E+00		3.20E+00
	1365.19	3.02	7.50E-01		1.44E+00
Cs-137	661.66	85.10	3.50E-02	7.36E-02	7.36E-02
Eu-152	121.78	28.67	1.16E-01	1.36E-01	1.80E-01
	244.70	7.61	7.07E-02		5.98E-01
	295.94	0.45	3.85E+00		1.13E+01
	344.28	26.60	-4.16E-02		1.36E-01
	367.79	0.86	-1.48E+00		4.21E+00
	411.12	2.24	-5.46E-01		1.91E+00
	443.96	2.83	-8.09E-01		1.52E+00
	488.68	0.42	-1.26E+00		1.03E+01
	563.99	0.49	3.95E+00		9.02E+00
	586.26	0.46	2.62E-01		1.45E+01
	678.62	0.47	2.49E+00		9.97E+00
	688.67	0.86	-3.14E+00		4.86E+00
	719.35	0.28	3.37E+00		1.73E+01
	778.90	12.96	-1.86E-01		3.75E-01
	810.45	0.32	-3.14E+00		1.60E+01
	867.37	4.26	-2.82E-02		1.17E+00
	919.33	0.43	1.14E+00		1.31E+01
	964.08	14.65	-1.03E-01		4.95E-01
	1085.87	10.24	7.88E-02		6.90E-01
	1089.74	1.73	1.98E+00		4.05E+00
	1112.07	13.69	2.96E-01		5.43E-01
	1212.95	1.43	1.03E-01		4.81E+00
	1249.94	0.19	1.53E+01		3.70E+01
	1299.14	1.63	-9.32E-01		4.48E+00
	1408.01	21.07	-1.54E-01		2.84E-01
	1457.64	0.50	1.68E+02		4.78E+01
	1528.10	0.28	-3.35E+00		1.32E+01
Eu-154	123.07	40.40	-7.62E-02	1.26E-01	1.26E-01
	247.93	6.89	-1.80E-01		5.80E-01
	591.76	4.95	-1.83E-01		8.53E-01
	692.42	1.78	6.71E-01		2.53E+00
	723.30	20.06	-8.16E-03		2.71E-01
	756.80	4.52	2.14E-01		1.10E+00
	873.18	12.08	1.01E-01		3.30E-01

Analysis Report for 29-Oct-19-10040

L1-10206B-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.04E-02	1.26E-01	5.49E-01
	1004.76	18.01	-1.25E-01		3.05E-01
	1274.43	34.80	-8.75E-02		2.01E-01
	1596.48	1.80	3.15E-01		2.72E+00
Eu-155	45.30	1.31	-1.18E+01	2.89E-01	3.08E+01
	60.01	1.22	-5.71E+00		3.35E+01
	86.55	30.70	-5.37E-02		2.89E-01
	105.31	21.10	1.77E-02		3.02E-01
Ra-226	186.21	3.64	9.77E-01	1.28E+00	1.28E+00
Pa-231	27.36	10.30	3.21E+00	1.75E+00	3.78E+00
	283.69	1.70	-5.77E-01		2.33E+00
	300.07	2.47	1.49E+00		1.75E+00
	302.65	2.20	1.23E+00		2.00E+00
	330.06	1.40	-7.45E-01		3.14E+00
U-235	143.76	10.96	3.39E-01	8.11E-02	4.33E-01
	163.33	5.08	1.90E-02		8.87E-01
	185.71	57.20	3.75E-02		8.11E-02
	202.11	1.08	-2.61E+00		3.67E+00
	205.31	5.01	-2.82E-01		7.96E-01
Am-241	59.54	35.90	6.04E-01	1.19E+00	1.19E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10041

L1-10206B-FSGS-012SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10041
Sample Description	: L1-10206B-FSGS-012SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.425E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:22:00PM
Acquisition Started	: 10/29/2019 12:23:27PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.4 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80827
Fill Height	: 1425.43 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 12:38:38PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10041

L1-10206B-FSGS-012SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.78	946 - 962		954.69	1.91E+02	21.69	8.90E+01	1.04
2	295.51	1173 - 1188		1181.34	8.80E+01	15.42	5.00E+01	0.67
3	338.34	1345 - 1359		1352.45	5.69E+01	11.74	2.81E+01	0.98
4	352.01	1399 - 1412		1407.06	1.35E+02	15.81	4.18E+01	0.74
5	463.22	1848 - 1856		1851.43	1.63E+01	6.78	1.27E+01	0.79
6	511.08	2037 - 2047		2042.67	2.03E+01	10.26	3.58E+01	0.40
7	583.14	2321 - 2336		2330.70	5.49E+01	11.03	2.21E+01	1.08
8	609.03	2427 - 2441		2434.18	1.03E+02	12.35	1.67E+01	1.25
9	661.92	2638 - 2650		2645.59	4.75E+01	10.12	2.05E+01	0.77
10	727.32	2903 - 2912		2907.01	2.10E+01	6.89	1.10E+01	0.52
11	911.12	3633 - 3649		3641.94	5.63E+01	9.49	1.07E+01	1.12
12	1460.42	5827 - 5851		5839.62	3.81E+02	20.47	9.33E+00	1.88

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	2.44E-02	1.25E-02
K-40	0.97	1460.82	*	10.66	8.73E+00	6.03E-01
Cs-137	0.98	661.66	*	85.10	7.91E-02	1.75E-02
Tl-208	1.00	583.19	*	85.00	8.41E-02	1.76E-02
Bi-212	1.00	39.86		1.06		

Analysis Report for 29-Oct-19-10041

L1-10206B-FSGS-012SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-212	1.00	727.33	*	6.67	4.79E-01	1.59E-01
		785.37		1.10		
		1620.50		1.47		
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	3.08E-01	4.29E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	3.05E-01	4.08E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	3.82E-01	7.36E-02
		351.93	*	35.60	3.46E-01	4.90E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	4.46E-01	9.91E-02
		409.46		1.92		
		463.00	*	4.40	4.11E-01	1.74E-01
		794.95		4.25		
		911.20	*	25.80	3.86E-01	6.72E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10041

L1-10206B-FSGS-012SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.999	2.44E-02	1.25E-02	
	K-40	0.975	8.73E+00	6.03E-01	
X	Sb-125	0.420			
	Cs-137	0.989	7.91E-02	1.75E-02	
	Tl-208	1.000	8.41E-02	1.76E-02	
X	Bi-211	0.868			
	Bi-212	1.000	4.79E-01	1.59E-01	
	Pb-212	0.997	3.08E-01	4.29E-02	
	Bi-214	0.995	3.05E-01	4.08E-02	
	Pb-214	0.995	3.57E-01	4.08E-02	
	Ac-228	0.999	4.06E-01	5.30E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10041

L1-10206B-FSGS-012SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 12:38:38PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	2.44E-02	4.12E-02	4.12E-02
	BE-7	477.60		10.44	5.35E-02	4.86E-01	4.86E-01
+	K-40	1460.82	*	10.66	8.73E+00	5.48E-01	5.48E-01
	Mn-54	834.85		99.98	1.87E-02	5.21E-02	5.21E-02
	Co-60	1173.23		99.85	1.71E-03	6.54E-02	6.55E-02
		1332.49		99.98	6.61E-02		6.54E-02
	Nb-94	702.65		99.81	-1.66E-02	4.81E-02	4.81E-02
		871.09		99.89	-2.21E-02		5.22E-02
	Ag-108m	79.13		6.60	1.55E+00	4.15E-02	1.44E+00
		433.94		90.50	-2.18E-02		4.15E-02
		614.28		89.80	-4.84E-02		7.43E-02
		722.94		90.80	-3.55E-02		6.86E-02
	Sb-125	176.31		6.84	-7.23E-01	1.45E-01	4.87E-01
		380.45		1.52	2.07E-01		2.57E+00
		427.87		29.60	7.10E-03		1.45E-01
		463.36	*	10.49	1.73E-01		2.27E-01
		600.60		17.65	-1.87E-02		2.47E-01
		606.71		4.98	2.65E+00		1.64E+00
		635.95		11.22	1.86E-01		4.00E-01

Analysis Report for 29-Oct-19-10041

L1-10206B-FSGS-012SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-4.80E-01	1.45E-01	2.26E+00
	Ba-133	79.61		2.65	3.51E+00	8.27E-02	3.45E+00
		81.00		32.90	-4.26E-01		2.21E-01
		276.40		7.16	2.04E-01		5.61E-01
		302.85		18.34	-3.33E-02		1.85E-01
		356.01		62.05	-8.44E-02		8.27E-02
		383.85		8.94	3.11E-01		4.55E-01
	Cs-134	475.36		1.48	1.54E+00	6.48E-02	3.53E+00
		563.25		8.34	-1.53E-01		5.82E-01
		569.33		15.37	2.23E-01		2.95E-01
		604.72		97.62	-1.11E-02		7.09E-02
		795.86		85.46	3.70E-02		6.48E-02
		801.95		8.69	-2.16E-01		5.60E-01
		1038.61		0.99	1.89E+00		5.69E+00
		1167.97		1.79	8.75E-02		3.69E+00
		1365.19		3.02	8.47E-01		1.45E+00
+	Cs-137	661.66	*	85.10	7.91E-02	4.67E-02	4.67E-02
	Eu-152	121.78		28.67	1.76E-02	1.34E-01	1.34E-01
		244.70		7.61	1.15E-01		5.47E-01
		295.94		0.45	1.19E+01		1.20E+01
		344.28		26.60	-7.58E-02		1.34E-01
		367.79		0.86	-1.76E+00		3.94E+00
		411.12		2.24	-1.11E+00		1.78E+00
		443.96		2.83	-1.41E+00		1.35E+00
		488.68		0.42	-1.75E+00		1.01E+01
		563.99		0.49	-5.84E+00		9.28E+00
		586.26		0.46	-3.05E-02		1.44E+01
		678.62		0.47	3.56E+00		9.68E+00
		688.67		0.86	1.70E-01		5.64E+00
		719.35		0.28	-1.27E+01		1.87E+01
		778.90		12.96	2.14E-02		3.68E-01
		810.45		0.32	-1.61E+00		1.39E+01
		867.37		4.26	-2.95E-01		1.22E+00
		919.33		0.43	3.95E+00		1.25E+01
		964.08		14.65	3.30E-01		5.06E-01
		1085.87		10.24	3.74E-01		5.75E-01
		1089.74		1.73	-2.28E+00		3.60E+00
		1112.07		13.69	8.93E-02		4.61E-01
		1212.95		1.43	3.08E+00		5.62E+00
		1249.94		0.19	-1.43E+01		3.75E+01
		1299.14		1.63	2.13E+00		3.90E+00
		1408.01		21.07	-9.11E-02		2.56E-01
		1457.64		0.50	1.90E+02		4.77E+01
		1528.10		0.28	-3.69E+00		1.55E+01
	Eu-154	123.07		40.40	1.08E-02	9.43E-02	9.43E-02
		247.93		6.89	4.49E-02		5.18E-01
		591.76		4.95	-1.92E-01		8.20E-01
		692.42		1.78	9.09E-02		2.77E+00
		723.30		20.06	-1.57E-01		3.15E-01
		756.80		4.52	1.98E-01		1.09E+00
		873.18		12.08	1.38E-01		4.55E-01

Analysis Report for 29-Oct-19-10041

L1-10206B-FSGS-012SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.35E-01	9.43E-02	5.23E-01
	1004.76	18.01	-2.19E-01		3.19E-01
	1274.43	34.80	-9.85E-02		1.61E-01
	1596.48	1.80	8.20E-02		2.40E+00
Eu-155	45.30	1.31	4.49E+00	2.06E-01	1.30E+01
	60.01	1.22	-6.97E+00		1.32E+01
	86.55	30.70	2.42E-04		2.06E-01
	105.31	21.10	-3.26E-02		2.06E-01
Ra-226	186.21	3.64	1.03E+00	1.12E+00	1.12E+00
Pa-231	27.36	10.30	2.15E+00	1.54E+00	1.59E+00
	283.69	1.70	-1.47E+00		2.14E+00
	300.07	2.47	2.46E-01		1.55E+00
	302.65	2.20	2.97E-01		1.54E+00
	330.06	1.40	-2.18E+00		2.87E+00
U-235	143.76	10.96	-5.44E-02	7.13E-02	3.22E-01
	163.33	5.08	2.95E-01		7.35E-01
	185.71	57.20	7.39E-02		7.13E-02
	202.11	1.08	1.35E+00		3.48E+00
	205.31	5.01	5.23E-02		7.12E-01
Am-241	59.54	35.90	-1.89E-01	4.62E-01	4.62E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10042

L1-10206B-FSGS-013SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10042
Sample Description	: L1-10206B-FSGS-013SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.652E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:24:00PM
Acquisition Started	: 10/29/2019 12:23:35PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80828
Fill Height	: 1652.21 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 12:38:38PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10042

L1-10206B-FSGS-013SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.69	948 -	961	955.22	1.44E+02	18.92	7.70E+01	1.02
2	295.26	1175 -	1191	1181.28	6.61E+01	13.27	3.49E+01	0.94
3	338.21	1347 -	1357	1352.90	3.14E+01	9.48	2.46E+01	0.98
4	351.90	1399 -	1416	1407.59	9.47E+01	14.13	3.23E+01	0.73
5	477.56	1903 -	1916	1909.82	3.73E+01	8.66	1.37E+01	1.09
6	510.56	2037 -	2046	2041.72	2.93E+01	8.26	1.67E+01	0.55
7	583.17	2325 -	2339	2332.00	5.09E+01	9.74	1.51E+01	0.44
8	609.29	2429 -	2444	2436.43	7.38E+01	11.38	1.82E+01	0.68
9	661.41	2639 -	2652	2644.81	3.35E+01	9.05	1.75E+01	1.24
10	911.42	3639 -	3652	3644.72	3.30E+01	7.27	7.00E+00	0.65
11	1460.64	5830 -	5854	5842.94	3.21E+02	18.95	9.27E+00	2.13

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.96	511.00	*	100.00	3.26E-02	9.46E-03
BE-7	1.00	477.60	*	10.44	3.80E-01	9.24E-02
K-40	0.99	1460.82	*	10.66	6.58E+00	4.82E-01
Cs-137	0.99	661.66	*	85.10	5.12E-02	1.42E-02
Tl-208	1.00	583.19	*	85.00	7.16E-02	1.44E-02
Pb-212	1.00	115.18		0.60		

Analysis Report for 29-Oct-19-10042

L1-10206B-FSGS-013SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	1.00	238.63	*	43.60	2.23E-01	3.44E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.00E-01	3.30E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	2.71E-01	5.87E-02
		351.93	*	35.60	2.27E-01	3.85E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	2.31E-01	7.24E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.05E-01	4.60E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10042

L1-10206B-FSGS-013SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.969	3.26E-02	9.46E-03	
	BE-7	1.000	3.80E-01	9.24E-02	
	K-40	0.995	6.58E+00	4.82E-01	
	Cs-137	0.990	5.12E-02	1.42E-02	
	Tl-208	1.000	7.16E-02	1.44E-02	
X	Bi-211	0.896			
	Pb-212	1.000	2.23E-01	3.44E-02	
	Bi-214	1.000	2.00E-01	3.30E-02	
	Pb-214	1.000	2.41E-01	3.22E-02	
	Ac-228	0.997	2.13E-01	3.88E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10042

L1-10206B-FSGS-013SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 12:38:38PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	3.26E-02	2.68E-02	2.68E-02
+	BE-7	477.60	*	10.44	3.80E-01	2.42E-01	2.42E-01
+	K-40	1460.82	*	10.66	6.58E+00	4.89E-01	4.89E-01
	Mn-54	834.85		99.98	-1.48E-03	4.41E-02	4.41E-02
	Co-60	1173.23		99.85	-4.75E-02	5.41E-02	5.41E-02
		1332.49		99.98	-2.27E-02		6.14E-02
	Nb-94	702.65		99.81	-5.66E-03	3.83E-02	3.83E-02
		871.09		99.89	8.63E-05		4.92E-02
	Ag-108m	79.13		6.60	2.33E-01	3.78E-02	1.49E+00
		433.94		90.50	8.05E-05		3.78E-02
		614.28		89.80	-2.04E-02		7.42E-02
		722.94		90.80	3.42E-02		5.26E-02
	Sb-125	176.31		6.84	1.75E-01	1.15E-01	5.56E-01
		380.45		1.52	-9.34E-01		2.54E+00
		427.87		29.60	-8.67E-02		1.15E-01
		463.36		10.49	-6.47E-02		3.84E-01
		600.60		17.65	5.01E-02		2.24E-01
		606.71		4.98	2.28E+00		1.34E+00
		635.95		11.22	-2.30E-01		3.24E-01

Analysis Report for 29-Oct-19-10042

L1-10206B-FSGS-013SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-3.26E-02	1.15E-01	2.32E+00
	Ba-133	79.61		2.65	5.04E-01	7.99E-02	3.59E+00
		81.00		32.90	-6.23E-01		2.35E-01
		276.40		7.16	-2.13E-01		4.88E-01
		302.85		18.34	-2.01E-02		1.88E-01
		356.01		62.05	-6.47E-03		7.99E-02
		383.85		8.94	1.71E-01		4.42E-01
	Cs-134	475.36		1.48	2.45E+00	5.22E-02	3.29E+00
		563.25		8.34	-1.72E-01		4.67E-01
		569.33		15.37	-1.53E-02		2.52E-01
		604.72		97.62	-6.46E-03		6.04E-02
		795.86		85.46	1.76E-02		5.22E-02
		801.95		8.69	-4.33E-01		4.63E-01
		1038.61		0.99	-6.76E+00		4.47E+00
		1167.97		1.79	-9.06E-01		3.19E+00
		1365.19		3.02	9.13E-02		1.56E+00
+	Cs-137	661.66	*	85.10	5.12E-02	4.04E-02	4.04E-02
	Eu-152	121.78		28.67	-4.39E-02	1.43E-01	1.45E-01
		244.70		7.61	3.24E-01		5.50E-01
		295.94		0.45	8.40E+00		1.02E+01
		344.28		26.60	-6.96E-03		1.43E-01
		367.79		0.86	2.77E-01		4.31E+00
		411.12		2.24	6.75E-01		1.75E+00
		443.96		2.83	3.94E-01		1.28E+00
		488.68		0.42	5.15E+00		9.44E+00
		563.99		0.49	2.71E+00		8.28E+00
		586.26		0.46	2.10E+01		1.33E+01
		678.62		0.47	3.78E+00		8.86E+00
		688.67		0.86	2.10E+00		4.66E+00
		719.35		0.28	-5.38E+00		1.41E+01
		778.90		12.96	8.64E-02		3.83E-01
		810.45		0.32	2.08E+00		1.30E+01
		867.37		4.26	-1.59E+00		1.15E+00
		919.33		0.43	-1.36E+01		1.05E+01
		964.08		14.65	-3.79E-02		4.51E-01
		1085.87		10.24	-1.27E-01		5.18E-01
		1089.74		1.73	-1.20E+00		3.60E+00
		1112.07		13.69	-1.72E-01		4.47E-01
		1212.95		1.43	-1.40E+00		4.43E+00
		1249.94		0.19	-1.65E+00		3.20E+01
		1299.14		1.63	-1.90E-01		3.50E+00
		1408.01		21.07	-2.06E-02		1.57E-01
		1457.64		0.50	1.43E+02		3.96E+01
		1528.10		0.28	-1.17E+01		1.25E+01
	Eu-154	123.07		40.40	-7.85E-02	1.01E-01	1.01E-01
		247.93		6.89	-2.25E-01		5.15E-01
		591.76		4.95	3.10E-02		8.73E-01
		692.42		1.78	-1.16E+00		1.95E+00
		723.30		20.06	1.15E-01		2.38E-01
		756.80		4.52	-4.33E-02		9.01E-01
		873.18		12.08	1.22E-01		3.97E-01

Analysis Report for 29-Oct-19-10042

L1-10206B-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	8.79E-03	1.01E-01	5.06E-01
	1004.76	18.01	-1.07E-01		2.64E-01
	1274.43	34.80	1.00E-01		1.53E-01
	1596.48	1.80	-7.67E+00		2.44E+00
Eu-155	45.30	1.31	1.60E+01	2.38E-01	2.21E+01
	60.01	1.22	-5.04E+00		2.28E+01
	86.55	30.70	7.71E-02		2.38E-01
	105.31	21.10	9.59E-02		2.42E-01
Ra-226	186.21	3.64	1.03E+00	1.17E+00	1.17E+00
Pa-231	27.36	10.30	2.49E+00	1.51E+00	2.60E+00
	283.69	1.70	-3.47E-01		2.04E+00
	300.07	2.47	-2.13E-01		1.51E+00
	302.65	2.20	-4.69E-01		1.56E+00
	330.06	1.40	8.57E-01		2.72E+00
U-235	143.76	10.96	8.02E-02	7.28E-02	3.69E-01
	163.33	5.08	-1.33E-01		6.77E-01
	185.71	57.20	4.04E-02		7.28E-02
	202.11	1.08	1.42E+00		3.58E+00
	205.31	5.01	-7.11E-01		7.46E-01
Am-241	59.54	35.90	-2.58E-01	7.74E-01	7.74E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10043

L1-10206B-FSGS-014SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10043
Sample Description	: L1-10206B-FSGS-014SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.470E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:26:00PM
Acquisition Started	: 10/29/2019 12:46:27PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80829
Fill Height	: 1469.70 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 1:01:30PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10043

L1-10206B-FSGS-014SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.61	472 -	481	477.40	1.73E+02	19.53	9.08E+01	1.04
2	338.23	672 -	680	676.43	2.14E+01	10.72	4.36E+01	0.81
3	351.84	698 -	708	703.63	8.13E+01	12.52	3.17E+01	1.11
4	583.14	1160 -	1170	1165.89	6.25E+01	10.08	1.65E+01	1.05
5	609.16	1213 -	1223	1217.91	7.30E+01	10.42	1.50E+01	1.52
6	661.40	1318 -	1326	1322.33	2.05E+01	7.94	1.95E+01	1.16
7	911.01	1816 -	1825	1821.47	4.13E+01	7.81	8.73E+00	1.66
8	1460.47	2914 -	2928	2921.00	2.52E+02	16.41	5.77E+00	1.75

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	4.80E+00	3.75E-01
Cs-137	0.98	661.66	*	85.10	2.90E-02	1.13E-02
Tl-208	1.00	583.19	*	85.00	8.13E-02	1.40E-02
Bi-211	0.90	351.07	*	13.02	4.91E-01	8.54E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.45E-01	3.39E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.83E-01	2.83E-02
		768.36		4.89		

Analysis Report for 29-Oct-19-10043

L1-10206B-FSGS-014SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	1.80E-01	3.12E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.45E-01	7.37E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.37E-01	4.60E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-Oct-19-10043

L1-10206B-FSGS-014SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.981	4.80E+00	3.75E-01	
	Cs-137	0.989	2.90E-02	1.13E-02	
	Tl-208	1.000	8.13E-02	1.40E-02	
?	Bi-211	0.909	4.91E-01	8.54E-02	
	Pb-212	1.000	2.45E-01	3.39E-02	
	Bi-214	0.998	1.83E-01	2.83E-02	
?	Pb-214	0.999	1.80E-01	3.12E-02	
	Ac-228	0.998	2.11E-01	3.90E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10043

L1-10206B-FSGS-014SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 1:01:30PM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	5.72E-02	5.06E-02	5.06E-02
	BE-7	477.60		10.44	2.68E-01	3.98E-01	3.98E-01
+	K-40	1460.82	*	10.66	4.80E+00	3.20E-01	3.20E-01
	Mn-54	834.85		99.98	-1.73E-02	3.26E-02	3.26E-02
	Co-60	1173.23		99.85	1.35E-03	4.06E-02	5.31E-02
		1332.49		99.98	1.67E-02		4.06E-02
	Nb-94	702.65		99.81	-7.92E-03	3.54E-02	3.54E-02
		871.09		99.89	-2.52E-03		3.65E-02
	Ag-108m	79.13		6.60	2.50E-01	3.76E-02	1.10E+00
		433.94		90.50	1.67E-02		3.76E-02
		614.28		89.80	-1.03E-02		4.69E-02
		722.94		90.80	-1.01E-02		4.21E-02
	Sb-125	176.31		6.84	-1.39E-01	1.10E-01	4.68E-01
		380.45		1.52	1.50E+00		1.96E+00
		427.87		29.60	-1.58E-03		1.10E-01
		463.36		10.49	-1.65E-02		3.04E-01
		600.60		17.65	3.51E-03		1.89E-01
		606.71		4.98	-3.70E-01		1.16E+00
		635.95		11.22	-1.26E-02		3.09E-01

Analysis Report for 29-Oct-19-10043

L1-10206B-FSGS-014SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-4.58E-01	1.10E-01	2.15E+00
	Ba-133	79.61		2.65	-3.76E-01	6.44E-02	2.56E+00
		81.00		32.90	-2.23E-01		1.78E-01
		276.40		7.16	-2.23E-01		3.92E-01
		302.85		18.34	5.67E-02		1.86E-01
		356.01		62.05	-2.14E-02		6.44E-02
		383.85		8.94	2.79E-02		3.07E-01
	Cs-134	475.36		1.48	1.01E+00	4.34E-02	2.79E+00
		563.25		8.34	2.32E-02		3.48E-01
		569.33		15.37	2.89E-02		2.19E-01
		604.72		97.62	-1.66E-02		5.32E-02
		795.86		85.46	1.04E-02		4.34E-02
		801.95		8.69	5.27E-02		3.90E-01
		1038.61		0.99	-3.46E-01		4.22E+00
		1167.97		1.79	-1.06E+00		2.79E+00
		1365.19		3.02	-3.46E-02		1.25E+00
+	Cs-137	661.66	*	85.10	2.90E-02	3.53E-02	3.53E-02
	Eu-152	121.78		28.67	1.10E-02	1.13E-01	1.13E-01
		244.70		7.61	-1.17E-01		4.43E-01
		295.94		0.45	5.00E+00		8.74E+00
		344.28		26.60	-4.48E-03		1.26E-01
		367.79		0.86	-6.36E-01		3.56E+00
		411.12		2.24	2.69E-01		1.41E+00
		443.96		2.83	-1.47E-01		9.91E-01
		488.68		0.42	-3.15E+00		7.59E+00
		563.99		0.49	2.42E+00		6.23E+00
		586.26		0.46	-4.78E+00		1.17E+01
		678.62		0.47	1.42E+00		8.40E+00
		688.67		0.86	-1.23E-02		4.31E+00
		719.35		0.28	8.53E+00		1.39E+01
		778.90		12.96	8.02E-02		3.18E-01
		810.45		0.32	-5.76E+00		9.43E+00
		867.37		4.26	3.33E-01		8.88E-01
		919.33		0.43	-6.26E-01		8.85E+00
		964.08		14.65	-3.70E-02		3.65E-01
		1085.87		10.24	-2.53E-01		4.03E-01
		1089.74		1.73	3.85E-01		2.67E+00
		1112.07		13.69	-1.02E-01		3.25E-01
		1212.95		1.43	1.25E+00		3.80E+00
		1249.94		0.19	1.35E+01		2.80E+01
		1299.14		1.63	-1.25E+00		2.23E+00
		1408.01		21.07	5.40E-02		2.01E-01
		1457.64		0.50	-1.91E+00		3.24E+01
		1528.10		0.28	-1.12E+00		1.40E+01
	Eu-154	123.07		40.40	-2.96E-02	7.74E-02	7.74E-02
		247.93		6.89	-3.43E-02		4.43E-01
		591.76		4.95	-9.03E-02		6.77E-01
		692.42		1.78	1.86E-01		2.21E+00
		723.30		20.06	-2.82E-02		1.91E-01
		756.80		4.52	1.53E-01		7.22E-01
		873.18		12.08	-7.47E-02		3.09E-01

Analysis Report for 29-Oct-19-10043

L1-10206B-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-4.79E-02	7.74E-02	4.17E-01
	1004.76	18.01	-1.34E-02		2.23E-01
	1274.43	34.80	-5.97E-02		1.10E-01
	1596.48	1.80	-5.43E-01		1.98E+00
Eu-155	45.30	1.31	3.36E+00	1.76E-01	1.12E+01
	60.01	1.22	-2.63E+00		1.06E+01
	86.55	30.70	3.76E-02		1.76E-01
	105.31	21.10	5.84E-02		1.80E-01
Ra-226	186.21	3.64	9.24E-01	9.79E-01	9.79E-01
Pa-231	27.36	10.30	1.08E+00	1.22E+00	1.22E+00
	283.69	1.70	-2.10E-01		1.71E+00
	300.07	2.47	-1.81E+00		1.32E+00
	302.65	2.20	4.72E-01		1.55E+00
	330.06	1.40	1.66E+00		2.66E+00
U-235	143.76	10.96	-7.29E-02	6.20E-02	2.63E-01
	163.33	5.08	1.18E-01		6.51E-01
	185.71	57.20	4.76E-02		6.20E-02
	202.11	1.08	3.42E-01		3.03E+00
	205.31	5.01	-4.92E-02		6.81E-01
Am-241	59.54	35.90	-5.48E-02	3.77E-01	3.77E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10044

L1-10206B-FSGS-015SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10044
Sample Description	: L1-10206B-FSGS-015SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.567E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:28:00PM
Acquisition Started	: 10/29/2019 12:46:33PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.4 seconds
Dead Time	: 0.15 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/29/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80830
Fill Height	: 1567.28 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 1:01:37PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10044

L1-10206B-FSGS-015SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.54	949 -	959	954.25	1.32E+02	16.49	5.89E+01	0.76
2	295.34	1175 -	1186	1181.26	4.84E+01	11.62	3.46E+01	0.97
3	338.06	1348 -	1358	1352.00	1.86E+01	8.93	2.54E+01	0.61
4	351.82	1400 -	1414	1407.02	7.86E+01	12.94	3.04E+01	0.85
5	510.40	2035 -	2045	2040.96	2.94E+01	9.76	2.76E+01	1.04
6	583.12	2325 -	2337	2331.71	5.33E+01	8.88	9.70E+00	0.92
7	609.00	2430 -	2443	2435.18	7.63E+01	11.19	1.67E+01	0.98
8	968.69	3868 -	3879	3873.72	3.10E+01	6.20	3.00E+00	0.94
9	1460.28	5830 -	5851	5840.97	2.80E+02	17.04	2.70E+00	1.97

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.94	511.00	*	100.00	3.84E-02	1.30E-02
K-40	0.95	1460.82	*	10.66	6.94E+00	5.18E-01
Tl-208	0.99	583.19	*	85.00	8.85E-02	1.57E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.35E-01	3.50E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.44E-01	3.86E-02
		768.36		4.89		

Analysis Report for 29-Oct-19-10044

L1-10206B-FSGS-015SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.30E-01	5.81E-02
		351.93	*	35.60	2.19E-01	4.01E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.59E-01	7.74E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20		25.80		
		964.77		4.99		
		968.97	*	15.80	3.91E-01	8.01E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-Oct-19-10044

L1-10206B-FSGS-015SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.945	3.84E-02	1.30E-02	
	K-40	0.955	6.94E+00	5.18E-01	
	Tl-208	0.999	8.85E-02	1.57E-02	
X	Bi-211	0.914			
	Pb-212	0.999	2.35E-01	3.50E-02	
	Bi-214	0.993	2.44E-01	3.86E-02	
	Pb-214	0.998	2.22E-01	3.30E-02	
	Ac-228	0.996	2.71E-01	5.57E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10044

L1-10206B-FSGS-015SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 1:01:37PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	3.84E-02	3.97E-02	3.97E-02
	BE-7	477.60		10.44	1.76E-01	4.35E-01	4.35E-01
+	K-40	1460.82	*	10.66	6.94E+00	3.37E-01	3.37E-01
	Mn-54	834.85		99.98	1.53E-02	5.17E-02	5.17E-02
	Co-60	1173.23		99.85	-1.36E-02	5.72E-02	6.08E-02
		1332.49		99.98	4.43E-02		5.72E-02
	Nb-94	702.65		99.81	3.24E-02	5.06E-02	5.33E-02
		871.09		99.89	1.87E-02		5.06E-02
	Ag-108m	79.13		6.60	1.51E+00	4.64E-02	2.04E+00
		433.94		90.50	-3.79E-02		4.64E-02
		614.28		89.80	-5.06E-02		6.36E-02
		722.94		90.80	5.50E-02		6.30E-02
	Sb-125	176.31		6.84	-5.66E-01	1.42E-01	5.62E-01
		380.45		1.52	1.63E+00		2.73E+00
		427.87		29.60	9.07E-03		1.42E-01
		463.36		10.49	-2.33E-01		3.86E-01
		600.60		17.65	-2.25E-03		2.68E-01
		606.71		4.98	1.49E+00		1.59E+00
		635.95		11.22	-6.74E-02		4.17E-01

Analysis Report for 29-Oct-19-10044

L1-10206B-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.82E+00	1.42E-01	2.53E+00
Ba-133	79.61	2.65	7.57E-01	7.84E-02	4.76E+00
	81.00	32.90	-1.01E-01		3.30E-01
	276.40	7.16	2.25E-02		5.54E-01
	302.85	18.34	1.53E-01		2.17E-01
	356.01	62.05	1.82E-02		7.84E-02
	383.85	8.94	7.85E-02		4.14E-01
Cs-134	475.36	1.48	1.84E+00	6.37E-02	3.06E+00
	563.25	8.34	3.37E-02		5.17E-01
	569.33	15.37	-2.04E-01		2.97E-01
	604.72	97.62	-3.24E-02		7.75E-02
	795.86	85.46	3.75E-02		6.37E-02
	801.95	8.69	-3.02E-02		4.79E-01
	1038.61	0.99	-1.97E+00		5.24E+00
	1167.97	1.79	-2.52E-02		3.67E+00
	1365.19	3.02	3.24E-01		1.50E+00
Cs-137	661.66	85.10	3.25E-02	7.07E-02	7.07E-02
Eu-152	121.78	28.67	-3.25E-03	1.36E-01	1.70E-01
	244.70	7.61	3.77E-01		5.82E-01
	295.94	0.45	1.87E+00		1.09E+01
	344.28	26.60	5.59E-02		1.36E-01
	367.79	0.86	3.64E+00		4.83E+00
	411.12	2.24	-1.82E+00		1.87E+00
	443.96	2.83	-8.44E-01		1.53E+00
	488.68	0.42	5.51E+00		9.43E+00
	563.99	0.49	2.32E+00		8.89E+00
	586.26	0.46	-1.16E+01		1.47E+01
	678.62	0.47	6.05E+00		9.37E+00
	688.67	0.86	2.09E-01		5.03E+00
	719.35	0.28	1.15E+00		1.65E+01
	778.90	12.96	-3.53E-02		3.86E-01
	810.45	0.32	8.40E+00		1.62E+01
	867.37	4.26	-2.40E-01		1.08E+00
	919.33	0.43	-5.78E+00		1.25E+01
	964.08	14.65	-1.02E-01		5.17E-01
	1085.87	10.24	3.41E-01		5.93E-01
	1089.74	1.73	1.87E-01		3.34E+00
	1112.07	13.69	-1.71E-01		3.79E-01
	1212.95	1.43	-4.22E-01		5.00E+00
	1249.94	0.19	-4.30E+01		2.83E+01
	1299.14	1.63	2.75E-01		3.62E+00
	1408.01	21.07	3.96E-02		2.69E-01
	1457.64	0.50	1.46E+02		4.41E+01
	1528.10	0.28	3.88E+00		1.21E+01
Eu-154	123.07	40.40	-6.60E-03	1.22E-01	1.22E-01
	247.93	6.89	-2.06E-01		5.05E-01
	591.76	4.95	2.84E-01		9.99E-01
	692.42	1.78	-2.50E-01		2.68E+00
	723.30	20.06	1.99E-01		2.85E-01
	756.80	4.52	-1.77E-01		9.45E-01
	873.18	12.08	4.29E-01		4.33E-01

Analysis Report for 29-Oct-19-10044

L1-10206B-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.89E-01	1.22E-01	4.82E-01
	1004.76	18.01	1.06E-01		3.15E-01
	1274.43	34.80	1.48E-01		1.91E-01
	1596.48	1.80	1.18E+00		3.38E+00
Eu-155	45.30	1.31	9.07E+00	2.79E-01	3.12E+01
	60.01	1.22	-2.09E+01		3.26E+01
	86.55	30.70	3.71E-02		2.84E-01
	105.31	21.10	1.31E-02		2.79E-01
Ra-226	186.21	3.64	1.12E+00	1.26E+00	1.26E+00
Pa-231	27.36	10.30	3.23E+00	1.59E+00	3.74E+00
	283.69	1.70	-1.39E+00		2.06E+00
	300.07	2.47	-3.65E-01		1.59E+00
	302.65	2.20	1.18E+00		1.81E+00
	330.06	1.40	-1.27E+00		2.93E+00
U-235	143.76	10.96	1.49E-02	8.08E-02	4.12E-01
	163.33	5.08	3.29E-01		8.44E-01
	185.71	57.20	7.51E-02		8.08E-02
	202.11	1.08	1.17E+00		3.60E+00
	205.31	5.01	-2.87E-01		7.60E-01
Am-241	59.54	35.90	-3.93E-01	1.20E+00	1.20E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10045

L1-10206B-FSGS-016SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10045
Sample Description	: L1-10206B-FSGS-016SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.507E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:30:00PM
Acquisition Started	: 10/29/2019 12:46:40PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 1/24/2019
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80831
Fill Height	: 1506.77 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 1:02:00PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10045

L1-10206B-FSGS-016SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.34	306 -	316	309.88	4.15E+01	13.86	6.25E+01	0.92
2	238.84	949 -	960	954.92	9.91E+01	16.24	6.39E+01	0.75
3	295.41	1175 -	1188	1180.94	6.30E+01	12.11	3.00E+01	1.04
4	352.02	1403 -	1414	1407.10	7.74E+01	10.91	1.66E+01	1.41
5	583.13	2323 -	2336	2330.66	4.97E+01	9.17	1.23E+01	0.86
6	609.06	2426 -	2443	2434.27	7.29E+01	11.76	2.01E+01	0.98
7	1460.56	5828 -	5851	5840.17	2.75E+02	16.93	2.95E+00	1.59

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	6.20E+00	4.67E-01
Tl-208	1.00	583.19	*	85.00	7.51E-02	1.46E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.58E-01	2.88E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	2.91E-01	1.02E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.12E-01	3.65E-02

Analysis Report for 29-Oct-19-10045

L1-10206B-FSGS-016SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.70E-01	5.62E-02
		351.93	*	35.60	1.95E-01	3.17E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	5.14E-01	1.81E-01
		87.35		2.24		
		89.78		0.82		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.989	6.20E+00	4.67E-01	
Tl-208	1.000	7.51E-02	1.46E-02	

Analysis Report for 29-Oct-19-10045

L1-10206B-FSGS-016SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	Bi-211	0.865			
	Pb-212	0.994	1.58E-01	2.88E-02	
?	Pb212-XR	0.996	2.91E-01	1.02E-01	
	Bi-214	0.996	2.12E-01	3.65E-02	
	Pb-214	0.998	2.13E-01	2.76E-02	
?	Pb214-XR	0.996	5.14E-01	1.81E-01	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10045

L1-10206B-FSGS-016SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 1:02:00PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.60E-02	5.20E-02	5.20E-02
	BE-7	477.60		10.44	1.59E-01	3.47E-01	3.47E-01
+	K-40	1460.82	*	10.66	6.20E+00	3.26E-01	3.26E-01
	Mn-54	834.85		99.98	-3.49E-02	3.99E-02	3.99E-02
	Co-60	1173.23		99.85	-1.32E-03	5.45E-02	6.01E-02
		1332.49		99.98	4.48E-02		5.45E-02
	Nb-94	702.65		99.81	-1.63E-02	4.06E-02	4.06E-02
		871.09		99.89	-1.59E-02		4.10E-02
	Ag-108m	79.13		6.60	-1.50E-01	3.56E-02	1.08E+00
		433.94		90.50	-1.11E-02		3.56E-02
		614.28		89.80	1.19E-02		6.29E-02
		722.94		90.80	8.38E-03		5.44E-02
	Sb-125	176.31		6.84	-6.66E-02	1.11E-01	4.36E-01
		380.45		1.52	6.30E-01		2.25E+00
		427.87		29.60	-5.21E-02		1.11E-01
		463.36		10.49	8.96E-02		3.09E-01
		600.60		17.65	-1.05E-01		2.29E-01
		606.71		4.98	-3.84E-01		1.41E+00
		635.95		11.22	8.82E-02		3.08E-01

Analysis Report for 29-Oct-19-10045

L1-10206B-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	8.07E-01	1.11E-01	2.12E+00
Ba-133	79.61	2.65	-4.50E-01	6.61E-02	2.65E+00
	81.00	32.90	-2.37E-02		1.72E-01
	276.40	7.16	1.24E-01		4.65E-01
	302.85	18.34	-7.71E-02		1.61E-01
	356.01	62.05	-2.15E-02		6.61E-02
	383.85	8.94	6.70E-02		3.80E-01
Cs-134	475.36	1.48	5.73E-01	5.16E-02	2.45E+00
	563.25	8.34	-3.40E-01		4.64E-01
	569.33	15.37	1.69E-01		2.57E-01
	604.72	97.62	-1.90E-02		6.39E-02
	795.86	85.46	-1.43E-02		5.16E-02
	801.95	8.69	2.75E-02		4.66E-01
	1038.61	0.99	-2.26E+00		4.88E+00
	1167.97	1.79	-6.97E-01		2.85E+00
	1365.19	3.02	1.47E-01		1.31E+00
Cs-137	661.66	85.10	3.17E-02	4.72E-02	4.72E-02
Eu-152	121.78	28.67	4.10E-02	1.21E-01	1.21E-01
	244.70	7.61	5.19E-01		4.95E-01
	295.94	0.45	8.24E+00		1.01E+01
	344.28	26.60	3.70E-03		1.33E-01
	367.79	0.86	8.98E-01		3.81E+00
	411.12	2.24	5.03E-01		1.62E+00
	443.96	2.83	-3.15E-01		1.11E+00
	488.68	0.42	3.72E+00		8.98E+00
	563.99	0.49	-6.17E+00		7.45E+00
	586.26	0.46	-9.20E+00		1.28E+01
	678.62	0.47	-2.86E+00		6.29E+00
	688.67	0.86	4.19E-01		3.70E+00
	719.35	0.28	2.05E+00		1.57E+01
	778.90	12.96	-6.03E-03		2.93E-01
	810.45	0.32	1.58E+00		1.24E+01
	867.37	4.26	-3.76E-01		8.94E-01
	919.33	0.43	2.96E+00		1.08E+01
	964.08	14.65	3.40E-01		4.54E-01
	1085.87	10.24	9.21E-02		5.40E-01
	1089.74	1.73	8.28E-01		2.99E+00
	1112.07	13.69	-1.44E-01		3.45E-01
	1212.95	1.43	1.58E+00		4.17E+00
	1249.94	0.19	-9.94E+00		3.21E+01
	1299.14	1.63	1.74E+00		3.15E+00
	1408.01	21.07	-1.37E-01		2.08E-01
	1457.64	0.50	1.21E+02		3.98E+01
	1528.10	0.28	-1.03E+01		1.10E+01
Eu-154	123.07	40.40	3.54E-02	8.48E-02	8.48E-02
	247.93	6.89	-3.65E-01		3.93E-01
	591.76	4.95	-4.15E-01		7.64E-01
	692.42	1.78	-1.64E-01		2.02E+00
	723.30	20.06	-7.41E-03		2.46E-01
	756.80	4.52	3.56E-01		1.00E+00
	873.18	12.08	6.29E-02		3.89E-01

Analysis Report for 29-Oct-19-10045

L1-10206B-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	7.02E-02	8.48E-02	4.29E-01
	1004.76	18.01	-3.85E-02		2.72E-01
	1274.43	34.80	-1.84E-01		1.59E-01
	1596.48	1.80	8.60E-01		2.10E+00
Eu-155	45.30	1.31	3.73E+00	1.73E-01	1.09E+01
	60.01	1.22	1.30E+00		1.20E+01
	86.55	30.70	-1.63E-02		1.76E-01
	105.31	21.10	4.68E-02		1.73E-01
Ra-226	186.21	3.64	6.35E-01	9.09E-01	9.09E-01
Pa-231	27.36	10.30	1.07E+00	1.32E+00	1.32E+00
	283.69	1.70	1.70E-01		1.94E+00
	300.07	2.47	8.31E-01		1.36E+00
	302.65	2.20	-6.64E-01		1.37E+00
	330.06	1.40	-1.02E+00		2.19E+00
U-235	143.76	10.96	-2.31E-01	5.75E-02	2.88E-01
	163.33	5.08	-1.69E-01		5.51E-01
	185.71	57.20	1.23E-02		5.75E-02
	202.11	1.08	-1.53E+00		2.58E+00
	205.31	5.01	-7.77E-01		5.32E-01
Am-241	59.54	35.90	2.22E-01	4.24E-01	4.24E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 29-Oct-19-10046

L1-10206B-FSGS-017SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 29-Oct-19-10046
Sample Description	: L1-10206B-FSGS-017SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.689E+03 grams
Facility	: Default
Sample Taken On	: 10/28/2019 1:32:00PM
Acquisition Started	: 10/29/2019 12:46:48PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 9/29/2018
Efficiency Calibration Used Done On	: 10/29/2019
Efficiency Calibration Description	:
Sample Number	: 80832
Fill Height	: 1688.90 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 10/29/2019 1:01:52PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0730 10-30-19

Analysis Report for 29-Oct-19-10046

L1-10206B-FSGS-017SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	238.57	950 -	974	954.74	1.13E+02	11.85	4.10E+01	0.92
m	2	241.54	950 -	974	966.61	3.14E+01	7.21	3.69E+01	0.92
	3	338.40	1349 -	1358	1353.65	1.55E+01	8.17	2.25E+01	0.84
	4	352.02	1401 -	1414	1408.07	7.73E+01	12.30	2.67E+01	0.95
	5	510.33	2036 -	2045	2040.81	1.89E+01	9.03	2.51E+01	0.41
	6	583.20	2325 -	2338	2332.11	4.33E+01	8.74	1.17E+01	0.76
	7	609.16	2430 -	2446	2435.92	6.38E+01	8.89	5.22E+00	1.16
	8	911.15	3638 -	3649	3643.65	2.21E+01	7.47	1.29E+01	0.46
	9	1460.63	5830 -	5855	5842.88	3.92E+02	20.13	3.17E+00	1.57

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.93	511.00	*	100.00	2.10E-02	1.01E-02
K-40	0.99	1460.82	*	10.66	8.00E+00	5.38E-01
Tl-208	1.00	583.19	*	85.00	6.07E-02	1.28E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.74E-01	2.31E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.72E-01	2.61E-02
		768.36		4.89		

Analysis Report for 29-Oct-19-10046

L1-10206B-FSGS-017SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.50	241.99	*	7.25	2.93E-01	7.12E-02
		295.22		18.42		
		351.93	*	35.60	1.85E-01	3.29E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.14E-01	6.08E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.36E-01	4.65E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 29-Oct-19-10046

L1-10206B-FSGS-017SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.931	2.10E-02	1.01E-02	
	K-40	0.994	8.00E+00	5.38E-01	
	Tl-208	1.000	6.07E-02	1.28E-02	
X	Bi-211	0.866			
	Pb-212	0.999	1.74E-01	2.31E-02	
	Bi-214	0.998	1.72E-01	2.61E-02	
	Pb-214	0.509	2.04E-01	2.99E-02	
	Ac-228	1.000	1.28E-01	3.70E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 29-Oct-19-10046

L1-10206B-FSGS-017SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 10/29/2019 1:01:52PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	2.10E-02	3.29E-02	3.29E-02
	BE-7	477.60		10.44	1.63E-01	3.80E-01	3.80E-01
+	K-40	1460.82	*	10.66	8.00E+00	3.11E-01	3.11E-01
	Mn-54	834.85		99.98	2.90E-02	4.46E-02	4.46E-02
	Co-60	1173.23		99.85	-3.65E-02	4.95E-02	5.86E-02
		1332.49		99.98	-4.25E-03		4.95E-02
	Nb-94	702.65		99.81	1.75E-02	3.76E-02	4.37E-02
		871.09		99.89	-5.07E-03		3.76E-02
	Ag-108m	79.13		6.60	4.76E-01	3.88E-02	1.43E+00
		433.94		90.50	-1.40E-02		3.88E-02
		614.28		89.80	-6.82E-03		6.32E-02
		722.94		90.80	-2.42E-02		4.78E-02
	Sb-125	176.31		6.84	-1.37E-02	1.13E-01	5.10E-01
		380.45		1.52	-7.98E-01		2.37E+00
		427.87		29.60	3.24E-02		1.13E-01
		463.36		10.49	-3.98E-01		3.70E-01
		600.60		17.65	-1.41E-01		2.21E-01
		606.71		4.98	9.25E-01		1.16E+00
		635.95		11.22	2.87E-01		3.86E-01

Analysis Report for 29-Oct-19-10046

L1-10206B-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.60E+00	1.13E-01	2.40E+00
Ba-133	79.61	2.65	1.42E+00	7.17E-02	3.47E+00
	81.00	32.90	-2.24E-01		2.45E-01
	276.40	7.16	1.71E-01		4.98E-01
	302.85	18.34	1.26E-01		1.87E-01
	356.01	62.05	-3.34E-02		7.17E-02
	383.85	8.94	3.35E-01		4.20E-01
Cs-134	475.36	1.48	1.27E+00	4.67E-02	2.58E+00
	563.25	8.34	-2.71E-02		4.26E-01
	569.33	15.37	5.63E-03		2.45E-01
	604.72	97.62	-6.72E-02		5.42E-02
	795.86	85.46	-2.81E-02		4.67E-02
	801.95	8.69	-3.03E-01		4.45E-01
	1038.61	0.99	2.21E+00		5.11E+00
	1167.97	1.79	1.39E+00		3.73E+00
	1365.19	3.02	-3.26E-01		1.24E+00
Cs-137	661.66	85.10	1.14E-03	5.17E-02	5.17E-02
Eu-152	121.78	28.67	4.14E-02	1.28E-01	1.48E-01
	244.70	7.61	2.23E-01		5.21E-01
	295.94	0.45	9.79E+00		9.23E+00
	344.28	26.60	2.04E-02		1.28E-01
	367.79	0.86	7.88E-01		4.05E+00
	411.12	2.24	2.85E-01		1.69E+00
	443.96	2.83	3.21E-01		1.38E+00
	488.68	0.42	-2.59E+00		8.50E+00
	563.99	0.49	-9.92E+00		6.93E+00
	586.26	0.46	6.76E+00		1.17E+01
	678.62	0.47	-5.98E+00		8.13E+00
	688.67	0.86	-2.52E+00		4.08E+00
	719.35	0.28	-4.64E+00		1.43E+01
	778.90	12.96	4.14E-02		3.14E-01
	810.45	0.32	4.42E+00		1.28E+01
	867.37	4.26	2.32E-01		9.72E-01
	919.33	0.43	-1.14E+01		1.02E+01
	964.08	14.65	2.20E-01		3.96E-01
	1085.87	10.24	-1.81E-03		4.60E-01
	1089.74	1.73	-4.29E-01		2.97E+00
	1112.07	13.69	-9.78E-02		5.21E-01
	1212.95	1.43	2.25E+00		4.35E+00
	1249.94	0.19	7.84E+00		3.39E+01
	1299.14	1.63	-1.27E+00		2.99E+00
	1408.01	21.07	-3.04E-01		2.03E-01
	1457.64	0.50	1.73E+02		4.27E+01
	1528.10	0.28	-6.27E+00		1.24E+01
Eu-154	123.07	40.40	5.45E-02	1.05E-01	1.05E-01
	247.93	6.89	2.56E-01		5.07E-01
	591.76	4.95	5.72E-02		8.35E-01
	692.42	1.78	-2.62E+00		2.05E+00
	723.30	20.06	-1.18E-01		2.19E-01
	756.80	4.52	4.53E-01		9.24E-01
	873.18	12.08	-2.79E-01		3.19E-01

Analysis Report for 29-Oct-19-10046

L1-10206B-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.55E-01	1.05E-01	4.09E-01
	1004.76	18.01	1.64E-01		2.79E-01
	1274.43	34.80	-1.48E-01		1.58E-01
	1596.48	1.80	-2.34E-01		2.13E+00
Eu-155	45.30	1.31	5.50E+00	2.18E-01	1.93E+01
	60.01	1.22	-1.87E+00		2.09E+01
	86.55	30.70	6.34E-02		2.18E-01
	105.31	21.10	4.51E-02		2.26E-01
Ra-226	186.21	3.64	9.15E-01	1.05E+00	1.05E+00
Pa-231	27.36	10.30	9.24E-01	1.44E+00	2.36E+00
	283.69	1.70	-1.46E+00		1.91E+00
	300.07	2.47	-2.53E+00		1.44E+00
	302.65	2.20	4.50E-01		1.55E+00
	330.06	1.40	-6.11E-01		2.61E+00
U-235	143.76	10.96	-5.72E-03	6.69E-02	3.67E-01
	163.33	5.08	-1.90E-01		6.80E-01
	185.71	57.20	4.70E-02		6.69E-02
	202.11	1.08	-6.53E-01		3.16E+00
	205.31	5.01	-2.66E-01		6.96E-01
Am-241	59.54	35.90	-8.49E-02	7.47E-01	7.47E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 05-Nov-19-10010

L1-10206B-FSGS-006SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-Nov-19-10010
Sample Description	: L1-10206B-FSGS-006SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.627E+03 grams
Facility	: Default
Sample Taken On	: 11/1/2019 9:25:00AM
Acquisition Started	: 11/5/2019 9:10:14AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/5/2019
Efficiency Calibration Description	:
Sample Number	: 80967
Fill Height	: 1627.16 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/5/2019 9:25:17AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated 1500 11/6/19

Analysis Report for 05-Nov-19-10010

L1-10206B-FSGS-006SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.67	473 -	481	477.52	1.13E+02	20.35	1.35E+02	1.16
2	295.29	587 -	595	590.63	6.50E+01	12.53	4.30E+01	1.10
3	351.85	699 -	708	703.64	9.47E+01	14.45	5.03E+01	1.00
4	609.11	1213 -	1223	1217.79	8.16E+01	10.65	1.34E+01	1.68
5	911.34	1818 -	1827	1822.14	3.34E+01	9.18	2.16E+01	1.61
6	968.80	1933 -	1942	1937.07	1.90E+01	8.00	2.00E+01	0.79
7	1460.88	2914 -	2929	2921.82	3.11E+02	17.97	4.00E+00	2.25

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	5.75E+00	4.16E-01
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.57E-01	3.10E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.99E-01	2.87E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		

Analysis Report for 05-Nov-19-10010

L1-10206B-FSGS-006SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.41E-01	5.02E-02
		351.93	*	35.60	2.05E-01	3.53E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.87E-01	5.21E-02
		964.77		4.99		
		968.97	*	15.80	1.81E-01	7.67E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 05-Nov-19-10010

L1-10206B-FSGS-006SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	5.75E+00	4.16E-01	
X	Bi-211	0.908			
	Pb-212	1.000	1.57E-01	3.10E-02	
	Bi-214	0.997	1.99E-01	2.87E-02	
	Pb-214	0.999	2.17E-01	2.89E-02	
	Ac-228	0.998	1.85E-01	4.31E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 05-Nov-19-10010

L1-10206B-FSGS-006SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/5/2019 9:25:17AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.30E-02	5.05E-02	5.05E-02
	BE-7	477.60		10.44	-7.07E-02	3.06E-01	3.06E-01
+	K-40	1460.82	*	10.66	5.75E+00	2.71E-01	2.71E-01
	Mn-54	834.85		99.98	1.67E-02	4.36E-02	4.36E-02
	Co-60	1173.23		99.85	-2.18E-02	4.39E-02	4.57E-02
		1332.49		99.98	-5.12E-03		4.39E-02
	Nb-94	702.65		99.81	-2.40E-03	3.18E-02	4.06E-02
		871.09		99.89	-1.91E-02		3.18E-02
	Ag-108m	79.13		6.60	-3.41E-01	3.41E-02	1.04E+00
		433.94		90.50	-4.09E-03		3.41E-02
		614.28		89.80	-2.50E-02		4.67E-02
		722.94		90.80	-1.08E-02		4.23E-02
	Sb-125	176.31		6.84	3.30E-01	1.05E-01	5.10E-01
		380.45		1.52	6.37E-01		2.09E+00
		427.87		29.60	7.17E-02		1.05E-01
		463.36		10.49	1.03E-01		3.20E-01
		600.60		17.65	2.14E-02		1.98E-01
		606.71		4.98	-1.07E-01		1.21E+00
		635.95		11.22	2.91E-02		3.07E-01

Analysis Report for 05-Nov-19-10010

L1-10206B-FSGS-006SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-8.63E-02	1.05E-01	1.94E+00
Ba-133	79.61	2.65	-1.32E+00	6.92E-02	2.45E+00
	81.00	32.90	-1.91E-01		1.74E-01
	276.40	7.16	1.52E-01		4.28E-01
	302.85	18.34	4.62E-02		1.80E-01
	356.01	62.05	-2.63E-02		6.92E-02
	383.85	8.94	1.63E-01		3.58E-01
Cs-134	475.36	1.48	4.65E-01	4.25E-02	2.16E+00
	563.25	8.34	2.60E-02		4.13E-01
	569.33	15.37	2.11E-02		2.17E-01
	604.72	97.62	-1.34E-02		5.42E-02
	795.86	85.46	7.19E-03		4.25E-02
	801.95	8.69	9.66E-02		4.34E-01
	1038.61	0.99	1.05E+00		4.72E+00
	1167.97	1.79	1.02E+00		2.68E+00
	1365.19	3.02	2.18E-02		1.13E+00
Cs-137	661.66	85.10	3.28E-02	5.53E-02	5.53E-02
Eu-152	121.78	28.67	-5.32E-03	1.07E-01	1.07E-01
	244.70	7.61	-1.86E-01		4.64E-01
	295.94	0.45	4.79E+00		8.55E+00
	344.28	26.60	-1.18E-01		1.15E-01
	367.79	0.86	-2.74E+00		3.46E+00
	411.12	2.24	5.75E-01		1.54E+00
	443.96	2.83	2.74E-02		1.05E+00
	488.68	0.42	-2.24E-01		8.11E+00
	563.99	0.49	-6.88E-02		6.82E+00
	586.26	0.46	1.30E+01		1.08E+01
	678.62	0.47	4.59E+00		7.91E+00
	688.67	0.86	-3.87E-01		4.15E+00
	719.35	0.28	6.41E+00		1.33E+01
	778.90	12.96	3.43E-02		2.66E-01
	810.45	0.32	4.17E-01		1.02E+01
	867.37	4.26	2.84E-01		8.83E-01
	919.33	0.43	-2.45E+00		9.46E+00
	964.08	14.65	-1.49E-02		3.52E-01
	1085.87	10.24	-3.34E-01		3.58E-01
	1089.74	1.73	3.51E-01		2.33E+00
	1112.07	13.69	-5.52E-02		3.10E-01
	1212.95	1.43	-5.40E-01		3.99E+00
	1249.94	0.19	5.66E+00		2.28E+01
	1299.14	1.63	6.30E-03		3.30E+00
	1408.01	21.07	8.10E-02		1.90E-01
	1457.64	0.50	-7.83E-01		3.47E+01
	1528.10	0.28	5.06E+00		1.13E+01
Eu-154	123.07	40.40	2.05E-03	7.73E-02	7.73E-02
	247.93	6.89	-8.35E-02		4.50E-01
	591.76	4.95	1.23E-01		6.34E-01
	692.42	1.78	1.87E-01		2.16E+00
	723.30	20.06	-2.40E-02		1.99E-01
	756.80	4.52	1.06E-01		7.62E-01
	873.18	12.08	3.26E-02		2.89E-01

Analysis Report for 05-Nov-19-10010

L1-10206B-FSGS-006SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-5.62E-03	7.73E-02	4.14E-01
	1004.76	18.01	2.35E-02		2.46E-01
	1274.43	34.80	2.50E-02		1.54E-01
	1596.48	1.80	-1.73E+00		1.46E+00
Eu-155	45.30	1.31	-8.34E+00	1.70E-01	9.37E+00
	60.01	1.22	-3.57E+00		1.20E+01
	86.55	30.70	2.15E-02		1.70E-01
	105.31	21.10	-3.34E-02		1.72E-01
Ra-226	186.21	3.64	5.39E-01	9.38E-01	9.38E-01
Pa-231	27.36	10.30	2.11E-01	1.01E+00	1.01E+00
	283.69	1.70	4.90E-02		1.75E+00
	300.07	2.47	-2.19E-01		1.29E+00
	302.65	2.20	3.85E-01		1.50E+00
	330.06	1.40	1.22E+00		2.53E+00
U-235	143.76	10.96	1.17E-01	5.89E-02	2.97E-01
	163.33	5.08	-6.33E-02		6.61E-01
	185.71	57.20	3.61E-02		5.89E-02
	202.11	1.08	-5.79E-01		3.00E+00
	205.31	5.01	-3.54E-01		6.54E-01
Am-241	59.54	35.90	-8.26E-02	4.14E-01	4.14E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 05-Nov-19-10011

L1-10206B-FSGS-014SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-Nov-19-10011
Sample Description	: L1-10206B-FSGS-014SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.768E+03 grams
Facility	: Default
Sample Taken On	: 11/1/2019 9:15:00AM
Acquisition Started	: 11/5/2019 9:10:20AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.4 seconds
Dead Time	: 0.16 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/5/2019
Efficiency Calibration Description	:
Sample Number	: 80968
Fill Height	: 1768.09 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/5/2019 9:25:25AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

0800 11/6/19

Analysis Report for 05-Nov-19-10011

L1-10206B-FSGS-014SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	185.96	740 -	751	744.14	4.45E+01	13.19	5.15E+01	0.47
2	238.71	949 -	960	954.92	1.13E+02	15.41	4.95E+01	1.02
3	295.18	1174 -	1187	1180.61	2.47E+01	12.96	5.13E+01	0.44
4	338.38	1348 -	1360	1353.30	2.96E+01	11.25	3.64E+01	0.75
5	351.95	1401 -	1413	1407.55	7.79E+01	11.54	2.11E+01	1.14
6	583.36	2326 -	2339	2332.64	3.16E+01	8.12	1.24E+01	1.27
7	609.47	2431 -	2444	2437.06	6.38E+01	10.27	1.52E+01	0.70
8	1461.10	5832 -	5854	5844.22	3.24E+02	19.19	1.15E+01	1.75

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	7.77E+00	5.71E-01
Tl-208	0.99	583.19	*	85.00	5.12E-02	1.35E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	1.98E-01	3.13E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.99E-01	3.42E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 05-Nov-19-10011

L1-10206B-FSGS-014SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	1.15E-01	6.10E-02
		351.93	*	35.60	2.13E-01	3.58E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	8.31E-01	2.55E-01
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	2.48E-01	9.64E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20		25.80		
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.99	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	5.29E-02	1.63E-02
		202.11		1.08		
		205.31		5.01		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 05-Nov-19-10011

L1-10206B-FSGS-014SB

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.988	7.77E+00	5.71E-01	
	Tl-208	0.995	5.12E-02	1.35E-02	
X	Bi-211	0.883			
	Pb-212	0.999	1.98E-01	3.13E-02	
	Bi-214	0.999	1.99E-01	3.42E-02	
	Pb-214	1.000	1.88E-01	3.09E-02	
?	Ra-226	0.990	8.31E-01	2.55E-01	
	Ac-228	1.000	2.48E-01	9.64E-02	
?	U-235	0.993	5.29E-02	1.63E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 05-Nov-19-10011

L1-10206B-FSGS-014SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/5/2019 9:25:25AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	1.10E-02	5.46E-02	5.46E-02
	BE-7	477.60		10.44	1.23E-01	4.25E-01	4.25E-01
+	K-40	1460.82	*	10.66	7.77E+00	6.13E-01	6.13E-01
	Mn-54	834.85		99.98	1.97E-03	4.99E-02	4.99E-02
	Co-60	1173.23		99.85	3.97E-02	5.69E-02	6.97E-02
		1332.49		99.98	1.35E-02		5.69E-02
	Nb-94	702.65		99.81	3.52E-02	4.66E-02	5.07E-02
		871.09		99.89	2.45E-02		4.66E-02
	Ag-108m	79.13		6.60	-1.90E-01	4.40E-02	1.97E+00
		433.94		90.50	-2.42E-02		4.40E-02
		614.28		89.80	-2.27E-02		6.92E-02
		722.94		90.80	-2.72E-02		5.82E-02
	Sb-125	176.31		6.84	-2.55E-02	1.51E-01	5.84E-01
		380.45		1.52	5.43E-01		2.67E+00
		427.87		29.60	4.26E-02		1.51E-01
		463.36		10.49	-1.29E-01		3.69E-01
		600.60		17.65	-9.61E-02		2.22E-01
		606.71		4.98	2.51E+00		1.45E+00
		635.95		11.22	1.50E-01		4.33E-01

Analysis Report for 05-Nov-19-10011

L1-10206B-FSGS-014SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.50E+00	1.51E-01	2.32E+00
Ba-133	79.61	2.65	1.87E+00	7.44E-02	4.84E+00
	81.00	32.90	-1.99E-01		3.33E-01
	276.40	7.16	1.61E-01		5.38E-01
	302.85	18.34	1.13E-01		2.19E-01
	356.01	62.05	-4.36E-02		7.44E-02
	383.85	8.94	2.57E-02		4.59E-01
Cs-134	475.36	1.48	4.07E-01	6.32E-02	2.70E+00
	563.25	8.34	3.36E-01		4.72E-01
	569.33	15.37	1.83E-01		2.58E-01
	604.72	97.62	-1.59E-02		6.32E-02
	795.86	85.46	2.48E-02		6.54E-02
	801.95	8.69	-7.52E-02		5.91E-01
	1038.61	0.99	-4.88E+00		6.42E+00
	1167.97	1.79	-1.07E+00		3.68E+00
	1365.19	3.02	1.70E-02		1.92E+00
Cs-137	661.66	85.10	1.85E-02	5.14E-02	5.14E-02
Eu-152	121.78	28.67	-1.37E-02	1.43E-01	1.62E-01
	244.70	7.61	3.26E-01		5.28E-01
	295.94	0.45	2.16E+00		1.06E+01
	344.28	26.60	-7.41E-02		1.43E-01
	367.79	0.86	2.93E+00		4.47E+00
	411.12	2.24	-2.90E-01		1.94E+00
	443.96	2.83	4.35E-01		1.36E+00
	488.68	0.42	9.69E-01		9.08E+00
	563.99	0.49	-1.26E+00		7.62E+00
	586.26	0.46	-4.06E+00		1.25E+01
	678.62	0.47	-4.21E+00		8.84E+00
	688.67	0.86	-2.74E+00		5.15E+00
	719.35	0.28	-5.20E-01		1.78E+01
	778.90	12.96	1.33E-01		3.59E-01
	810.45	0.32	-2.65E+00		1.41E+01
	867.37	4.26	2.34E-01		1.23E+00
	919.33	0.43	4.83E-01		1.19E+01
	964.08	14.65	4.15E-02		4.53E-01
	1085.87	10.24	-1.48E-01		5.76E-01
	1089.74	1.73	1.72E+00		3.31E+00
	1112.07	13.69	2.58E-01		4.84E-01
	1212.95	1.43	1.93E+00		5.84E+00
	1249.94	0.19	4.24E+00		3.48E+01
	1299.14	1.63	-3.12E+00		3.81E+00
	1408.01	21.07	2.95E-03		2.38E-01
	1457.64	0.50	1.74E+02		4.67E+01
	1528.10	0.28	-6.81E+00		1.17E+01
Eu-154	123.07	40.40	5.80E-02	1.17E-01	1.17E-01
	247.93	6.89	2.30E-01		5.23E-01
	591.76	4.95	4.65E-01		9.44E-01
	692.42	1.78	2.02E+00		2.65E+00
	723.30	20.06	-2.80E-01		2.64E-01
	756.80	4.52	-5.44E-02		9.75E-01
	873.18	12.08	-8.85E-02		3.71E-01

Analysis Report for 05-Nov-19-10011

L1-10206B-FSGS-014SB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	3.71E-01	1.17E-01	5.97E-01
		1004.76		18.01	-2.35E-01		3.21E-01
		1274.43		34.80	-1.38E-01		1.79E-01
		1596.48		1.80	9.16E-01		2.23E+00
	Eu-155	45.30		1.31	-6.30E+00	2.83E-01	3.23E+01
		60.01		1.22	6.17E+00		3.52E+01
		86.55		30.70	1.09E-01		2.97E-01
		105.31		21.10	8.64E-02		2.83E-01
+	Ra-226	186.21	*	3.64	8.31E-01	7.75E-01	7.75E-01
	Pa-231	27.36		10.30	4.13E+00	1.62E+00	3.69E+00
		283.69		1.70	-1.34E+00		2.23E+00
		300.07		2.47	1.98E-01		1.62E+00
		302.65		2.20	3.72E-01		1.79E+00
		330.06		1.40	1.77E+00		3.00E+00
+	U-235	143.76		10.96	1.23E-01	4.93E-02	4.28E-01
		163.33		5.08	2.52E-01		8.64E-01
		185.71	*	57.20	5.29E-02		4.93E-02
		202.11		1.08	-3.71E+00		3.31E+00
		205.31		5.01	-2.06E-01		7.19E-01
	Am-241	59.54		35.90	1.72E-01	1.25E+00	1.25E+00

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 08-Nov-19-10044

L1-10206B-FSGS-014SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 08-Nov-19-10044
Sample Description	: L1-10206B-FSGS-014SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.768E+03 grams
Facility	: Default
Sample Taken On	: 11/1/2019 9:15:00AM
Acquisition Started	: 11/8/2019 12:49:18PM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1800.7 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/8/2019
Efficiency Calibration Description	:
Sample Number	: 81133
Fill Height	: 1768.09 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/8/2019 1:19:22PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

RECOUNT

DATA VALIDATED 11/8/19 - 1700

J Grohon

Analysis Report for 08-Nov-19-10044

L1-10206B-FSGS-014SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.20	152 -	158	155.00	6.43E+01	24.30	2.72E+02	0.79
2	186.02	368 -	376	372.34	7.81E+01	23.65	2.26E+02	1.07
3	238.64	473 -	481	477.46	3.10E+02	29.15	2.46E+02	1.14
4	295.21	586 -	594	590.49	1.36E+02	19.46	1.14E+02	1.17
5	338.32	672 -	681	676.62	6.58E+01	17.73	1.10E+02	1.49
6	351.96	700 -	708	703.86	2.64E+02	21.28	8.78E+01	1.40
7	510.58	1015 -	1026	1020.86	1.20E+02	17.20	7.05E+01	0.98
8	583.22	1161 -	1171	1166.05	1.18E+02	14.79	4.25E+01	1.50
9	609.34	1212 -	1223	1218.26	1.80E+02	17.32	4.79E+01	1.24
10	846.67	1690 -	1697	1692.79	1.05E+01	7.14	1.95E+01	1.22
11	911.31	1815 -	1826	1822.06	7.40E+01	12.82	3.60E+01	1.52
12	968.97	1933 -	1943	1937.41	5.05E+01	12.41	4.15E+01	1.54
13	1120.48	2234 -	2247	2240.51	6.12E+01	11.63	2.68E+01	1.21
14	1460.74	2913 -	2929	2921.53	8.40E+02	29.32	6.33E+00	2.06
15	1764.78	3524 -	3536	3530.41	4.12E+01	6.82	1.84E+00	1.55

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.97	511.00	*	100.00	6.41E-02	1.02E-02
K-40	0.99	1460.82	*	10.66	7.61E+00	4.24E-01

Analysis Report for 08-Nov-19-10044

L1-10206B-FSGS-014SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Tl-208	1.00	583.19	*	85.00	7.36E-02	1.03E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.13E-01	2.64E-02
		300.09		3.30		
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	2.07E-01	8.12E-02
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	2.17E-01	2.46E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	3.32E-01	6.46E-02
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49	*	15.30	2.99E-01	5.09E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	1.00	241.99		7.25		
		295.22	*	18.42	2.49E-01	4.08E-02
		351.93	*	35.60	2.82E-01	3.21E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	3.65E-01	1.44E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	5.70E-01	1.78E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	2.16E-01	6.09E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.04E-01	3.64E-02
		964.77		4.99		
		968.97	*	15.80	2.36E-01	5.90E-02
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	3.63E-02	1.14E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 08-Nov-19-10044

L1-10206B-FSGS-014SB

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	***Nuclide Id Confidence***	***Wt mean Activity (pCi/grams)***	***Wt mean Activity Uncertainty***	***Comments***
	An Pk	0.973	6.41E-02	1.02E-02	
	K-40	0.999	7.61E+00	4.24E-01	
	Tl-208	1.000	7.36E-02	1.03E-02	
X	Bi-211	0.881			
	Pb-212	1.000	2.13E-01	2.64E-02	
?	Pb212-XR	0.999	2.07E-01	8.12E-02	
	Bi-214	0.997	2.43E-01	2.09E-02	
	Pb-214	1.000	2.70E-01	2.52E-02	
?	Pb214-XR	0.999	3.65E-01	1.44E-01	
?	Ra-226	0.994	5.70E-01	1.78E-01	
	Ac-228	0.999	2.14E-01	2.76E-02	
?	U-235	0.989	3.63E-02	1.14E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 08-Nov-19-10044

L1-10206B-FSGS-014SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/8/2019 1:19:22PM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
10	846.67	5.84722E-03	67.80		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	6.41E-02	2.57E-02	2.57E-02
	BE-7	477.60		10.44	3.25E-03	2.50E-01	2.50E-01
+	K-40	1460.82	*	10.66	7.61E+00	1.63E-01	1.63E-01
	Mn-54	834.85		99.98	3.66E-03	2.92E-02	2.92E-02
	Co-60	1173.23		99.85	6.27E-04	3.04E-02	3.98E-02
		1332.49		99.98	-8.13E-03		3.04E-02
	Nb-94	702.65		99.81	-1.81E-04	2.48E-02	2.48E-02
		871.09		99.89	7.43E-03		2.81E-02
	Ag-108m	79.13		6.60	-2.51E-01	2.56E-02	7.75E-01
		433.94		90.50	-3.64E-04		2.56E-02
		614.28		89.80	-1.57E-02		3.72E-02
		722.94		90.80	-9.04E-03		3.26E-02
	Sb-125	176.31		6.84	-8.31E-02	7.88E-02	3.57E-01
		380.45		1.52	-2.92E-01		1.44E+00
		427.87		29.60	3.03E-02		7.88E-02
		463.36		10.49	1.33E-02		2.30E-01
		600.60		17.65	4.85E-02		1.57E-01
		606.71		4.98	-6.09E-02		8.89E-01

Analysis Report for 08-Nov-19-10044

L1-10206B-FSGS-014SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	4.60E-02	7.88E-02	2.18E-01
	671.44	1.79	-2.66E-01		1.37E+00
Ba-133	79.61	2.65	-7.64E-01	5.45E-02	1.85E+00
	81.00	32.90	-1.23E-01		1.23E-01
	276.40	7.16	-2.01E-01		3.06E-01
	302.85	18.34	5.53E-02		1.19E-01
	356.01	62.05	-3.81E-02		5.45E-02
	383.85	8.94	-1.24E-01		2.35E-01
Cs-134	475.36	1.48	-4.35E-01	3.12E-02	1.57E+00
	563.25	8.34	-5.08E-02		2.79E-01
	569.33	15.37	4.69E-02		1.51E-01
	604.72	97.62	-2.51E-03		3.97E-02
	795.86	85.46	5.88E-03		3.12E-02
	801.95	8.69	-2.95E-01		2.77E-01
	1038.61	0.99	-5.36E-01		3.29E+00
	1167.97	1.79	1.18E+00		2.11E+00
	1365.19	3.02	-5.58E-02		8.81E-01
Cs-137	661.66	85.10	1.91E-02	3.44E-02	3.44E-02
Eu-152	121.78	28.67	5.24E-03	8.29E-02	8.29E-02
	244.70	7.61	-3.09E-02		3.34E-01
	295.94	0.45	5.80E+00		6.34E+00
	344.28	26.60	-5.68E-02		8.69E-02
	367.79	0.86	2.07E-01		2.64E+00
	411.12	2.24	6.56E-01		1.08E+00
	443.96	2.83	-1.29E-02		7.42E-01
	488.68	0.42	2.35E+00		5.92E+00
	563.99	0.49	-8.31E-01		4.69E+00
	586.26	0.46	-9.79E-01		8.10E+00
	678.62	0.47	-7.10E-01		5.47E+00
	688.67	0.86	-6.91E-04		3.07E+00
	719.35	0.28	-1.50E+00		9.10E+00
	778.90	12.96	-7.88E-02		2.03E-01
	810.45	0.32	4.27E+00		8.79E+00
	867.37	4.26	-2.79E-01		6.58E-01
	919.33	0.43	-1.88E+00		6.59E+00
	964.08	14.65	2.11E-02		2.68E-01
	1085.87	10.24	3.57E-02		3.56E-01
	1089.74	1.73	-8.78E-01		2.10E+00
	1112.07	13.69	1.52E-02		2.49E-01
	1212.95	1.43	3.36E-01		2.73E+00
	1249.94	0.19	1.13E+01		2.09E+01
	1299.14	1.63	1.15E+00		2.21E+00
	1408.01	21.07	9.04E-02		1.40E-01
	1457.64	0.50	-1.18E+00		2.74E+01
	1528.10	0.28	9.75E-01		6.91E+00
Eu-154	123.07	40.40	-2.57E-02	5.68E-02	5.68E-02
	247.93	6.89	-6.88E-02		3.16E-01
	591.76	4.95	2.88E-01		5.15E-01
	692.42	1.78	-2.01E-01		1.39E+00
	723.30	20.06	1.02E-01		1.58E-01
	756.80	4.52	1.84E-01		6.40E-01

Analysis Report for 08-Nov-19-10044

L1-10206B-FSGS-014SB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	873.18		12.08	-1.10E-01	5.68E-02	2.19E-01
		996.29		10.48	-7.67E-02		2.67E-01
		1004.76		18.01	1.20E-01		1.71E-01
		1274.43		34.80	-6.95E-02		1.01E-01
		1596.48		1.80	-6.35E-01		1.16E+00
	Eu-155	45.30		1.31	2.17E+00	1.22E-01	8.27E+00
		60.01		1.22	3.05E+00		9.01E+00
		86.55		30.70	2.76E-02		1.26E-01
		105.31		21.10	-5.66E-02		1.22E-01
+	Ra-226	186.21	*	3.64	5.70E-01	5.64E-01	5.64E-01
	Pa-231	27.36		10.30	9.05E-01	8.33E-01	8.33E-01
		283.69		1.70	-2.26E-01		1.24E+00
		300.07		2.47	-9.87E-01		8.58E-01
		302.65		2.20	4.60E-01		9.90E-01
		330.06		1.40	4.03E-01		1.64E+00
+	U-235	143.76		10.96	7.39E-03	3.59E-02	1.99E-01
		163.33		5.08	4.92E-02		4.95E-01
		185.71	*	57.20	3.63E-02		3.59E-02
		202.11		1.08	-3.14E-01		2.24E+00
		205.31		5.01	6.55E-02		4.99E-01
	Am-241	59.54		35.90	-1.25E-02	3.09E-01	3.09E-01

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 07-Nov-19-10014

L1-10206B-FIGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 07-Nov-19-10014
Sample Description	: L1-10206B-FIGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.476E+03 grams
Facility	: Default
Sample Taken On	: 11/6/2019 1:20:00PM
Acquisition Started	: 11/7/2019 11:00:23AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.5 seconds
Dead Time	: 0.05 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/7/2019
Efficiency Calibration Description	:
Sample Number	: 81060
Fill Height	: 1476.43 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/7/2019 11:15:25AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated 11/8/19 - 0900

J Graham

Analysis Report for 07-Nov-19-10014
L1-10206B-FIGS-001SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	77.31	151 -	158	155.21	1.67E+02	26.46	2.58E+02	1.04
	2	186.11	368 -	376	372.53	1.21E+02	22.65	1.82E+02	1.35
M	3	238.69	473 -	488	477.57	4.03E+02	56.84	1.20E+02	1.05
m	4	241.95	473 -	488	484.08	9.54E+01	15.81	1.27E+02	1.05
M	5	295.21	585 -	605	590.48	1.74E+02	53.79	7.40E+01	1.02
m	6	300.08	585 -	605	600.20	3.16E+01	12.76	9.85E+01	1.03
	7	338.27	671 -	681	676.51	1.08E+02	17.48	8.28E+01	1.18
	8	351.79	698 -	708	703.53	2.90E+02	21.90	7.98E+01	1.23
	9	510.88	1016 -	1026	1021.45	7.05E+01	14.90	6.35E+01	1.41
	10	583.15	1163 -	1171	1165.91	1.12E+02	13.22	2.92E+01	1.62
	11	609.27	1212 -	1223	1218.13	2.34E+02	17.91	3.45E+01	1.53
	12	911.18	1815 -	1826	1821.82	1.15E+02	13.69	2.91E+01	1.95
	13	968.88	1933 -	1943	1937.22	5.30E+01	11.66	3.20E+01	1.29
	14	1120.51	2234 -	2247	2240.57	6.15E+01	11.36	2.45E+01	1.26
	15	1460.75	2914 -	2928	2921.56	7.27E+02	27.27	5.61E+00	2.04
	16	1764.36	3525 -	3536	3529.58	4.15E+01	7.06	3.52E+00	1.97

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.99	511.00	*	100.00	7.24E-02	1.61E-02

Analysis Report for 07-Nov-19-10014

L1-10206B-FIGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	1.38E+01	7.92E-01
Tl-208	1.00	583.19	*	85.00	1.45E-01	1.93E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	5.68E-01	9.24E-02
		300.09	*	3.30	6.71E-01	2.77E-01
Pb212-XR	0.99	74.82		10.28		
		77.11	*	17.10	1.09E+00	2.06E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	5.86E-01	5.70E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	6.98E-01	1.32E-01
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49	*	15.30	6.33E-01	1.11E-01
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	8.15E-01	1.50E-01
		295.22	*	18.42	6.56E-01	2.09E-01
		351.93	*	35.60	6.40E-01	7.04E-02
		785.96		1.06		
Pb214-XR	0.99	74.82		5.80		
		77.11	*	9.70	1.92E+00	3.73E-01
		87.35		2.24		
		89.78		0.82		
Ra-226	0.99	186.21	*	3.64	1.82E+00	3.70E-01
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	7.34E-01	1.33E-01
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	6.60E-01	8.36E-02
		964.77		4.99		
		968.97	*	15.80	5.18E-01	1.16E-01
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	1.16E-01	2.35E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 07-Nov-19-10014

L1-10206B-FIGS-001SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.998	7.24E-02	1.61E-02	
	K-40	0.999	1.38E+01	7.92E-01	
	Tl-208	1.000	1.45E-01	1.93E-02	
X	Bi-211	0.919			
	Pb-212	0.999	5.79E-01	8.77E-02	
?	Pb212-XR	0.997	1.09E+00	2.06E-01	
	Bi-214	0.999	6.09E-01	4.73E-02	
	Pb-214	0.998	6.71E-01	6.10E-02	
?	Pb214-XR	0.997	1.92E+00	3.73E-01	
?	Ra-226	0.998	1.82E+00	3.70E-01	
	Ac-228	1.000	6.37E-01	6.04E-02	
X	Pa-231	1.000			
?	U-235	0.982	1.16E-01	2.35E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 07-Nov-19-10014
L1-10206B-FIGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/7/2019 11:15:25AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	7.24E-02	4.58E-02	4.58E-02
	BE-7	477.60		10.44	1.83E-01	4.30E-01	4.30E-01
+	K-40	1460.82	*	10.66	1.38E+01	3.13E-01	3.13E-01
	Mn-54	834.85		99.98	-3.64E-02	5.15E-02	5.15E-02
	Co-60	1173.23		99.85	-4.89E-03	5.76E-02	6.93E-02
		1332.49		99.98	2.17E-02		5.76E-02
	Nb-94	702.65		99.81	5.60E-02	4.83E-02	5.66E-02
		871.09		99.89	-2.58E-03		4.83E-02
	Ag-108m	79.13		6.60	-8.08E-01	3.92E-02	1.55E+00
		433.94		90.50	-2.93E-02		3.92E-02
		614.28		89.80	-6.42E-02		8.14E-02
		722.94		90.80	-1.11E-02		5.95E-02
	Sb-125	176.31		6.84	1.01E-01	1.52E-01	6.56E-01
		380.45		1.52	2.25E-01		2.68E+00
		427.87		29.60	1.54E-02		1.52E-01
		463.36		10.49	2.98E-01		4.36E-01
		600.60		17.65	5.37E-02		2.97E-01
		606.71		4.98	-2.15E-01		1.92E+00
		635.95		11.22	7.56E-02		4.14E-01

Analysis Report for 07-Nov-19-10014

L1-10206B-FIGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.45E-01	1.52E-01	2.67E+00
Ba-133	79.61	2.65	-2.21E+00	1.02E-01	3.66E+00
	81.00	32.90	-3.57E-01		2.34E-01
	276.40	7.16	9.81E-02		6.03E-01
	302.85	18.34	3.56E-02		2.53E-01
	356.01	62.05	-8.50E-02		1.02E-01
	383.85	8.94	-2.27E-01		4.47E-01
Cs-134	475.36	1.48	1.46E+00	6.54E-02	3.07E+00
	563.25	8.34	-2.15E-01		5.61E-01
	569.33	15.37	4.88E-02		3.22E-01
	604.72	97.62	4.02E-03		8.26E-02
	795.86	85.46	5.01E-02		6.54E-02
	801.95	8.69	-2.90E-01		5.66E-01
	1038.61	0.99	3.22E+00		6.53E+00
	1167.97	1.79	-1.25E-01		3.76E+00
	1365.19	3.02	-4.59E-01		1.65E+00
Cs-137	661.66	85.10	-1.17E-02	6.15E-02	6.15E-02
Eu-152	121.78	28.67	-4.13E-02	1.45E-01	1.45E-01
	244.70	7.61	-1.69E-01		6.35E-01
	295.94	0.45	1.75E+01		1.34E+01
	344.28	26.60	-1.05E-01		1.53E-01
	367.79	0.86	-1.96E+00		4.25E+00
	411.12	2.24	5.36E-01		2.05E+00
	443.96	2.83	-1.53E-01		1.51E+00
	488.68	0.42	-1.18E+00		9.60E+00
	563.99	0.49	2.57E+00		9.96E+00
	586.26	0.46	-3.35E+00		1.58E+01
	678.62	0.47	-1.22E+00		1.04E+01
	688.67	0.86	-2.61E+00		5.33E+00
	719.35	0.28	1.69E+00		1.86E+01
	778.90	12.96	-1.30E-01		3.30E-01
	810.45	0.32	7.55E+00		1.57E+01
	867.37	4.26	-7.70E-01		1.12E+00
	919.33	0.43	-1.68E+01		1.18E+01
	964.08	14.65	-1.07E-01		5.13E-01
	1085.87	10.24	-1.05E-01		6.23E-01
	1089.74	1.73	-1.82E+00		3.64E+00
	1112.07	13.69	-1.27E-01		4.77E-01
	1212.95	1.43	2.56E+00		5.94E+00
	1249.94	0.19	-1.25E+01		3.72E+01
	1299.14	1.63	-7.74E-02		3.53E+00
	1408.01	21.07	4.40E-02		2.85E-01
	1457.64	0.50	-6.03E+00		5.36E+01
	1528.10	0.28	-2.72E+00		1.45E+01
Eu-154	123.07	40.40	6.20E-02	1.09E-01	1.09E-01
	247.93	6.89	1.95E-01		5.89E-01
	591.76	4.95	5.18E-03		9.95E-01
	692.42	1.78	-1.07E+00		2.42E+00
	723.30	20.06	1.98E-01		2.89E-01
	756.80	4.52	1.61E-02		9.74E-01
	873.18	12.08	2.07E-01		3.91E-01

Analysis Report for 07-Nov-19-10014

L1-10206B-FIGS-001SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	-3.68E-03	1.09E-01	5.76E-01
		1004.76		18.01	1.95E-01		3.56E-01
		1274.43		34.80	-1.13E-01		1.83E-01
		1596.48		1.80	9.88E-01		3.24E+00
	Eu-155	45.30		1.31	4.56E+00	2.46E-01	1.49E+01
		60.01		1.22	-6.90E+00		1.63E+01
		86.55		30.70	6.00E-02		2.46E-01
		105.31		21.10	6.01E-02		2.55E-01
+	Ra-226	186.21	*	3.64	1.82E+00	1.05E+00	1.05E+00
	Pa-231	27.36		10.30	1.24E+00	1.43E+00	1.57E+00
		283.69		1.70	-6.49E-01		2.39E+00
		300.07	*	2.47	8.97E-01		1.43E+00
		302.65		2.20	2.97E-01		2.11E+00
		330.06		1.40	1.46E+00		3.32E+00
+	U-235	143.76		10.96	-1.67E-01	6.68E-02	3.67E-01
		163.33		5.08	8.31E-02		9.05E-01
		185.71	*	57.20	1.16E-01		6.68E-02
		202.11		1.08	1.04E+00		4.07E+00
		205.31		5.01	-6.60E-01		8.92E-01
	Am-241	59.54		35.90	-1.52E-01	5.73E-01	5.73E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 07-Nov-19-10015

L1-10206B-QIGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 07-Nov-19-10015
Sample Description	: L1-10206B-QIGS-001SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.795E+03 grams
Facility	: Default
Sample Taken On	: 11/6/2019 1:22:00PM
Acquisition Started	: 11/7/2019 11:27:45AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.4 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/7/2019
Efficiency Calibration Description	:
Sample Number	: 81062
Fill Height	: 1795.37 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/7/2019 11:42:48AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

DATA VALIDATED 11/8/19 - 0900

J Graham

Analysis Report for 07-Nov-19-10015

L1-10206B-QIGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	186.04	368 -	376	372.39	5.47E+01	17.26	1.14E+02	1.00
2	238.65	473 -	481	477.48	1.66E+02	23.17	1.65E+02	1.22
3	351.95	698 -	708	703.84	1.62E+02	17.31	5.77E+01	1.23
4	583.34	1162 -	1171	1166.28	9.51E+01	12.04	2.19E+01	1.24
5	609.22	1213 -	1223	1218.01	1.21E+02	13.07	2.07E+01	1.42
6	911.47	1817 -	1827	1822.38	5.65E+01	10.26	2.05E+01	2.02
7	968.95	1933 -	1942	1937.36	2.96E+01	7.74	1.34E+01	1.10
8	1120.19	2236 -	2245	2239.93	2.20E+01	7.42	1.40E+01	1.34
9	1460.76	2914 -	2928	2921.57	5.01E+02	22.63	3.75E+00	2.04

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	9.06E+00	5.67E-01
Tl-208	0.99	583.19	*	85.00	1.19E-01	1.67E-02
Bi-211	0.88	351.07	*	13.02	9.46E-01	1.26E-01
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.27E-01	3.67E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.91E-01	3.59E-02
		768.36		4.89		

Analysis Report for 07-Nov-19-10015

L1-10206B-QIGS-001SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	2.38E-01	8.09E-02
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.51	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	3.46E-01	4.62E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	7.95E-01	2.59E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.11E-01	5.80E-02
		964.77		4.99		
		968.97	*	15.80	2.76E-01	7.33E-02
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	5.06E-02	1.65E-02
		202.11		1.08		
		205.31		5.01		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 07-Nov-19-10015

L1-10206B-QIGS-001SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	9.06E+00	5.67E-01	
	Tl-208	0.996	1.19E-01	1.67E-02	
?	Bi-211	0.884	9.46E-01	1.26E-01	
	Pb-212	1.000	2.27E-01	3.67E-02	
	Bi-214	0.999	2.82E-01	3.28E-02	
?	Pb-214	0.514	3.46E-01	4.62E-02	
?	Ra-226	0.995	7.95E-01	2.59E-01	
	Ac-228	0.997	2.97E-01	4.55E-02	
?	U-235	0.988	5.06E-02	1.65E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 07-Nov-19-10015
L1-10206B-QIGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/7/2019 11:42:48AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.76E-02	5.35E-02	5.35E-02
	BE-7	477.60		10.44	3.23E-01	4.37E-01	4.37E-01
+	K-40	1460.82	*	10.66	9.06E+00	2.53E-01	2.53E-01
	Mn-54	834.85		99.98	3.93E-03	4.08E-02	4.08E-02
	Co-60	1173.23		99.85	2.02E-02	5.98E-02	6.61E-02
		1332.49		99.98	3.98E-02		5.98E-02
	Nb-94	702.65		99.81	1.15E-02	3.89E-02	3.89E-02
		871.09		99.89	-1.24E-02		3.95E-02
	Ag-108m	79.13		6.60	7.80E-01	3.81E-02	1.28E+00
		433.94		90.50	-6.06E-03		3.81E-02
		614.28		89.80	-4.21E-02		5.47E-02
		722.94		90.80	-2.80E-02		5.08E-02
	Sb-125	176.31		6.84	1.18E-01	1.20E-01	5.28E-01
		380.45		1.52	-5.47E-01		2.16E+00
		427.87		29.60	1.47E-02		1.20E-01
		463.36		10.49	1.18E-01		3.51E-01
		600.60		17.65	5.45E-02		2.30E-01
		606.71		4.98	-2.75E-01		1.40E+00
		635.95		11.22	7.93E-02		3.29E-01

Analysis Report for 07-Nov-19-10015

L1-10206B-QIGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.73E+00	1.20E-01	2.06E+00
Ba-133	79.61	2.65	9.70E-01	8.14E-02	2.99E+00
	81.00	32.90	-3.22E-01		1.93E-01
	276.40	7.16	1.11E-01		4.94E-01
	302.85	18.34	4.69E-02		1.80E-01
	356.01	62.05	-6.02E-02		8.14E-02
	383.85	8.94	-9.81E-05		3.85E-01
Cs-134	475.36	1.48	2.45E+00	5.79E-02	3.08E+00
	563.25	8.34	-5.58E-02		4.41E-01
	569.33	15.37	1.70E-02		2.39E-01
	604.72	97.62	-1.66E-02		6.25E-02
	795.86	85.46	3.88E-02		5.79E-02
	801.95	8.69	-4.93E-01		4.57E-01
	1038.61	0.99	-4.25E+00		4.61E+00
	1167.97	1.79	1.06E-01		3.44E+00
	1365.19	3.02	6.54E-01		1.38E+00
Cs-137	661.66	85.10	5.66E-02	6.79E-02	6.79E-02
Eu-152	121.78	28.67	2.50E-02	1.23E-01	1.23E-01
	244.70	7.61	-8.67E-02		5.31E-01
	295.94	0.45	9.86E+00		1.03E+01
	344.28	26.60	-1.18E-01		1.26E-01
	367.79	0.86	1.45E+00		4.06E+00
	411.12	2.24	-4.98E-01		1.43E+00
	443.96	2.83	-4.39E-01		1.20E+00
	488.68	0.42	8.30E-01		7.97E+00
	563.99	0.49	5.29E-01		7.64E+00
	586.26	0.46	-4.37E+00		1.35E+01
	678.62	0.47	1.59E+00		8.43E+00
	688.67	0.86	2.58E-02		4.36E+00
	719.35	0.28	-2.19E+00		1.53E+01
	778.90	12.96	-3.95E-02		3.05E-01
	810.45	0.32	3.97E-01		1.39E+01
	867.37	4.26	1.23E-02		9.66E-01
	919.33	0.43	-6.93E+00		9.86E+00
	964.08	14.65	5.86E-02		3.99E-01
	1085.87	10.24	-6.75E-02		5.08E-01
	1089.74	1.73	-8.75E-02		3.15E+00
	1112.07	13.69	2.21E-01		3.99E-01
	1212.95	1.43	5.53E-01		4.30E+00
	1249.94	0.19	2.78E+01		3.27E+01
	1299.14	1.63	3.82E-01		2.98E+00
	1408.01	21.07	-9.20E-02		2.07E-01
	1457.64	0.50	-1.91E+00		4.25E+01
	1528.10	0.28	3.60E+00		1.16E+01
Eu-154	123.07	40.40	-1.19E-02	8.47E-02	8.47E-02
	247.93	6.89	3.55E-02		4.96E-01
	591.76	4.95	3.10E-01		7.97E-01
	692.42	1.78	-2.24E-01		2.06E+00
	723.30	20.06	-7.58E-03		2.42E-01
	756.80	4.52	3.48E-01		9.34E-01
	873.18	12.08	-2.87E-02		3.37E-01

Analysis Report for 07-Nov-19-10015

L1-10206B-QIGS-001SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	3.05E-02	8.47E-02	4.36E-01
		1004.76		18.01	2.84E-02		2.69E-01
		1274.43		34.80	-1.37E-02		1.42E-01
		1596.48		1.80	-4.87E-01		1.98E+00
	Eu-155	45.30		1.31	-5.45E+00	2.04E-01	1.20E+01
		60.01		1.22	-5.96E+00		1.33E+01
		86.55		30.70	5.00E-02		2.04E-01
		105.31		21.10	3.82E-02		2.12E-01
+	Ra-226	186.21	*	3.64	7.95E-01	8.11E-01	8.11E-01
	Pa-231	27.36		10.30	1.09E+00	1.26E+00	1.26E+00
		283.69		1.70	-5.29E-01		1.88E+00
		300.07		2.47	-2.25E+00		1.35E+00
		302.65		2.20	3.91E-01		1.50E+00
		330.06		1.40	8.69E-01		2.81E+00
+	U-235	143.76		10.96	5.06E-02	5.16E-02	3.29E-01
		163.33		5.08	5.26E-01		7.83E-01
		185.71	*	57.20	5.06E-02		5.16E-02
		202.11		1.08	1.89E+00		3.48E+00
		205.31		5.01	-6.14E-01		7.39E-01
	Am-241	59.54		35.90	-3.76E-01	4.49E-01	4.49E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 07-Nov-19-10016

L1-10206B-FIGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 07-Nov-19-10016
Sample Description	: L1-10206B-FIGS-002SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.477E+03 grams
Facility	: Default
Sample Taken On	: 11/6/2019 1:24:00PM
Acquisition Started	: 11/7/2019 11:00:29AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 902.1 seconds
Dead Time	: 0.24 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/7/2019
Efficiency Calibration Description	:
Sample Number	: 81061
Fill Height	: 1476.94 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/7/2019 11:15:33AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

DATA VALIDATED 11/8/19 - 0900
J Graham/

Analysis Report for 07-Nov-19-10016

L1-10206B-FIGS-002SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.94	294 -	314	300.51	4.94E+01	6.41	1.10E+02	0.60
m	2	77.28	294 -	314	309.86	5.97E+01	7.26	1.60E+02	0.60
	3	87.26	343 -	355	349.72	7.08E+01	19.29	1.14E+02	0.43
	4	238.71	946 -	961	954.92	2.97E+02	26.67	1.38E+02	0.98
	5	295.39	1173 -	1188	1181.45	1.24E+02	16.74	5.20E+01	0.80
	6	338.50	1347 -	1360	1353.77	4.68E+01	14.13	5.32E+01	0.89
	7	352.01	1399 -	1414	1407.77	2.13E+02	19.37	5.39E+01	1.01
	8	409.48	1634 -	1642	1637.49	1.45E+01	6.74	1.45E+01	0.38
	9	510.51	2035 -	2048	2041.37	4.12E+01	11.11	2.98E+01	0.43
	10	583.34	2323 -	2338	2332.56	7.65E+01	11.29	1.65E+01	1.04
	11	609.45	2428 -	2444	2436.97	1.84E+02	15.83	2.13E+01	1.37
	12	911.01	3636 -	3651	3643.02	6.81E+01	10.19	1.19E+01	1.56
	13	969.18	3869 -	3883	3875.71	4.45E+01	7.75	5.45E+00	1.80
	14	1120.16	4473 -	4487	4479.75	4.26E+01	8.35	9.38E+00	0.79
	15	1460.86	5831 -	5855	5843.27	5.52E+02	24.06	6.44E+00	1.91

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.96	511.00	*	100.00	5.45E-02	1.52E-02
K-40	1.00	1460.82	*	10.66	1.39E+01	8.55E-01

Analysis Report for 07-Nov-19-10016

L1-10206B-FIGS-002SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Cd-109	0.90	88.03	*	3.70	2.69E+00	7.85E-01
Tl-208	0.99	583.19	*	85.00	1.29E-01	2.05E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	5.34E-01	6.46E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	1.14E+00	1.88E-01
		77.11	*	17.10	7.27E-01	1.16E-01
		87.35	*	3.97	2.51E+00	7.30E-01
		89.78		1.46		
Bi-214	0.82	609.32	*	45.49	5.96E-01	6.26E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	6.38E-01	1.27E-01
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	5.95E-01	9.34E-02
		351.93	*	35.60	6.01E-01	7.28E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	4.05E-01	1.27E-01
		409.46	*	1.92	8.48E-01	3.99E-01
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	5.12E-01	7.97E-02
		964.77		4.99		
		968.97	*	15.80	5.71E-01	1.02E-01
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 07-Nov-19-10016

L1-10206B-FIGS-002SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.962	5.45E-02	1.52E-02	
	K-40	1.000	1.39E+01	8.55E-01	
	Cd-109	0.908	1.79E+00	7.88E-01	
X	Eu-155	0.955			
	Tl-208	0.996	1.29E-01	2.05E-02	
X	Bi-211	0.868			
	Pb-212	0.999	5.34E-01	6.46E-02	
	Pb212-XR	0.996	8.39E-01	9.75E-02	
	Bi-214	0.824	6.04E-01	5.62E-02	
	Pb-214	0.998	5.99E-01	5.74E-02	
X	Pb214-XR	0.996			
	Ac-228	0.996	5.16E-01	5.58E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 07-Nov-19-10016
L1-10206B-FIGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/7/2019 11:15:33AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	5.45E-02	4.45E-02	4.45E-02
	BE-7	477.60		10.44	5.89E-01	5.37E-01	5.37E-01
+	K-40	1460.82	*	10.66	1.39E+01	5.18E-01	5.18E-01
	Mn-54	834.85		99.98	-7.24E-02	6.21E-02	6.21E-02
	Co-60	1173.23		99.85	1.03E-02	6.61E-02	8.24E-02
		1332.49		99.98	2.82E-02		6.61E-02
	Nb-94	702.65		99.81	6.66E-03	6.32E-02	6.52E-02
		871.09		99.89	-7.52E-03		6.32E-02
	Ag-108m	79.13		6.60	-9.30E-01	6.24E-02	2.41E+00
		433.94		90.50	-3.94E-02		6.24E-02
		614.28		89.80	-1.73E-02		1.04E-01
		722.94		90.80	3.24E-02		7.36E-02
	Sb-125	176.31		6.84	5.63E-01	1.95E-01	7.87E-01
		380.45		1.52	2.91E+00		3.48E+00
		427.87		29.60	2.62E-02		1.95E-01
		463.36		10.49	8.30E-02		5.18E-01
		600.60		17.65	2.35E-02		3.39E-01
		606.71		4.98	5.12E+00		2.25E+00
		635.95		11.22	2.36E-02		4.84E-01

Analysis Report for 07-Nov-19-10016

L1-10206B-FIGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.24E+00	1.95E-01	3.21E+00
Ba-133	79.61	2.65	-1.24E+00	1.18E-01	5.78E+00
	81.00	32.90	-2.48E-01		3.96E-01
	276.40	7.16	9.88E-02		7.31E-01
	302.85	18.34	-3.33E-02		2.89E-01
	356.01	62.05	-7.90E-02		1.18E-01
	383.85	8.94	2.39E-02		5.57E-01
Cs-134	475.36	1.48	-1.21E+00	7.48E-02	3.43E+00
	563.25	8.34	-6.13E-01		6.51E-01
	569.33	15.37	8.51E-02		3.94E-01
	604.72	97.62	-4.25E-02		9.70E-02
	795.86	85.46	1.21E-03		7.48E-02
	801.95	8.69	3.35E-01		6.48E-01
	1038.61	0.99	1.92E+00		7.36E+00
	1167.97	1.79	3.55E+00		4.89E+00
	1365.19	3.02	-8.04E-01		1.87E+00
Cs-137	661.66	85.10	1.94E-03	7.84E-02	7.84E-02
Eu-152	121.78	28.67	4.68E-02	2.07E-01	2.12E-01
	244.70	7.61	3.01E-01		8.20E-01
	295.94	0.45	1.83E+01		1.50E+01
	344.28	26.60	3.10E-02		2.07E-01
	367.79	0.86	4.04E+00		5.88E+00
	411.12	2.24	1.25E+00		2.38E+00
	443.96	2.83	-2.41E+00		1.74E+00
	488.68	0.42	-7.56E+00		1.11E+01
	563.99	0.49	-7.84E-01		1.16E+01
	586.26	0.46	-7.12E+00		1.75E+01
	678.62	0.47	1.30E+00		1.22E+01
	688.67	0.86	5.16E-01		7.81E+00
	719.35	0.28	-7.26E+00		2.05E+01
	778.90	12.96	-3.76E-01		4.90E-01
	810.45	0.32	-7.31E+00		1.72E+01
	867.37	4.26	-1.07E+00		1.54E+00
	919.33	0.43	6.50E+00		1.65E+01
	964.08	14.65	2.49E-01		6.23E-01
	1085.87	10.24	6.73E-01		8.21E-01
	1089.74	1.73	-1.18E+00		4.57E+00
	1112.07	13.69	-4.84E-02		5.92E-01
	1212.95	1.43	-4.80E-01		5.90E+00
	1249.94	0.19	-1.12E+01		4.31E+01
	1299.14	1.63	9.22E-01		4.91E+00
	1408.01	21.07	2.30E-01		3.21E-01
	1457.64	0.50	2.85E+02		6.24E+01
	1528.10	0.28	-4.69E+00		1.70E+01
Eu-154	123.07	40.40	-6.87E-02	1.48E-01	1.48E-01
	247.93	6.89	1.42E-01		7.55E-01
	591.76	4.95	3.94E-01		1.23E+00
	692.42	1.78	-2.39E+00		3.68E+00
	723.30	20.06	2.43E-01		3.38E-01
	756.80	4.52	8.13E-01		1.28E+00
	873.18	12.08	-1.30E-01		4.87E-01

Analysis Report for 07-Nov-19-10016

L1-10206B-FIGS-002SS

Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29		10.48	-3.19E-02	1.48E-01	6.69E-01
	1004.76		18.01	1.27E-01		4.47E-01
	1274.43		34.80	-2.59E-01		2.66E-01
	1596.48		1.80	-1.84E+00		3.54E+00
Eu-155	45.30		1.31	-3.87E+01	2.83E-01	3.88E+01
	60.01		1.22	-2.95E+00		4.28E+01
	86.55	*	30.70	3.24E-01		2.83E-01
	105.31		21.10	-1.38E-01		3.71E-01
Ra-226	186.21		3.64	1.83E+00	1.66E+00	1.66E+00
Pa-231	27.36		10.30	5.70E+00	2.23E+00	4.66E+00
	283.69		1.70	7.01E-01		3.06E+00
	300.07		2.47	1.43E+00		2.23E+00
	302.65		2.20	-3.83E-01		2.42E+00
	330.06		1.40	-6.89E-02		3.63E+00
U-235	143.76		10.96	-7.57E-01	1.05E-01	4.82E-01
	163.33		5.08	-2.52E-01		1.04E+00
	185.71		57.20	1.32E-01		1.05E-01
	202.11		1.08	-1.40E+00		4.81E+00
	205.31		5.01	-8.42E-01		1.05E+00
Am-241	59.54		35.90	2.47E-01	1.54E+00	1.54E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 20-Nov-19-10006

L1-10206B-FIGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 20-Nov-19-10006
Sample Description	: L1-10206B-FIGS-003SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.593E+03 grams
Facility	: Default
Sample Taken On	: 11/19/2019 12:30:00PM
Acquisition Started	: 11/20/2019 8:40:57AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.4 seconds
Dead Time	: 0.05 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/20/2019
Efficiency Calibration Description	:
Sample Number	: 81433
Fill Height	: 1593.32 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/20/2019 8:56:00AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated
1200 11-20-19

Analysis Report for 20-Nov-19-10006

L1-10206B-FIGS-003SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	75.10	147 -	154	150.80	4.39E+01	24.51	2.64E+02	0.76
M	2	238.65	472 -	488	477.49	3.30E+02	53.88	1.04E+02	1.26
m	3	241.78	472 -	488	483.73	1.01E+02	17.94	1.29E+02	1.26
	4	295.19	585 -	595	590.44	1.07E+02	19.25	1.09E+02	1.11
	5	338.34	673 -	681	676.65	4.63E+01	13.50	6.27E+01	0.74
	6	351.87	698 -	708	703.69	2.29E+02	20.22	7.55E+01	1.25
	7	583.17	1162 -	1171	1165.95	8.56E+01	13.23	3.95E+01	1.40
	8	609.26	1212 -	1223	1218.10	1.83E+02	16.66	3.76E+01	1.63
	9	661.60	1319 -	1325	1322.73	1.41E+01	7.68	2.29E+01	1.02
	10	911.02	1815 -	1827	1821.50	8.54E+01	12.03	2.26E+01	1.58
	11	968.88	1933 -	1941	1937.22	2.69E+01	10.12	3.51E+01	1.42
	12	1120.26	2235 -	2246	2240.08	3.94E+01	9.82	2.26E+01	0.78
	13	1460.47	2913 -	2928	2921.00	6.08E+02	25.73	1.80E+01	1.87
	14	1763.79	3524 -	3535	3528.43	2.93E+01	5.83	1.70E+00	1.33

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	1.13E+01	6.85E-01
Cs-137	0.99	661.66	*	85.10	1.96E-02	1.07E-02
Tl-208	1.00	583.19	*	85.00	1.09E-01	1.81E-02

Analysis Report for 20-Nov-19-10006

L1-10206B-FIGS-003SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	4.59E-01	8.37E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	5.16E-01	2.92E-01
		77.11		17.10		
		87.35		3.97		
		89.78		1.46		
Bi-214	0.98	609.32	*	45.49	4.51E-01	4.91E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29	*	14.92	4.38E-01	1.11E-01
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49	*	15.30	4.37E-01	8.87E-02
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	8.49E-01	1.66E-01
		295.22	*	18.42	3.98E-01	7.83E-02
		351.93	*	35.60	4.99E-01	5.94E-02
		785.96		1.06		
Pb214-XR	0.99	74.82	*	5.80	9.14E-01	5.20E-01
		77.11		9.70		
		87.35		2.24		
		89.78		0.82		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	3.10E-01	9.37E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	4.81E-01	7.09E-02
		964.77		4.99		
		968.97	*	15.80	2.57E-01	9.75E-02
		1588.20		3.22		

Analysis Report for 20-Nov-19-10006

L1-10206B-FIGS-003SS

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.981	1.13E+01	6.85E-01	
	Cs-137	0.999	1.96E-02	1.07E-02	
	Tl-208	1.000	1.09E-01	1.81E-02	
X	Bi-211	0.902			
	Pb-212	1.000	4.59E-01	8.37E-02	
?	Pb212-XR	0.996	5.16E-01	2.92E-01	
	Bi-214	0.989	4.46E-01	4.00E-02	
	Pb-214	0.999	4.91E-01	4.55E-02	
?	Pb214-XR	0.996	9.14E-01	5.20E-01	
	Ac-228	0.998	3.78E-01	4.89E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 20-Nov-19-10006

L1-10206B-FIGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/20/2019 8:56:00AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.59E-02	5.69E-02	5.69E-02
	BE-7	477.60		10.44	-7.55E-03	3.72E-01	3.72E-01
+	K-40	1460.82	*	10.66	1.13E+01	5.16E-01	5.16E-01
	Mn-54	834.85		99.98	-1.03E-02	4.41E-02	4.41E-02
	Co-60	1173.23		99.85	-1.59E-04	5.15E-02	6.35E-02
		1332.49		99.98	-7.57E-03		5.15E-02
	Nb-94	702.65		99.81	2.31E-02	4.56E-02	4.56E-02
		871.09		99.89	2.35E-02		4.85E-02
	Ag-108m	79.13		6.60	3.95E-01	4.49E-02	1.45E+00
		433.94		90.50	7.79E-03		4.49E-02
		614.28		89.80	-3.64E-02		7.10E-02
		722.94		90.80	-1.23E-03		5.16E-02
	Sb-125	176.31		6.84	1.37E-02	1.30E-01	5.88E-01
		380.45		1.52	-6.74E-01		2.54E+00
		427.87		29.60	-6.53E-02		1.30E-01
		463.36		10.49	2.56E-01		4.19E-01
		600.60		17.65	1.71E-01		2.70E-01
		606.71		4.98	1.02E-01		1.75E+00
		635.95		11.22	1.89E-01		4.07E-01

Analysis Report for 20-Nov-19-10006

L1-10206B-FIGS-003SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Sb-125	671.44		1.79	-1.27E+00	1.30E-01	2.21E+00
	Ba-133	79.61		2.65	4.06E-01	9.41E-02	3.31E+00
		81.00		32.90	-4.34E-01		2.16E-01
		276.40		7.16	-1.24E-01		5.60E-01
		302.85		18.34	1.51E-01		2.16E-01
		356.01		62.05	-5.42E-02		9.41E-02
		383.85		8.94	2.89E-02		4.47E-01
	Cs-134	475.36		1.48	9.24E-01	5.29E-02	2.67E+00
		563.25		8.34	1.78E-01		4.86E-01
		569.33		15.37	4.31E-02		2.68E-01
		604.72		97.62	-6.72E-03		7.54E-02
		795.86		85.46	-1.30E-03		5.29E-02
		801.95		8.69	-3.22E-01		4.75E-01
		1038.61		0.99	1.89E-01		5.25E+00
		1167.97		1.79	3.54E+00		3.98E+00
		1365.19		3.02	-9.84E-01		1.22E+00
+	Cs-137	661.66	*	85.10	1.96E-02	3.55E-02	3.55E-02
	Eu-152	121.78		28.67	-2.62E-02	1.37E-01	1.37E-01
		244.70		7.61	-6.73E-02		5.98E-01
		295.94		0.45	-1.46E+00		1.16E+01
		344.28		26.60	-6.23E-02		1.46E-01
		367.79		0.86	8.19E-01		4.41E+00
		411.12		2.24	6.20E-01		1.90E+00
		443.96		2.83	-2.02E-01		1.37E+00
		488.68		0.42	3.56E+00		9.96E+00
		563.99		0.49	-4.15E-01		8.11E+00
		586.26		0.46	-3.25E+00		1.47E+01
		678.62		0.47	5.78E+00		9.85E+00
		688.67		0.86	-2.66E-01		4.74E+00
		719.35		0.28	-3.70E+00		1.47E+01
		778.90		12.96	1.04E-01		3.65E-01
		810.45		0.32	2.69E+00		1.48E+01
		867.37		4.26	-5.32E-01		1.04E+00
		919.33		0.43	-5.18E+00		1.14E+01
		964.08		14.65	-1.15E-01		4.98E-01
		1085.87		10.24	2.33E-01		5.63E-01
		1089.74		1.73	-1.18E+00		3.24E+00
		1112.07		13.69	-1.45E-01		4.01E-01
		1212.95		1.43	7.95E-01		5.33E+00
		1249.94		0.19	-9.48E+00		2.74E+01
		1299.14		1.63	-2.13E+00		3.32E+00
		1408.01		21.07	-2.19E-02		2.71E-01
		1457.64		0.50	-7.67E-01		4.87E+01
		1528.10		0.28	-3.27E+00		1.20E+01
	Eu-154	123.07		40.40	-5.05E-02	9.43E-02	9.43E-02
		247.93		6.89	7.76E-02		5.44E-01
		591.76		4.95	-4.68E-01		8.52E-01
		692.42		1.78	2.09E-03		2.30E+00
		723.30		20.06	1.13E-01		2.46E-01
		756.80		4.52	-1.68E-01		9.98E-01
		873.18		12.08	-7.73E-02		3.79E-01

Analysis Report for 20-Nov-19-10006

L1-10206B-FIGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-3.22E-01	9.43E-02	4.65E-01
	1004.76	18.01	6.23E-02		2.98E-01
	1274.43	34.80	7.78E-02		1.90E-01
	1596.48	1.80	-1.43E+00		2.13E+00
Eu-155	45.30	1.31	-3.64E+00	2.12E-01	1.30E+01
	60.01	1.22	-5.20E+00		1.49E+01
	86.55	30.70	-5.93E-03		2.12E-01
	105.31	21.10	1.15E-01		2.30E-01
Ra-226	186.21	3.64	1.23E+00	1.25E+00	1.25E+00
Pa-231	27.36	10.30	1.02E+00	1.38E+00	1.38E+00
	283.69	1.70	7.14E-01		2.32E+00
	300.07	2.47	5.83E-01		1.56E+00
	302.65	2.20	1.26E+00		1.80E+00
	330.06	1.40	8.40E-01		2.79E+00
U-235	143.76	10.96	-5.47E-02	7.80E-02	3.40E-01
	163.33	5.08	7.63E-01		8.54E-01
	185.71	57.20	6.42E-02		7.80E-02
	202.11	1.08	-2.16E-01		3.64E+00
	205.31	5.01	-1.54E-01		7.74E-01
Am-241	59.54	35.90	-4.24E-02	5.25E-01	5.25E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 20-Nov-19-10007

L1-10206B-FIGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 20-Nov-19-10007
Sample Description	: L1-10206B-FIGS-004SS
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.615E+03 grams
Facility	: Default
Sample Taken On	: 11/19/2019 12:32:00PM
Acquisition Started	: 11/20/2019 8:41:04AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.8 seconds
Dead Time	: 0.20 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/20/2019
Efficiency Calibration Description	:
Sample Number	: 81434
Fill Height	: 1615.10 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/20/2019 8:56:07AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated

1200 11-20-19

Analysis Report for 20-Nov-19-10007

L1-10206B-FIGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.09	306 -	314	309.10	2.88E+01	13.48	7.02E+01	0.54
2	238.65	948 -	961	954.67	1.68E+02	21.95	1.10E+02	0.80
3	295.37	1175 -	1187	1181.37	7.23E+01	13.48	4.17E+01	0.98
4	338.38	1349 -	1360	1353.29	6.08E+01	10.09	1.62E+01	1.03
5	352.07	1402 -	1414	1407.99	1.22E+02	15.42	4.41E+01	1.00
6	583.33	2324 -	2340	2332.55	6.78E+01	11.32	1.92E+01	1.37
7	609.23	2429 -	2443	2436.11	1.35E+02	14.12	2.25E+01	0.91
8	911.29	3639 -	3651	3644.10	4.26E+01	8.35	1.04E+01	0.96
9	968.94	3869 -	3880	3874.75	2.00E+01	6.52	9.00E+00	0.93
10	1173.28	4686 -	4698	4692.31	3.64E+01	6.96	4.55E+00	0.38
11	1332.72	5325 -	5337	5330.37	2.07E+01	7.66	1.43E+01	0.84
12	1460.90	5833 -	5856	5843.43	4.20E+02	21.32	8.68E+00	1.56

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	1.03E+01	6.89E-01
Co-60	0.99	1173.23	*	99.85	8.19E-02	1.60E-02
		1332.49	*	99.98	5.05E-02	1.88E-02
Tl-208	0.99	583.19	*	85.00	1.12E-01	1.98E-02
Pb-212	1.00	115.18		0.60		

Analysis Report for 20-Nov-19-10007

L1-10206B-FIGS-004SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	1.00	238.63	*	43.60	2.98E-01	4.57E-02
		300.09		3.30		
Pb212-XR	1.00	74.82		10.28		
		77.11	*	17.10	3.52E-01	1.68E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	1.00	609.32	*	45.49	4.27E-01	5.16E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	3.41E-01	6.92E-02
		351.93	*	35.60	3.38E-01	5.05E-02
		785.96		1.06		
Pb214-XR	1.00	74.82		5.80		
		77.11	*	9.70	6.20E-01	2.98E-01
		87.35		2.24		
		89.78		0.82		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	5.17E-01	9.56E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.13E-01	6.29E-02
		964.77		4.99		
		968.97	*	15.80	2.50E-01	8.24E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 20-Nov-19-10007

L1-10206B-FIGS-004SS

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	1.03E+01	6.89E-01	
	Co-60	0.996	6.87E-02	1.22E-02	
	Tl-208	0.997	1.12E-01	1.98E-02	
X	Bi-211	0.853			
	Pb-212	1.000	2.98E-01	4.57E-02	
?	Pb212-XR	1.000	3.52E-01	1.68E-01	
	Bi-214	1.000	4.27E-01	5.16E-02	
	Pb-214	0.997	3.39E-01	4.08E-02	
?	Pb214-XR	1.000	6.20E-01	2.98E-01	
	Ac-228	1.000	3.39E-01	4.43E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 20-Nov-19-10007

L1-10206B-FIGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/20/2019 8:56:07AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	8.92E-02	6.82E-02	6.82E-02
	BE-7	477.60		10.44	-4.71E-02	5.25E-01	5.25E-01
+	K-40	1460.82	*	10.66	1.03E+01	5.57E-01	5.57E-01
	Mn-54	834.85		99.98	1.83E-02	6.64E-02	6.64E-02
+	Co-60	1173.23	*	99.85	8.19E-02	3.29E-02	3.29E-02
		1332.49	*	99.98	5.05E-02		5.81E-02
	Nb-94	702.65		99.81	-1.09E-02	4.91E-02	4.91E-02
		871.09		99.89	-4.42E-02		5.89E-02
	Ag-108m	79.13		6.60	1.09E-01	4.90E-02	2.01E+00
		433.94		90.50	-5.82E-03		4.90E-02
		614.28		89.80	-1.65E-02		8.67E-02
		722.94		90.80	-4.13E-02		6.57E-02
	Sb-125	176.31		6.84	-2.28E-01	1.58E-01	6.39E-01
		380.45		1.52	-6.35E-01		2.64E+00
		427.87		29.60	5.17E-03		1.58E-01
		463.36		10.49	4.59E-01		5.34E-01
		600.60		17.65	-4.89E-02		2.78E-01
		606.71		4.98	3.83E+00		1.97E+00
		635.95		11.22	-1.98E-01		4.83E-01

Analysis Report for 20-Nov-19-10007

L1-10206B-FIGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-8.22E-01	1.58E-01	2.96E+00
Ba-133	79.61	2.65	2.78E-02	1.01E-01	4.79E+00
	81.00	32.90	-1.82E-01		3.36E-01
	276.40	7.16	-9.01E-02		6.22E-01
	302.85	18.34	-1.80E-02		2.36E-01
	356.01	62.05	-2.08E-02		1.01E-01
	383.85	8.94	7.60E-02		4.88E-01
Cs-134	475.36	1.48	3.01E+00	7.65E-02	3.71E+00
	563.25	8.34	-3.63E-01		5.76E-01
	569.33	15.37	-2.90E-01		3.21E-01
	604.72	97.62	-3.30E-02		9.27E-02
	795.86	85.46	5.60E-02		7.65E-02
	801.95	8.69	-7.81E-01		6.49E-01
	1038.61	0.99	2.69E+00		6.79E+00
	1167.97	1.79	5.73E-01		5.30E+00
	1365.19	3.02	-1.25E+00		1.55E+00
Cs-137	661.66	85.10	9.74E-02	8.12E-02	8.12E-02
Eu-152	121.78	28.67	-3.13E-02	1.58E-01	1.95E-01
	244.70	7.61	-2.21E-01		6.90E-01
	295.94	0.45	9.84E+00		1.26E+01
	344.28	26.60	-5.28E-02		1.58E-01
	367.79	0.86	1.12E+00		4.87E+00
	411.12	2.24	1.48E-01		2.10E+00
	443.96	2.83	-7.89E-01		1.69E+00
	488.68	0.42	-5.91E+00		1.09E+01
	563.99	0.49	4.51E-02		1.04E+01
	586.26	0.46	-2.01E+00		1.61E+01
	678.62	0.47	8.94E+00		1.22E+01
	688.67	0.86	-4.39E+00		5.63E+00
	719.35	0.28	1.24E+01		1.97E+01
	778.90	12.96	-3.13E-02		4.51E-01
	810.45	0.32	-4.74E+00		1.89E+01
	867.37	4.26	-2.15E-01		1.43E+00
	919.33	0.43	-2.09E-01		1.36E+01
	964.08	14.65	-2.40E-01		5.30E-01
	1085.87	10.24	-2.56E-01		5.98E-01
	1089.74	1.73	1.16E+00		4.01E+00
	1112.07	13.69	-2.78E-01		5.13E-01
	1212.95	1.43	3.25E+00		6.54E+00
	1249.94	0.19	3.62E+01		4.20E+01
	1299.14	1.63	-5.48E-01		4.49E+00
	1408.01	21.07	-1.75E-01		2.27E-01
	1457.64	0.50	-8.76E+00		5.39E+01
	1528.10	0.28	-2.62E+01		9.28E+00
Eu-154	123.07	40.40	-1.75E-02	1.38E-01	1.38E-01
	247.93	6.89	2.24E-01		6.76E-01
	591.76	4.95	3.57E-01		9.16E-01
	692.42	1.78	1.70E+00		2.94E+00
	723.30	20.06	1.48E-01		3.19E-01
	756.80	4.52	-6.82E-01		1.26E+00
	873.18	12.08	6.06E-01		5.34E-01

Analysis Report for 20-Nov-19-10007

L1-10206B-FIGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	5.73E-01	1.38E-01	6.09E-01
	1004.76	18.01	-2.04E-01		3.28E-01
	1274.43	34.80	-3.49E-01		1.86E-01
	1596.48	1.80	1.25E+00		3.25E+00
Eu-155	45.30	1.31	8.98E+00	3.24E-01	3.72E+01
	60.01	1.22	-2.73E+01		3.80E+01
	86.55	30.70	-5.86E-02		3.24E-01
	105.31	21.10	1.49E-02		3.37E-01
Ra-226	186.21	3.64	3.36E-01	1.39E+00	1.39E+00
Pa-231	27.36	10.30	4.64E+00	1.76E+00	4.45E+00
	283.69	1.70	-7.52E-03		2.52E+00
	300.07	2.47	2.44E-01		1.76E+00
	302.65	2.20	3.62E-01		2.01E+00
	330.06	1.40	9.78E-01		3.58E+00
U-235	143.76	10.96	-2.15E-01	8.94E-02	4.70E-01
	163.33	5.08	7.57E-02		9.61E-01
	185.71	57.20	4.50E-02		8.94E-02
	202.11	1.08	6.14E-01		4.20E+00
	205.31	5.01	-7.01E-01		9.31E-01
Am-241	59.54	35.90	-8.36E-01	1.38E+00	1.38E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 23-Nov-19-10013

L1-10206B-FIGS-001SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 23-Nov-19-10013
Sample Description	: L1-10206B-FIGS-001SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.528E+03 grams
Facility	: Default
Sample Taken On	: 11/21/2019 2:05:00PM
Acquisition Started	: 11/23/2019 8:53:56AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.4 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/23/2019
Efficiency Calibration Description	:
Sample Number	: 81568
Fill Height	: 1527.82 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/23/2019 9:08:58AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated
0800 11/27/19

Analysis Report for 23-Nov-19-10013

L1-10206B-FIGS-001SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.62	474 -	481	477.43	1.09E+02	19.03	1.18E+02	1.29
2	351.91	699 -	708	703.77	1.16E+02	14.05	3.56E+01	1.26
3	583.11	1161 -	1171	1165.83	4.47E+01	10.00	2.33E+01	0.95
4	609.27	1212 -	1223	1218.12	1.15E+02	12.18	1.35E+01	1.52
5	911.58	1817 -	1826	1822.62	4.35E+01	8.49	1.25E+01	0.89
6	968.75	1933 -	1943	1936.97	3.59E+01	9.08	1.91E+01	1.09
7	1460.59	2913 -	2927	2921.22	5.61E+02	24.23	9.24E+00	1.68

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	1.05E+01	6.46E-01
Tl-208	0.99	583.19	*	85.00	5.77E-02	1.34E-02
Bi-211	0.89	351.07	*	13.02	6.98E-01	1.01E-01
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.53E-01	2.94E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.84E-01	3.47E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 23-Nov-19-10013

L1-10206B-FIGS-001SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.51	241.99		7.25		
		295.22		18.42		
		351.93	*	35.60	2.55E-01	3.69E-02
		785.96		1.06		
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.48E-01	4.95E-02
		964.77		4.99		
		968.97	*	15.80	3.47E-01	8.92E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 23-Nov-19-10013

L1-10206B-FIGS-001SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.991	1.05E+01	6.46E-01	
	Tl-208	0.999	5.77E-02	1.34E-02	
?	Bi-211	0.893	6.98E-01	1.01E-01	
	Pb-212	1.000	1.53E-01	2.94E-02	
	Bi-214	1.000	2.84E-01	3.47E-02	
?	Pb-214	0.514	2.55E-01	3.69E-02	
	Ac-228	0.992	2.71E-01	4.33E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 23-Nov-19-10013

L1-10206B-FIGS-001SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/23/2019 9:08:58AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.33E-02	5.30E-02	5.30E-02
	BE-7	477.60		10.44	-1.23E-01	3.13E-01	3.13E-01
+	K-40	1460.82	*	10.66	1.05E+01	3.82E-01	3.82E-01
	Mn-54	834.85		99.98	1.43E-02	4.57E-02	4.57E-02
	Co-60	1173.23		99.85	-1.01E-02	4.85E-02	6.30E-02
		1332.49		99.98	1.34E-02		4.85E-02
	Nb-94	702.65		99.81	-9.00E-03	4.28E-02	4.35E-02
		871.09		99.89	1.95E-02		4.28E-02
	Ag-108m	79.13		6.60	9.66E-01	3.73E-02	1.21E+00
		433.94		90.50	-6.81E-03		3.73E-02
		614.28		89.80	-2.25E-02		5.82E-02
		722.94		90.80	2.33E-03		4.51E-02
	Sb-125	176.31		6.84	8.69E-03	1.21E-01	5.24E-01
		380.45		1.52	7.01E-01		2.35E+00
		427.87		29.60	-1.09E-02		1.21E-01
		463.36		10.49	1.17E-01		3.54E-01
		600.60		17.65	9.42E-03		1.96E-01
		606.71		4.98	-1.37E-01		1.33E+00
		635.95		11.22	1.58E-01		3.40E-01

Analysis Report for 23-Nov-19-10013

L1-10206B-FIGS-001SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	2.51E-01	1.21E-01	2.18E+00
Ba-133	79.61	2.65	1.32E+00	7.19E-02	2.78E+00
	81.00	32.90	-2.37E-01		1.80E-01
	276.40	7.16	-4.70E-02		4.60E-01
	302.85	18.34	6.87E-02		1.83E-01
	356.01	62.05	-4.20E-02		7.19E-02
	383.85	8.94	-7.80E-03		3.88E-01
Cs-134	475.36	1.48	-8.50E-01	4.45E-02	2.25E+00
	563.25	8.34	3.30E-03		4.12E-01
	569.33	15.37	-6.11E-02		2.11E-01
	604.72	97.62	-1.35E-02		5.69E-02
	795.86	85.46	-1.14E-02		4.45E-02
	801.95	8.69	-1.42E-01		4.54E-01
	1038.61	0.99	-1.01E+00		4.99E+00
	1167.97	1.79	-1.21E+00		3.27E+00
	1365.19	3.02	8.86E-01		1.32E+00
Cs-137	661.66	85.10	1.16E-02	4.70E-02	4.70E-02
Eu-152	121.78	28.67	2.33E-02	1.15E-01	1.15E-01
	244.70	7.61	1.41E-01		4.93E-01
	295.94	0.45	1.18E+01		9.54E+00
	344.28	26.60	-1.04E-01		1.24E-01
	367.79	0.86	-1.09E+00		3.56E+00
	411.12	2.24	-6.51E-01		1.67E+00
	443.96	2.83	-3.64E-01		1.06E+00
	488.68	0.42	2.24E+00		9.00E+00
	563.99	0.49	-8.61E-01		6.83E+00
	586.26	0.46	-1.18E+00		1.13E+01
	678.62	0.47	-4.04E+00		7.13E+00
	688.67	0.86	1.02E+00		4.39E+00
	719.35	0.28	-2.93E+00		1.14E+01
	778.90	12.96	-9.77E-02		3.24E-01
	810.45	0.32	2.00E+00		1.27E+01
	867.37	4.26	5.84E-02		1.00E+00
	919.33	0.43	-4.41E+00		1.05E+01
	964.08	14.65	-3.77E-02		4.10E-01
	1085.87	10.24	-4.98E-02		4.88E-01
	1089.74	1.73	1.36E-01		2.94E+00
	1112.07	13.69	6.00E-02		3.91E-01
	1212.95	1.43	1.65E-01		4.33E+00
	1249.94	0.19	2.14E+00		2.81E+01
	1299.14	1.63	-1.82E-01		3.10E+00
	1408.01	21.07	7.46E-02		2.15E-01
	1457.64	0.50	-1.34E+00		4.69E+01
	1528.10	0.28	3.03E+00		1.21E+01
Eu-154	123.07	40.40	-4.67E-03	8.00E-02	8.00E-02
	247.93	6.89	1.15E-01		4.73E-01
	591.76	4.95	1.99E-01		7.43E-01
	692.42	1.78	-7.10E-01		2.13E+00
	723.30	20.06	3.06E-03		2.04E-01
	756.80	4.52	-1.29E-01		9.22E-01
	873.18	12.08	-1.54E-02		3.17E-01

Analysis Report for 23-Nov-19-10013

L1-10206B-FIGS-001SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.54E-01	8.00E-02	4.99E-01
	1004.76	18.01	-3.11E-01		2.02E-01
	1274.43	34.80	8.12E-02		1.68E-01
	1596.48	1.80	3.38E-01		1.74E+00
Eu-155	45.30	1.31	5.22E+00	1.81E-01	1.27E+01
	60.01	1.22	-3.45E+00		1.29E+01
	86.55	30.70	1.14E-01		1.94E-01
	105.31	21.10	-6.63E-02		1.81E-01
Ra-226	186.21	3.64	4.04E-02	1.00E+00	1.00E+00
Pa-231	27.36	10.30	8.04E-01	1.20E+00	1.20E+00
	283.69	1.70	-1.27E-01		1.89E+00
	300.07	2.47	-3.04E+00		1.27E+00
	302.65	2.20	5.73E-01		1.53E+00
	330.06	1.40	-2.12E-01		2.56E+00
U-235	143.76	10.96	-1.74E-02	6.44E-02	2.79E-01
	163.33	5.08	3.07E-01		7.23E-01
	185.71	57.20	1.70E-02		6.44E-02
	202.11	1.08	-4.05E-02		3.36E+00
	205.31	5.01	7.64E-02		7.23E-01
Am-241	59.54	35.90	-9.27E-03	4.51E-01	4.51E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 23-Nov-19-10014

L1-10206B-QIGS-001SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 23-Nov-19-10014
Sample Description	: L1-10206B-QIGS-001SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.543E+03 grams
Facility	: Default
Sample Taken On	: 11/21/2019 2:05:00PM
Acquisition Started	: 11/23/2019 9:12:28AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 324
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.4 seconds
Dead Time	: 0.04 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 4096
Peak Area Range (in channels)	: 120 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/23/2019
Efficiency Calibration Description	:
Sample Number	: 81572
Fill Height	: 1542.94 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/23/2019 9:27:31AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 4096

Data Validated
0800 11-24-19

Analysis Report for 23-Nov-19-10014

L1-10206B-QIGS-001SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.61	473 -	481	477.40	1.20E+02	20.08	1.29E+02	1.01
2	295.41	588 -	595	590.88	4.84E+01	12.58	5.36E+01	0.97
3	351.82	698 -	708	703.59	9.60E+01	15.45	6.00E+01	0.94
4	583.09	1160 -	1170	1165.78	6.80E+01	10.55	1.80E+01	1.46
5	609.27	1214 -	1222	1218.11	7.95E+01	11.00	1.95E+01	1.32
6	911.15	1817 -	1827	1821.75	4.00E+01	9.05	1.70E+01	1.71
7	1460.47	2914 -	2928	2921.00	4.75E+02	22.27	7.50E+00	2.06

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	8.90E+00	5.69E-01
Tl-208	0.99	583.19	*	85.00	8.75E-02	1.46E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	1.68E-01	3.12E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	1.97E-01	2.97E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		
		1120.29		14.92		

Analysis Report for 23-Nov-19-10014

L1-10206B-QIGS-001SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	1.81E-01	4.92E-02
		351.93	*	35.60	2.10E-01	3.77E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.27E-01	5.23E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 23-Nov-19-10014

L1-10206B-QIGS-001SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.981	8.90E+00	5.69E-01	
	Tl-208	0.998	8.75E-02	1.46E-02	
X	Bi-211	0.913			
	Pb-212	1.000	1.68E-01	3.12E-02	
	Bi-214	1.000	1.97E-01	2.97E-02	
	Pb-214	0.997	1.99E-01	3.00E-02	
	Ac-228	1.000	2.27E-01	5.23E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 23-Nov-19-10014
L1-10206B-QIGS-001SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/23/2019 9:27:31AM
Peak Locate From Channel : 120
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	6.26E-02	5.43E-02	5.43E-02
	BE-7	477.60		10.44	9.45E-02	3.39E-01	3.39E-01
+	K-40	1460.82	*	10.66	8.90E+00	3.50E-01	3.50E-01
	Mn-54	834.85		99.98	1.09E-02	4.56E-02	4.56E-02
	Co-60	1173.23		99.85	-2.55E-02	3.89E-02	4.63E-02
		1332.49		99.98	-4.39E-02		3.89E-02
	Nb-94	702.65		99.81	2.74E-03	3.75E-02	4.02E-02
		871.09		99.89	-1.11E-02		3.75E-02
	Ag-108m	79.13		6.60	9.07E-01	3.18E-02	1.28E+00
		433.94		90.50	-2.47E-02		3.18E-02
		614.28		89.80	-6.62E-02		5.16E-02
		722.94		90.80	-4.77E-03		4.66E-02
	Sb-125	176.31		6.84	2.99E-01	1.02E-01	5.37E-01
		380.45		1.52	-7.57E-01		2.17E+00
		427.87		29.60	1.65E-03		1.02E-01
		463.36		10.49	4.77E-02		3.20E-01
		600.60		17.65	-8.93E-02		2.03E-01
		606.71		4.98	-6.06E-01		1.26E+00
		635.95		11.22	3.83E-02		3.39E-01

Analysis Report for 23-Nov-19-10014

L1-10206B-QIGS-001SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-6.98E-01	1.02E-01	1.96E+00
Ba-133	79.61	2.65	-8.61E-02	6.99E-02	2.89E+00
	81.00	32.90	-3.21E-01		1.89E-01
	276.40	7.16	1.30E-03		5.01E-01
	302.85	18.34	5.83E-02		1.80E-01
	356.01	62.05	-2.57E-02		6.99E-02
	383.85	8.94	2.18E-01		4.14E-01
Cs-134	475.36	1.48	6.15E-01	5.56E-02	2.32E+00
	563.25	8.34	1.61E-01		4.77E-01
	569.33	15.37	1.75E-02		2.38E-01
	604.72	97.62	-4.19E-02		5.65E-02
	795.86	85.46	3.16E-02		5.56E-02
	801.95	8.69	-3.92E-01		4.32E-01
	1038.61	0.99	1.84E+00		5.17E+00
	1167.97	1.79	-3.77E-02		3.00E+00
	1365.19	3.02	4.10E-01		1.50E+00
Cs-137	661.66	85.10	7.99E-03	4.59E-02	4.59E-02
Eu-152	121.78	28.67	4.79E-02	1.12E-01	1.24E-01
	244.70	7.61	7.22E-02		4.85E-01
	295.94	0.45	1.05E+01		9.18E+00
	344.28	26.60	-2.15E-01		1.12E-01
	367.79	0.86	-4.03E-01		3.87E+00
	411.12	2.24	4.61E-01		1.60E+00
	443.96	2.83	-2.68E-01		1.10E+00
	488.68	0.42	-3.44E+00		8.44E+00
	563.99	0.49	-1.50E+00		7.64E+00
	586.26	0.46	-4.96E+00		1.19E+01
	678.62	0.47	-2.88E+00		8.11E+00
	688.67	0.86	1.27E-01		4.77E+00
	719.35	0.28	-1.06E+01		1.31E+01
	778.90	12.96	2.87E-02		3.02E-01
	810.45	0.32	3.40E+00		1.21E+01
	867.37	4.26	-5.31E-01		8.77E-01
	919.33	0.43	-1.60E+00		8.92E+00
	964.08	14.65	-9.17E-03		4.02E-01
	1085.87	10.24	4.09E-01		5.13E-01
	1089.74	1.73	6.50E-01		3.01E+00
	1112.07	13.69	-5.26E-02		4.35E-01
	1212.95	1.43	-8.80E-01		4.70E+00
	1249.94	0.19	-7.18E-01		3.08E+01
	1299.14	1.63	-7.05E-01		3.20E+00
	1408.01	21.07	5.85E-02		2.20E-01
	1457.64	0.50	-1.14E+01		4.31E+01
	1528.10	0.28	-1.14E+01		1.14E+01
Eu-154	123.07	40.40	-2.75E-02	8.33E-02	8.33E-02
	247.93	6.89	3.43E-02		4.73E-01
	591.76	4.95	-2.10E-02		7.33E-01
	692.42	1.78	8.61E-01		2.31E+00
	723.30	20.06	3.21E-02		2.16E-01
	756.80	4.52	-1.19E-01		7.98E-01
	873.18	12.08	-4.16E-02		3.11E-01

Analysis Report for 23-Nov-19-10014

L1-10206B-QIGS-001SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.30E-01	8.33E-02	4.63E-01
	1004.76	18.01	-3.96E-02		2.49E-01
	1274.43	34.80	-8.80E-02		1.57E-01
	1596.48	1.80	5.65E-01		2.23E+00
Eu-155	45.30	1.31	-2.55E+00	1.79E-01	1.12E+01
	60.01	1.22	1.47E+00		1.25E+01
	86.55	30.70	-1.64E-02		1.79E-01
	105.31	21.10	2.71E-02		2.04E-01
Ra-226	186.21	3.64	5.53E-01	1.08E+00	1.08E+00
Pa-231	27.36	10.30	7.96E-01	1.16E+00	1.16E+00
	283.69	1.70	5.16E-01		2.03E+00
	300.07	2.47	4.61E-03		1.37E+00
	302.65	2.20	4.86E-01		1.50E+00
	330.06	1.40	7.88E-01		2.63E+00
U-235	143.76	10.96	-1.21E-01	6.94E-02	2.89E-01
	163.33	5.08	-1.43E-01		7.03E-01
	185.71	57.20	3.75E-02		6.94E-02
	202.11	1.08	-9.66E-01		3.07E+00
	205.31	5.01	-3.02E-01		6.87E-01
Am-241	59.54	35.90	9.25E-02	4.40E-01	4.40E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 23-Nov-19-10015

L1-10206B-FIGS-002SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 23-Nov-19-10015
Sample Description	: L1-10206B-FIGS-002SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.620E+03 grams
Facility	: Default
Sample Taken On	: 11/21/2019 2:35:00PM
Acquisition Started	: 11/23/2019 8:54:02AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.3 seconds
Dead Time	: 0.15 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/23/2019
Efficiency Calibration Description	:
Sample Number	: 81569
Fill Height	: 1620.31 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/23/2019 9:09:06AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0800 11-24-19

Analysis Report for 23-Nov-19-10015

L1-10206B-FIGS-002SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	949 -	960	954.83	1.31E+02	17.14	6.47E+01	0.74
2	295.10	1175 -	1187	1180.29	4.34E+01	11.37	3.16E+01	0.46
3	352.02	1403 -	1413	1407.81	7.32E+01	11.29	2.28E+01	1.12
4	510.65	2037 -	2046	2041.95	2.17E+01	8.98	2.53E+01	0.57
5	583.11	2325 -	2338	2331.65	3.54E+01	10.18	2.46E+01	1.16
6	609.43	2430 -	2443	2436.87	6.83E+01	10.55	1.57E+01	1.05
7	911.26	3635 -	3652	3644.02	4.45E+01	7.69	4.50E+00	0.42
8	1460.97	5832 -	5855	5843.73	2.51E+02	16.92	8.89E+00	1.78

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.98	511.00	*	100.00	2.84E-02	1.19E-02
K-40	0.99	1460.82	*	10.66	6.16E+00	4.94E-01
Tl-208	0.99	583.19	*	85.00	5.83E-02	1.71E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.32E-01	3.57E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.17E-01	3.59E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 23-Nov-19-10015

L1-10206B-FIGS-002SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.05E-01	5.60E-02
		351.93	*	35.60	2.03E-01	3.52E-02
		785.96		1.06		
Ac-228	1.00	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	3.27E-01	5.82E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 23-Nov-19-10015

L1-10206B-FIGS-002SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	An Pk	0.981	2.84E-02	1.19E-02	
	K-40	0.996	6.16E+00	4.94E-01	
	Tl-208	0.999	5.83E-02	1.71E-02	
X	Bi-211	0.866			
	Pb-212	1.000	2.32E-01	3.57E-02	
	Bi-214	0.999	2.17E-01	3.59E-02	
	Pb-214	0.999	2.03E-01	2.98E-02	
	Ac-228	1.000	3.27E-01	5.82E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 23-Nov-19-10015

L1-10206B-FIGS-002SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/23/2019 9:09:06AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	An Pk	511.00	*	100.00	2.84E-02	3.79E-02	3.79E-02
	BE-7	477.60		10.44	3.18E-01	3.93E-01	3.93E-01
+	K-40	1460.82	*	10.66	6.16E+00	5.65E-01	5.65E-01
	Mn-54	834.85		99.98	6.41E-03	4.26E-02	4.26E-02
	Co-60	1173.23		99.85	5.57E-02	4.58E-02	7.28E-02
		1332.49		99.98	2.68E-02		4.58E-02
	Nb-94	702.65		99.81	-8.25E-03	4.97E-02	4.97E-02
		871.09		99.89	3.03E-02		5.10E-02
	Ag-108m	79.13		6.60	2.05E+00	4.69E-02	2.12E+00
		433.94		90.50	-1.86E-02		4.69E-02
		614.28		89.80	-2.54E-02		7.31E-02
		722.94		90.80	-1.11E-02		6.06E-02
	Sb-125	176.31		6.84	-4.47E-02	1.40E-01	5.93E-01
		380.45		1.52	1.12E+00		2.62E+00
		427.87		29.60	-6.45E-02		1.40E-01
		463.36		10.49	3.07E-01		4.24E-01
		600.60		17.65	-9.69E-02		2.53E-01
		606.71		4.98	2.17E+00		1.54E+00
		635.95		11.22	1.12E-01		4.20E-01

Analysis Report for 23-Nov-19-10015

L1-10206B-FIGS-002SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	7.21E-01	1.40E-01	2.69E+00
Ba-133	79.61	2.65	1.92E+00	7.54E-02	4.94E+00
	81.00	32.90	-6.07E-01		3.18E-01
	276.40	7.16	7.24E-02		5.10E-01
	302.85	18.34	2.23E-01		2.23E-01
	356.01	62.05	-6.85E-02		7.54E-02
	383.85	8.94	1.41E-01		4.55E-01
Cs-134	475.36	1.48	-2.82E-01	6.07E-02	2.61E+00
	563.25	8.34	6.81E-02		4.86E-01
	569.33	15.37	-1.88E-01		2.23E-01
	604.72	97.62	-2.16E-02		6.93E-02
	795.86	85.46	1.28E-02		6.07E-02
	801.95	8.69	-5.50E-02		5.65E-01
	1038.61	0.99	2.10E+00		5.09E+00
	1167.97	1.79	1.59E+00		3.70E+00
	1365.19	3.02	-9.62E-02		1.21E+00
Cs-137	661.66	85.10	-4.15E-02	4.27E-02	4.27E-02
Eu-152	121.78	28.67	4.29E-02	1.33E-01	1.58E-01
	244.70	7.61	1.49E-01		5.92E-01
	295.94	0.45	6.29E+00		1.03E+01
	344.28	26.60	3.74E-02		1.33E-01
	367.79	0.86	-8.35E-01		4.05E+00
	411.12	2.24	9.32E-01		1.92E+00
	443.96	2.83	8.44E-02		1.56E+00
	488.68	0.42	-8.09E-01		9.48E+00
	563.99	0.49	3.64E+00		8.13E+00
	586.26	0.46	-1.05E+00		1.43E+01
	678.62	0.47	-1.24E+00		9.59E+00
	688.67	0.86	-3.47E+00		4.44E+00
	719.35	0.28	1.26E+00		1.61E+01
	778.90	12.96	6.41E-03		3.27E-01
	810.45	0.32	3.01E+00		1.46E+01
	867.37	4.26	-1.19E+00		1.11E+00
	919.33	0.43	4.47E+00		1.24E+01
	964.08	14.65	1.04E-01		4.46E-01
	1085.87	10.24	1.53E-01		5.49E-01
	1089.74	1.73	-2.82E+00		2.80E+00
	1112.07	13.69	-5.64E-01		4.25E-01
	1212.95	1.43	-3.51E+00		4.75E+00
	1249.94	0.19	-1.24E+00		3.38E+01
	1299.14	1.63	1.21E+00		4.10E+00
	1408.01	21.07	-1.26E-02		2.80E-01
	1457.64	0.50	1.38E+02		4.24E+01
	1528.10	0.28	-5.14E+00		1.50E+01
Eu-154	123.07	40.40	-3.44E-02	1.13E-01	1.13E-01
	247.93	6.89	1.35E-01		5.76E-01
	591.76	4.95	-2.49E-01		8.82E-01
	692.42	1.78	-6.14E-01		2.42E+00
	723.30	20.06	3.23E-02		2.74E-01
	756.80	4.52	8.28E-01		1.12E+00
	873.18	12.08	-3.07E-02		4.23E-01

Analysis Report for 23-Nov-19-10015

L1-10206B-FIGS-002SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.30E-01	1.13E-01	5.07E-01
	1004.76	18.01	-3.93E-02		2.67E-01
	1274.43	34.80	3.02E-02		1.58E-01
	1596.48	1.80	-2.88E+00		1.94E+00
Eu-155	45.30	1.31	7.15E+00	2.70E-01	2.98E+01
	60.01	1.22	-1.89E+00		3.17E+01
	86.55	30.70	-1.30E-01		2.70E-01
	105.31	21.10	5.55E-02		2.84E-01
Ra-226	186.21	3.64	1.06E+00	1.12E+00	1.12E+00
Pa-231	27.36	10.30	2.36E+00	1.58E+00	3.59E+00
	283.69	1.70	2.13E-02		2.11E+00
	300.07	2.47	3.68E-01		1.58E+00
	302.65	2.20	1.63E+00		1.85E+00
	330.06	1.40	-7.92E-01		2.95E+00
U-235	143.76	10.96	-1.55E-01	6.86E-02	3.81E-01
	163.33	5.08	3.94E-01		8.45E-01
	185.71	57.20	1.92E-02		6.86E-02
	202.11	1.08	-3.12E-01		3.57E+00
	205.31	5.01	-5.06E-01		7.55E-01
Am-241	59.54	35.90	6.63E-01	1.17E+00	1.17E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 25-Nov-19-10003

L1-10206B-FIGS-002SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 25-Nov-19-10003
Sample Description	: L1-10206B-FIGS-002SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.620E+03 grams
Facility	: Default
Sample Taken On	: 11/21/2019 2:35:00PM
Acquisition Started	: 11/25/2019 6:34:32AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P11314
Geometry	: 130G_SOIL_1
Live Time	: 1800.0 seconds
Real Time	: 1800.6 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/25/2019
Efficiency Calibration Description	:
Sample Number	: 81600
Fill Height	: 1620.31 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/25/2019 7:04:36AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
1500 11-25-19

Analysis Report for 25-Nov-19-10003

L1-10206B-FIGS-002SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.70	946 -	962	954.36	2.94E+02	26.35	1.27E+02	1.04
2	295.36	1173 -	1189	1180.74	1.18E+02	18.53	7.18E+01	0.91
3	351.95	1397 -	1413	1406.83	2.15E+02	18.90	4.57E+01	1.07
4	509.98	2033 -	2043	2038.27	2.66E+01	11.93	4.64E+01	0.75
5	583.02	2322 -	2337	2330.19	8.68E+01	12.66	2.42E+01	0.72
6	609.05	2428 -	2442	2434.24	1.28E+02	13.69	2.09E+01	1.70
7	910.74	3632 -	3649	3640.42	7.33E+01	12.84	2.67E+01	1.17
8	968.75	3863 -	3880	3872.41	4.89E+01	10.46	1.81E+01	0.37
9	1460.01	5825 -	5850	5837.96	6.14E+02	25.85	1.28E+01	2.20

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.89	1460.82	*	10.66	6.78E+00	4.10E-01
Tl-208	0.99	583.19	*	85.00	6.45E-02	1.02E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	2.31E-01	2.79E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	1.83E-01	2.24E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 25-Nov-19-10003

L1-10206B-FIGS-002SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.50E-01	4.40E-02
		351.93	*	35.60	2.68E-01	3.18E-02
		785.96		1.06		
Ac-228	0.98	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	2.43E-01	4.38E-02
		964.77		4.99		
		968.97	*	15.80	2.76E-01	6.02E-02
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 25-Nov-19-10003

L1-10206B-FIGS-002SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.899	6.78E+00	4.10E-01	
	Tl-208	0.995	6.45E-02	1.02E-02	
X	Bi-211	0.883			
	Pb-212	0.999	2.31E-01	2.79E-02	
	Bi-214	0.995	1.83E-01	2.24E-02	
	Pb-214	0.999	2.62E-01	2.58E-02	
	Ac-228	0.988	2.54E-01	3.54E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 25-Nov-19-10003

L1-10206B-FIGS-002SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/25/2019 7:04:36AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
4	509.98	1.47565E-02	44.90		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	7.43E-02	3.87E-02	3.87E-02
	BE-7	477.60		10.44	-9.26E-02	2.27E-01	2.27E-01
+	K-40	1460.82	*	10.66	6.78E+00	3.06E-01	3.06E-01
	Mn-54	834.85		99.98	1.88E-02	2.96E-02	2.96E-02
	Co-60	1173.23		99.85	1.80E-03	3.06E-02	4.05E-02
		1332.49		99.98	1.65E-03		3.06E-02
	Nb-94	702.65		99.81	2.88E-03	2.96E-02	2.96E-02
		871.09		99.89	-1.19E-02		2.96E-02
	Ag-108m	79.13		6.60	6.93E-01	2.69E-02	8.60E-01
		433.94		90.50	1.47E-03		2.69E-02
		614.28		89.80	-7.54E-04		3.54E-02
		722.94		90.80	1.45E-02		3.48E-02
	Sb-125	176.31		6.84	-2.82E-02	7.90E-02	3.04E-01
		380.45		1.52	7.85E-01		1.48E+00
		427.87		29.60	9.82E-03		7.90E-02
		463.36		10.49	3.92E-02		2.51E-01
		600.60		17.65	-5.46E-02		1.45E-01
		606.71		4.98	1.97E+00		8.94E-01

Analysis Report for 25-Nov-19-10003

L1-10206B-FIGS-002SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	635.95	11.22	1.14E-01	7.90E-02	2.52E-01
	671.44	1.79	6.26E-02		1.35E+00
Ba-133	79.61	2.65	1.92E+00	4.74E-02	2.08E+00
	81.00	32.90	-2.92E-01		1.32E-01
	276.40	7.16	1.33E-01		3.22E-01
	302.85	18.34	2.90E-02		1.28E-01
	356.01	62.05	-4.29E-02		4.74E-02
	383.85	8.94	9.15E-02		2.74E-01
Cs-134	475.36	1.48	-3.68E-01	3.66E-02	1.50E+00
	563.25	8.34	-3.45E-02		3.38E-01
	569.33	15.37	-3.34E-02		1.70E-01
	604.72	97.62	-3.68E-02		4.12E-02
	795.86	85.46	1.69E-02		3.66E-02
	801.95	8.69	2.19E-01		3.48E-01
	1038.61	0.99	-2.53E+00		3.10E+00
	1167.97	1.79	1.49E+00		2.31E+00
	1365.19	3.02	-3.95E-01		1.02E+00
Cs-137	661.66	85.10	2.04E-02	3.57E-02	3.57E-02
Eu-152	121.78	28.67	2.69E-02	8.26E-02	8.40E-02
	244.70	7.61	-1.99E-01		3.13E-01
	295.94	0.45	7.52E+00		6.87E+00
	344.28	26.60	2.94E-03		8.26E-02
	367.79	0.86	-8.00E-01		2.50E+00
	411.12	2.24	-1.77E-01		1.00E+00
	443.96	2.83	-2.36E-01		8.81E-01
	488.68	0.42	7.67E-01		5.62E+00
	563.99	0.49	-2.54E+00		5.45E+00
	586.26	0.46	-1.08E+00		8.22E+00
	678.62	0.47	-2.30E+00		5.09E+00
	688.67	0.86	-4.75E-01		3.24E+00
	719.35	0.28	-8.97E+00		9.52E+00
	778.90	12.96	-1.43E-02		2.14E-01
	810.45	0.32	-9.18E-01		8.96E+00
	867.37	4.26	2.74E-01		6.79E-01
	919.33	0.43	-6.67E+00		7.04E+00
	964.08	14.65	-3.79E-02		3.05E-01
	1085.87	10.24	1.40E-01		3.25E-01
	1089.74	1.73	7.27E-01		1.93E+00
	1112.07	13.69	-7.30E-02		2.76E-01
	1212.95	1.43	1.48E+00		3.46E+00
	1249.94	0.19	-1.08E+01		2.01E+01
	1299.14	1.63	-8.26E-01		2.16E+00
	1408.01	21.07	-3.03E-02		1.49E-01
	1457.64	0.50	1.45E+02		2.89E+01
	1528.10	0.28	1.55E+00		7.80E+00
Eu-154	123.07	40.40	-2.28E-03	5.84E-02	5.84E-02
	247.93	6.89	-1.25E-02		3.11E-01
	591.76	4.95	-6.61E-02		5.00E-01
	692.42	1.78	-1.27E+00		1.48E+00
	723.30	20.06	5.76E-02		1.58E-01
	756.80	4.52	3.57E-01		7.12E-01

Analysis Report for 25-Nov-19-10003

L1-10206B-FIGS-002SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	2.24E-02	5.84E-02	2.60E-01
	996.29	10.48	0.00E+00		3.04E-01
	1004.76	18.01	7.23E-02		1.83E-01
	1274.43	34.80	5.36E-02		1.30E-01
	1596.48	1.80	6.16E-01		1.71E+00
Eu-155	45.30	1.31	5.06E+00	1.34E-01	8.27E+00
	60.01	1.22	-2.26E+00		8.60E+00
	86.55	30.70	5.55E-02		1.34E-01
	105.31	21.10	2.17E-02		1.35E-01
Ra-226	186.21	3.64	5.66E-01	6.84E-01	6.84E-01
Pa-231	27.36	10.30	1.25E+00	9.48E-01	9.48E-01
	283.69	1.70	-8.73E-01		1.21E+00
	300.07	2.47	1.84E-01		9.80E-01
	302.65	2.20	4.03E-01		1.07E+00
	330.06	1.40	1.38E+00		1.76E+00
U-235	143.76	10.96	2.34E-02	4.41E-02	2.13E-01
	163.33	5.08	-2.07E-01		4.09E-01
	185.71	57.20	4.79E-02		4.41E-02
	202.11	1.08	1.85E-01		2.01E+00
	205.31	5.01	5.06E-02		4.47E-01
Am-241	59.54	35.90	-1.90E-02	3.05E-01	3.05E-01

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 23-Nov-19-10016

L1-10206B-FIGS-003SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 23-Nov-19-10016
Sample Description	: L1-10206B-FIGS-003SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.475E+03 grams
Facility	: Default
Sample Taken On	: 11/21/2019 2:25:00PM
Acquisition Started	: 11/23/2019 8:54:09AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: 352
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 900.3 seconds
Dead Time	: 0.03 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/23/2019
Efficiency Calibration Description	:
Sample Number	: 81570
Fill Height	: 1475.08 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/23/2019 9:09:22AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated 0800 11-24-19

Analysis Report for 23-Nov-19-10016

L1-10206B-FIGS-003SB

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	186.11	739 -	750	745.17	3.60E+01	13.08	5.40E+01	0.99
M	2	238.67	949 -	974	955.17	1.64E+02	13.83	5.51E+01	1.00
m	3	242.22	949 -	974	969.31	3.54E+01	7.62	4.24E+01	1.01
	4	338.18	1348 -	1358	1352.77	2.15E+01	9.74	3.05E+01	0.79
	5	351.86	1400 -	1415	1407.44	1.02E+02	13.61	2.77E+01	1.23
	6	583.17	2325 -	2339	2331.98	4.68E+01	9.21	1.32E+01	0.67
	7	609.05	2429 -	2443	2435.48	7.43E+01	11.06	1.67E+01	1.12
	8	911.41	3639 -	3652	3644.69	3.04E+01	9.50	1.96E+01	0.34
	9	1460.55	5829 -	5854	5842.59	4.21E+02	20.86	3.34E+00	1.81

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.82	*	10.66	8.90E+00	5.86E-01
Tl-208	1.00	583.19	*	85.00	6.76E-02	1.39E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.58E-01	3.02E-02
		300.09		3.30		
Bi-214	0.99	609.32	*	45.49	2.06E-01	3.31E-02
		768.36		4.89		
		806.18		1.26		

Analysis Report for 23-Nov-19-10016

L1-10206B-FIGS-003SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	934.06		3.11		
		1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.51	241.99	*	7.25	3.38E-01	7.76E-02
		295.22		18.42		
		351.93	*	35.60	2.51E-01	3.89E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	6.08E-01	2.26E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32	*	11.27	1.62E-01	7.45E-02
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	1.94E-01	6.12E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		
U-235	0.98	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	3.87E-02	1.44E-02
		202.11		1.08		
		205.31		5.01		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

Analysis Report for 23-Nov-19-10016

L1-10206B-FIGS-003SB

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.989	8.90E+00	5.86E-01	
	Tl-208	1.000	6.76E-02	1.39E-02	
X	Bi-211	0.905			
	Pb-212	1.000	2.58E-01	3.02E-02	
	Bi-214	0.995	2.06E-01	3.31E-02	
	Pb-214	0.512	2.68E-01	3.48E-02	
?	Ra-226	0.998	6.08E-01	2.26E-01	
	Ac-228	0.997	1.81E-01	4.73E-02	
?	U-235	0.982	3.87E-02	1.44E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 23-Nov-19-10016
L1-10206B-FIGS-003SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/23/2019 9:09:22AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	1.53E-02	5.41E-02	5.41E-02
	BE-7	477.60		10.44	3.13E-02	3.87E-01	3.87E-01
+	K-40	1460.82	*	10.66	8.90E+00	3.34E-01	3.34E-01
	Mn-54	834.85		99.98	-1.16E-02	5.46E-02	5.46E-02
	Co-60	1173.23		99.85	4.99E-03	4.65E-02	6.74E-02
		1332.49		99.98	3.69E-03		4.65E-02
	Nb-94	702.65		99.81	-1.57E-02	4.77E-02	4.77E-02
		871.09		99.89	1.48E-02		5.30E-02
	Ag-108m	79.13		6.60	6.94E-01	4.17E-02	1.57E+00
		433.94		90.50	-2.27E-02		4.17E-02
		614.28		89.80	-2.49E-02		7.71E-02
		722.94		90.80	-4.73E-03		5.51E-02
	Sb-125	176.31		6.84	-2.02E-01	1.39E-01	5.22E-01
		380.45		1.52	1.01E-02		2.13E+00
		427.87		29.60	6.73E-02		1.39E-01
		463.36		10.49	3.31E-01		4.23E-01
		600.60		17.65	5.32E-03		2.66E-01
		606.71		4.98	1.41E+00		1.43E+00
		635.95		11.22	1.33E-01		4.02E-01

Analysis Report for 23-Nov-19-10016

L1-10206B-FIGS-003SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-9.88E-01	1.39E-01	2.35E+00
Ba-133	79.61	2.65	1.71E+00	8.19E-02	3.75E+00
	81.00	32.90	-3.59E-01		2.59E-01
	276.40	7.16	3.38E-01		5.23E-01
	302.85	18.34	5.73E-02		2.09E-01
	356.01	62.05	3.51E-03		8.19E-02
	383.85	8.94	-2.03E-01		3.75E-01
Cs-134	475.36	1.48	-1.48E+00	5.85E-02	2.49E+00
	563.25	8.34	-1.82E-01		4.50E-01
	569.33	15.37	2.52E-01		2.67E-01
	604.72	97.62	-1.57E-02		6.94E-02
	795.86	85.46	3.02E-02		5.85E-02
	801.95	8.69	-1.05E-02		5.00E-01
	1038.61	0.99	-2.06E-01		6.02E+00
	1167.97	1.79	-1.94E+00		3.67E+00
	1365.19	3.02	-7.18E-01		1.39E+00
Cs-137	661.66	85.10	1.56E-02	5.71E-02	5.71E-02
Eu-152	121.78	28.67	1.53E-02	1.33E-01	1.51E-01
	244.70	7.61	-1.86E-01		5.46E-01
	295.94	0.45	5.56E+00		1.05E+01
	344.28	26.60	-4.17E-02		1.33E-01
	367.79	0.86	-2.43E+00		4.08E+00
	411.12	2.24	1.14E+00		1.68E+00
	443.96	2.83	7.65E-01		1.39E+00
	488.68	0.42	1.33E+00		1.01E+01
	563.99	0.49	4.79E-01		8.02E+00
	586.26	0.46	1.88E+01		1.25E+01
	678.62	0.47	5.94E+00		9.32E+00
	688.67	0.86	-1.87E+00		3.96E+00
	719.35	0.28	-1.52E+00		1.62E+01
	778.90	12.96	8.58E-03		3.62E-01
	810.45	0.32	6.76E+00		1.30E+01
	867.37	4.26	-2.48E-01		1.18E+00
	919.33	0.43	-1.31E+00		1.08E+01
	964.08	14.65	3.79E-01		4.74E-01
	1085.87	10.24	4.68E-02		5.63E-01
	1089.74	1.73	4.78E-01		3.43E+00
	1112.07	13.69	-5.47E-01		4.05E-01
	1212.95	1.43	1.94E+00		5.93E+00
	1249.94	0.19	1.07E+01		3.51E+01
	1299.14	1.63	1.21E+00		4.14E+00
	1408.01	21.07	1.71E-01		2.70E-01
	1457.64	0.50	1.84E+02		4.58E+01
	1528.10	0.28	6.62E+00		1.36E+01
Eu-154	123.07	40.40	-1.33E-02	1.04E-01	1.04E-01
	247.93	6.89	-5.20E-01		4.86E-01
	591.76	4.95	7.96E-02		8.59E-01
	692.42	1.78	9.66E-03		2.32E+00
	723.30	20.06	-4.87E-02		2.49E-01
	756.80	4.52	3.50E-01		1.07E+00
	873.18	12.08	2.73E-01		4.39E-01

Analysis Report for 23-Nov-19-10016

L1-10206B-FIGS-003SB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	2.31E-01	1.04E-01	5.14E-01
		1004.76		18.01	-1.70E-01		2.71E-01
		1274.43		34.80	5.45E-02		1.91E-01
		1596.48		1.80	1.21E+00		2.32E+00
	Eu-155	45.30		1.31	4.44E+00	2.11E-01	2.03E+01
		60.01		1.22	-1.13E+01		2.28E+01
		86.55		30.70	1.97E-02		2.34E-01
		105.31		21.10	-3.81E-02		2.11E-01
+	Ra-226	186.21	*	3.64	6.08E-01	7.14E-01	7.14E-01
	Pa-231	27.36		10.30	1.70E+00	1.60E+00	2.36E+00
		283.69		1.70	-3.08E+00		1.82E+00
		300.07		2.47	-3.13E+00		1.60E+00
		302.65		2.20	2.72E-01		1.73E+00
		330.06		1.40	3.40E-01		3.20E+00
+	U-235	143.76		10.96	1.77E-01	4.54E-02	3.74E-01
		163.33		5.08	-2.55E-01		7.59E-01
		185.71	*	57.20	3.87E-02		4.54E-02
		202.11		1.08	-2.15E+00		3.41E+00
		205.31		5.01	-6.89E-01		7.43E-01
	Am-241	59.54		35.90	-2.26E-01	8.01E-01	8.01E-01

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Apex-Gamma

Analysis Report for 23-Nov-19-10017

L1-10206B-FIGS-004SB

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 23-Nov-19-10017
Sample Description	: L1-10206B-FIGS-004SB
Sample Type	: Soil
Unit	:
Sample Point	:
Sample Size	: 1.646E+03 grams
Facility	: Default
Sample Taken On	: 11/21/2019 2:20:00PM
Acquisition Started	: 11/23/2019 9:12:35AM
Procedure	: 130G_SOIL_1
Operator	: Administrator
Detector Name	: P40818B
Geometry	: 130G_SOIL_1
Live Time	: 900.0 seconds
Real Time	: 901.4 seconds
Dead Time	: 0.15 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 11/4/2019
Efficiency Calibration Used Done On	: 11/23/2019
Efficiency Calibration Description	:
Sample Number	: 81573
Fill Height	: 1646.05 gram
Certificate Name	: Eu155-Na22
Certificate Date	: 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 11/23/2019 9:27:39AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Data Validated
0800 11/26/19

Analysis Report for 23-Nov-19-10017

L1-10206B-FIGS-004SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.66	950 -	959	954.73	1.14E+02	15.30	5.29E+01	1.17
2	295.36	1176 -	1188	1181.33	4.27E+01	12.52	4.33E+01	0.58
3	352.09	1400 -	1415	1408.10	8.98E+01	13.47	3.02E+01	1.11
4	462.81	1846 -	1855	1850.67	1.76E+01	5.68	6.36E+00	1.23
5	583.16	2327 -	2340	2331.85	4.83E+01	9.42	1.47E+01	0.44
6	609.34	2430 -	2444	2436.53	7.27E+01	10.55	1.33E+01	1.08
7	911.03	3637 -	3648	3643.07	3.02E+01	6.70	5.85E+00	0.67
8	1460.91	5832 -	5855	5843.46	3.24E+02	18.95	8.82E+00	1.71

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

No background subtract performed on this spectrum.

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.82	*	10.66	7.92E+00	5.77E-01
Tl-208	1.00	583.19	*	85.00	7.93E-02	1.62E-02
Pb-212	1.00	115.18		0.60		
		238.63	*	43.60	2.01E-01	3.15E-02
		300.09		3.30		
Bi-214	1.00	609.32	*	45.49	2.30E-01	3.61E-02
		768.36		4.89		
		806.18		1.26		
		934.06		3.11		

Analysis Report for 23-Nov-19-10017

L1-10206B-FIGS-004SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	1.00	1120.29		14.92		
		1155.21		1.63		
		1238.12		5.83		
		1280.98		1.43		
		1377.67		3.99		
		1385.31		0.79		
		1401.52		1.33		
		1407.99		2.39		
		1509.21		2.13		
		1661.27		1.05		
		1729.59		2.88		
		1764.49		15.30		
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99		7.25		
		295.22	*	18.42	2.01E-01	6.11E-02
		351.93	*	35.60	2.48E-01	4.21E-02
		785.96		1.06		
Ac-228	0.73	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00		2.95		
		338.32		11.27		
		409.46		1.92		
		463.00	*	4.40	4.78E-01	1.58E-01
		794.95		4.25		
		911.20	*	25.80	2.21E-01	4.99E-02
		964.77		4.99		
		968.97		15.80		
		1588.20		3.22		

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Analysis Report for 23-Nov-19-10017

L1-10206B-FIGS-004SB

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	7.92E+00	5.77E-01	
X	Sb-125	0.413			
	Tl-208	1.000	7.93E-02	1.62E-02	
	Pb-212	1.000	2.01E-01	3.15E-02	
	Bi-214	1.000	2.30E-01	3.61E-02	
	Pb-214	0.997	2.33E-01	3.47E-02	
	Ac-228	0.736	2.44E-01	4.76E-02	

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for 23-Nov-19-10017
L1-10206B-FIGS-004SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 11/23/2019 9:27:39AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Default\Library\ZION LIB-BNL.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	An Pk	511.00		100.00	4.60E-02	5.94E-02	5.94E-02
	BE-7	477.60		10.44	-3.67E-01	3.73E-01	3.73E-01
+	K-40	1460.82	*	10.66	7.92E+00	5.59E-01	5.59E-01
	Mn-54	834.85		99.98	6.17E-03	4.88E-02	4.88E-02
	Co-60	1173.23		99.85	-5.83E-03	4.74E-02	7.26E-02
		1332.49		99.98	-7.09E-02		4.74E-02
	Nb-94	702.65		99.81	-2.37E-02	4.55E-02	4.69E-02
		871.09		99.89	-1.74E-03		4.55E-02
	Ag-108m	79.13		6.60	9.85E-01	3.73E-02	1.99E+00
		433.94		90.50	-2.71E-02		3.73E-02
		614.28		89.80	-3.15E-02		7.24E-02
		722.94		90.80	1.54E-02		6.23E-02
	Sb-125	176.31		6.84	-2.84E-01	1.34E-01	4.90E-01
		380.45		1.52	-1.44E+00		2.40E+00
		427.87		29.60	3.82E-02		1.34E-01
		463.36	*	10.49	2.01E-01		1.80E-01
		600.60		17.65	7.77E-02		2.42E-01
		606.71		4.98	1.98E+00		1.47E+00
		635.95		11.22	4.06E-01		4.63E-01

Analysis Report for 23-Nov-19-10017

L1-10206B-FIGS-004SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	9.10E-01	1.34E-01	2.31E+00
Ba-133	79.61	2.65	2.02E+00	8.23E-02	4.76E+00
	81.00	32.90	-2.52E-01		3.16E-01
	276.40	7.16	2.57E-01		5.34E-01
	302.85	18.34	1.24E-02		1.98E-01
	356.01	62.05	-3.27E-02		8.23E-02
	383.85	8.94	-5.04E-02		4.61E-01
Cs-134	475.36	1.48	4.12E-01	6.05E-02	2.57E+00
	563.25	8.34	-2.81E-01		4.98E-01
	569.33	15.37	3.97E-02		2.72E-01
	604.72	97.62	-2.19E-02		6.56E-02
	795.86	85.46	-6.88E-03		6.05E-02
	801.95	8.69	-2.14E-01		4.85E-01
	1038.61	0.99	3.13E-01		5.60E+00
	1167.97	1.79	1.50E+00		3.94E+00
	1365.19	3.02	6.28E-01		1.66E+00
Cs-137	661.66	85.10	2.22E-03	4.80E-02	4.80E-02
Eu-152	121.78	28.67	9.31E-02	1.42E-01	1.60E-01
	244.70	7.61	2.22E-01		5.84E-01
	295.94	0.45	4.49E+00		1.11E+01
	344.28	26.60	-4.39E-03		1.42E-01
	367.79	0.86	4.12E-01		4.33E+00
	411.12	2.24	8.63E-02		1.87E+00
	443.96	2.83	2.65E-01		1.45E+00
	488.68	0.42	1.27E+01		1.10E+01
	563.99	0.49	-5.21E+00		8.34E+00
	586.26	0.46	1.95E+01		1.48E+01
	678.62	0.47	-7.51E-02		8.65E+00
	688.67	0.86	-2.00E+00		5.14E+00
	719.35	0.28	-1.33E+01		1.60E+01
	778.90	12.96	-3.27E-02		3.93E-01
	810.45	0.32	2.76E+00		1.35E+01
	867.37	4.26	-2.14E-01		1.15E+00
	919.33	0.43	1.26E+01		1.37E+01
	964.08	14.65	-2.56E-01		4.29E-01
	1085.87	10.24	3.56E-02		6.22E-01
	1089.74	1.73	-1.60E+00		3.30E+00
	1112.07	13.69	-1.43E-01		4.07E-01
	1212.95	1.43	-2.52E+00		5.61E+00
	1249.94	0.19	-1.49E-01		3.64E+01
	1299.14	1.63	-2.36E+00		3.06E+00
	1408.01	21.07	2.70E-02		2.58E-01
	1457.64	0.50	1.62E+02		4.74E+01
	1528.10	0.28	1.35E+00		1.07E+01
Eu-154	123.07	40.40	-1.51E-02	1.16E-01	1.16E-01
	247.93	6.89	-1.01E+00		5.07E-01
	591.76	4.95	-1.80E-01		9.02E-01
	692.42	1.78	-2.28E+00		2.49E+00
	723.30	20.06	2.41E-02		2.79E-01
	756.80	4.52	-5.11E-01		1.11E+00
	873.18	12.08	2.29E-01		3.85E-01

Analysis Report for 23-Nov-19-10017

L1-10206B-FIGS-004SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.15E-01	1.16E-01	4.95E-01
	1004.76	18.01	1.65E-01		2.84E-01
	1274.43	34.80	-1.16E-01		1.88E-01
	1596.48	1.80	-1.15E+00		2.11E+00
Eu-155	45.30	1.31	1.26E+01	2.66E-01	3.22E+01
	60.01	1.22	-8.99E+00		3.15E+01
	86.55	30.70	-6.42E-02		2.66E-01
	105.31	21.10	1.24E-01		3.11E-01
Ra-226	186.21	3.64	4.63E-01	1.19E+00	1.19E+00
Pa-231	27.36	10.30	2.68E+00	1.45E+00	3.63E+00
	283.69	1.70	6.49E-01		2.13E+00
	300.07	2.47	-8.73E-01		1.45E+00
	302.65	2.20	-1.30E-01		1.66E+00
	330.06	1.40	7.57E-01		3.01E+00
U-235	143.76	10.96	1.87E-02	7.31E-02	4.00E-01
	163.33	5.08	-8.07E-02		8.08E-01
	185.71	57.20	-2.92E-02		7.31E-02
	202.11	1.08	-1.72E+00		3.85E+00
	205.31	5.01	-3.62E-01		8.17E-01
Am-241	59.54	35.90	-3.35E-01	1.15E+00	1.15E+00

\+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
\> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction
? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

ATTACHMENT 8
EBERLINE ANALYTICAL REPORTS

EBERLINE ANALYTICAL

EBERLINE ANALYTICAL CORPORATION
601 SCARBORO ROAD
OAK RIDGE, TENNESSEE 37830
PHONE (865) 481-0683
FAX (865) 483-4621

EBS-OR-46575

January 21, 2020

Jeffrey Graham
Zion Solutions, LLC
2701 Deborah Avenue
Zion, IL 60099

CASE NARRATIVE
Work Order # 19-12037-OR

SAMPLE RECEIPT

This work order contains sixteen solid samples received 12/09/2019. Samples were analyzed for Total Strontium, Tritium, Nickel-63 and by Gamma Spectroscopy.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
L1-10206-A-FSGS-003-SS-A	19-12037-04	L1-10206-C-FSGS-011-SS-A	19-12037-12
L1-10206-A-FSGS-011-SS-A	19-12037-05	L1-10206-D-FIGS-001-SS-A	19-12037-13
L1-10206-A-FQGS-005-SS-A	19-12037-06	L1-10206-D-FSGS-017-SS-A	19-12037-14
L1-10206-A-FSGS-003-SB-A	19-12037-07	L1-10206-E-FSGS-002-SS-A	19-12037-15
L1-10206-B-FSGS-010-SS-A	19-12037-08	L1-10206-E-FSGS-014-SS-A	19-12037-16
L1-10206-B-FSGS-012-SS-A	19-12037-09	L1-12205-B-FSGS-116-SB-A	19-12037-17
L1-10206-B-FIGS-004-SS-A	19-12037-10	L1-12205-C-FSGS-109-SS-A	19-12037-18
L1-10206-C-FSGS-007-SS-A	19-12037-11	L1-12209-C-FIGS-009-SS-A	19-12037-19

ANALYTICAL METHODS

Total Strontium was analyzed using EIChroM Method SRW01 Modified. Tritium was performed using Method LANL ER-210 Modified. Nickel-63 was performed using Method ASTM 3500-Ni Modified. Gamma Spectroscopy was performed using EPA Method 901.1 Modified.

Laboratory qualifiers are as follows:

U - Result is less than the MDA.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

Minimum Detectable Activity (MDA) values for data represented in this report are sample-specific. MDA measurements are determined based on factors and conditions including instrument settings, aliquot size and matrix type.

ANALYTICAL RESULTS CONTINUED

TOTAL STRONTIUM

Samples were prepared by acid digestion as appropriate for the matrix. Digested samples were acidified and were selectively extracted and precipitated. Precipitates were then mounted on 47mm filters. Filters were reweighed to determine aliquot size. Sample activities were determined by gas flow proportional counting.

Samples demonstrated acceptable results for all Total Strontium analyses. Strontium-90 results are reported from Total Strontium. Chemical recovery was acceptable for all samples. The Total Strontium method blank demonstrated an acceptable result. Results for the Total Strontium duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Total Strontium laboratory control sample demonstrated an acceptable percent recovery.

TRITIUM

A representative aliquot of each sample was equilibrated with Tritium free water. Equilibrates were transferred into round-bottomed distillation flasks and attached to single stage stills. A portion of each middle distillation fraction was transferred to a liquid scintillation vial and cocktail was added. Samples were counted by beta liquid scintillation.

Samples demonstrated acceptable results for all Tritium analyses. The Tritium method blank demonstrated an acceptable result. Results for the Tritium duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Tritium laboratory control sample demonstrated an acceptable percent recovery.

NICKEL-63

A representative aliquot of each sample was prepared by leaching in acids. Aliquots were placed into appropriately sized beakers. Stable elemental Nickel carrier was added to each sample prior to digestion. Samples were digested in concentrated Nitric acid. After digestion, each sample pH was adjusted and Nickel-63 was precipitated selectively with Dimethylglyoxime. Precipitates were selectively separated, redissolved, and residual acid was effectively neutralized. Sample residuals were placed into scintillation vials, scintillation cocktail was added, and Nickel-63 activity was determined by beta liquid scintillation.

Samples demonstrated acceptable results for all Nickel-63 analyses. The Nickel-63 method blank demonstrated an acceptable result. Results for the Nickel-63 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Nickel-63 laboratory control sample demonstrated an acceptable percent recovery.

GAMMA SPECTROSCOPY

Samples for Gamma Spectroscopy analysis were prepared by transferring a known mass of each homogenized sample to a standard geometry container. Samples were counted on High Purity Germanium (HPGe) gamma ray detectors.

ANALYTICAL RESULTS CONTINUED

GAMMA SPECTROSCOPY CONTINUED

Samples demonstrated acceptable results for all gamma-emitting radionuclides as reported. The method blank demonstrated acceptable results for all radionuclides as reported. Results for the Cobalt-60, Cesium-137 and Potassium-40 replicate demonstrated an acceptable relative percent difference and normalized difference recovery. Results for the Cobalt-60 and Cesium-137 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

I certify that this data report is in compliance with the terms and conditions of the Purchase Order, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the cognizant project manager or his/her designee to be accurate as verified by the following signature.

M.R. McDougall
Laboratory Manager

Date: 1/21/2020

Eberline Analytical wants and encourages your feedback regarding our performance providing radioanalytical services. Please visit http://eberlineanalytical.com/ to provide us with feedback on our services.

Eberline Analytical
Final Report of Analysis

Report To:		Work Order Details:	
Patricia Giza		SDG:	19-12037
Zion Solutions		Purchase Order:	677118
2701 Deborah Ave		Analysis Category:	ENVIRONMENTAL
Zion, IL 60099		Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-01	LCS	KNOWN	12/09/19 00:00	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	2.04E+02	7.34E+00				pCi/g
19-12037-01	LCS	SPIKE	12/09/19 00:00	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	2.05E+02	7.72E+00	1.38E+01	5.60E+00		pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	0.00E+00	3.21E+00	3.21E+00	5.56E+00	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	7.30E-01	3.17E+00	3.17E+00	5.46E+00	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	3.66E-01	3.17E+00	3.17E+00	5.48E+00	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-2.10E+00	2.94E+00	2.94E+00	5.24E+00	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	6.75E+00	3.30E+00	3.33E+00	5.32E+00		pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-2.20E+00	3.07E+00	3.07E+00	5.47E+00	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-2.09E+00	2.92E+00	2.92E+00	5.21E+00	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	0.00E+00	3.12E+00	3.12E+00	5.41E+00	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-1.76E+00	2.97E+00	2.97E+00	5.27E+00	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-2.26E+00	2.91E+00	2.91E+00	5.19E+00	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	1.78E-01	3.07E+00	3.07E+00	5.31E+00	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-7.11E-01	3.04E+00	3.04E+00	5.32E+00	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-2.01E+00	3.07E+00	3.07E+00	5.45E+00	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-5.22E-01	2.98E+00	2.98E+00	5.21E+00	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-6.91E-01	2.95E+00	2.95E+00	5.17E+00	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-1.30E+00	3.15E+00	3.15E+00	5.56E+00	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	-7.16E-01	3.06E+00	3.06E+00	5.36E+00	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/18/2019	19-12037	Tritium	LANL ER-210 Modified	3.18E+00	3.16E+00	3.17E+00	5.29E+00	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:

Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:

SDG: **19-12037**
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-01	LCS	KNOWN	12/09/19 00:00	12/9/2019	12/17/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	1.52E+03	4.57E+01				pCi/g
19-12037-01	LCS	SPIKE	12/09/19 00:00	12/9/2019	12/17/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	1.54E+03	1.35E+01	9.17E+01	3.20E+00		pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/17/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	0.00E+00	1.82E+00	1.82E+00	3.15E+00	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/17/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	8.23E-01	1.91E+00	1.91E+00	3.25E+00	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/17/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	2.68E-01	1.85E+00	1.85E+00	3.18E+00	U	pCi/g
19-12037-05	DO	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/17/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	3.63E-01	1.88E+00	1.88E+00	3.23E+00	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/17/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	9.25E-01	1.94E+00	1.94E+00	3.29E+00	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/17/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	1.12E+00	1.81E+00	1.81E+00	3.07E+00	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/17/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	-3.65E-01	1.87E+00	1.87E+00	3.25E+00	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	6.44E-01	1.92E+00	1.92E+00	3.27E+00	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	3.62E-01	1.88E+00	1.88E+00	3.22E+00	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	4.46E-01	1.85E+00	1.85E+00	3.18E+00	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	8.77E+00	2.06E+00	2.13E+00	3.12E+00		pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	5.96E-01	1.77E+00	1.77E+00	3.03E+00	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	1.76E-01	1.82E+00	1.82E+00	3.14E+00	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	6.27E-01	1.87E+00	1.87E+00	3.19E+00	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	1.45E+00	1.91E+00	1.91E+00	3.22E+00	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	-2.68E-01	1.83E+00	1.83E+00	3.18E+00	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	8.88E-01	2.32E+00	2.32E+00	3.95E+00	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/18/2019	19-12037	Nickel-63	ASTM 3500-Ni Modified	-1.08E+01	1.61E+00	1.73E+00	3.42E+00	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-01	LCS	KNOWN	12/09/19 00:00	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	5.03E+01	2.82E-01				pCi/g
19-12037-01	LCS	SPIKE	12/09/19 00:00	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	4.87E+01	1.36E+00	1.70E+01	7.09E-01		pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	2.09E-02	3.95E-01	3.95E-01	8.42E-01	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	1.58E-01	3.04E-01	3.09E-01	6.33E-01	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	-6.67E-02	3.01E-01	3.02E-01	6.52E-01	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	3.78E-02	2.71E-01	2.71E-01	5.75E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	-2.29E-01	3.45E-01	3.54E-01	7.60E-01	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	1.95E-01	2.78E-01	2.86E-01	5.73E-01	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	2.71E-01	2.76E-01	2.92E-01	5.59E-01	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	-6.10E-02	3.44E-01	3.45E-01	7.39E-01	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	-1.30E-01	2.95E-01	2.99E-01	6.51E-01	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	-1.49E-01	2.96E-01	3.01E-01	6.52E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	2.76E-02	3.53E-01	3.53E-01	7.51E-01	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	-1.44E-01	3.53E-01	3.56E-01	7.69E-01	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	6.62E-02	3.07E-01	3.08E-01	6.56E-01	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	-6.35E-02	3.39E-01	3.39E-01	7.35E-01	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	4.04E-01	4.05E-01	4.29E-01	8.20E-01	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	-1.85E-01	3.26E-01	3.32E-01	7.18E-01	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	1.13E-01	3.65E-01	3.67E-01	7.66E-01	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/17/2019	19-12037	Strontium-90	ElChroM SRW01 Modified	-1.37E-01	3.54E-01	3.57E-01	7.75E-01	U	pCi/g
19-12037-01	LCS	KNOWN	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g
19-12037-01	LCS	KNOWN	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g
19-12037-01	LCS	SPIKE	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	1.30E+02	7.95E+00	1.04E+01	1.56E+00		pCi/g
19-12037-01	LCS	SPIKE	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	8.53E+01	7.65E+00	8.82E+00	2.07E+00		pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:		Work Order Details:	
Patricia Giza		SDG:	19-12037
Zion Solutions		Purchase Order:	677118
2701 Deborah Ave		Analysis Category:	ENVIRONMENTAL
Zion, IL 60099		Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	-3.08E-02	7.95E-02	7.95E-02	1.06E-01	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-3.05E-05	1.93E-02	1.93E-02	2.53E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-1.62E-02	4.67E-02	4.67E-02	6.50E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-8.12E-03	2.49E-02	2.49E-02	3.55E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	3.61E-03	4.48E-02	4.48E-02	6.53E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	0.00E+00	1.76E-02	1.76E-02	2.98E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	4.47E-03	2.31E-02	2.31E-02	3.03E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	-1.45E-02	2.31E-02	2.32E-02	2.86E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	3.86E-03	7.12E-02	7.12E-02	8.25E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	2.16E-02	3.74E-02	3.74E-02	4.11E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	2.08E-02	2.54E-02	2.54E-02	6.13E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	3.23E-02	3.61E-02	3.61E-02	3.23E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-3.67E-02	7.81E-02	7.81E-02	1.11E-01	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	-7.72E-03	1.77E-01	1.77E-01	3.10E-01	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	1.58E-02	1.61E-02	1.61E-02	3.07E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	1.32E-02	1.66E-02	1.66E-02	1.80E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-9.82E-03	1.99E-02	1.99E-02	2.46E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	4.50E-01	3.88E-01	3.89E-01	6.17E-01	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	1.52E-02	3.05E-02	3.05E-02	4.82E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	2.44E-02	3.80E-02	3.81E-02	6.40E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	6.55E-03	3.34E-02	3.34E-02	9.53E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	3.61E-03	4.48E-02	4.48E-02	6.53E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	-7.85E-02	5.40E-02	5.41E-02	5.50E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	9.85E-01	3.89E-01	3.92E-01	6.77E-01	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	3.56E-02	5.41E-02	5.42E-02	8.95E-02	U	pCi/g
19-12037-02	MBL	BLANK	12/09/19 00:00	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	2.89E-02	1.14E-01	1.14E-01	1.76E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-12037
Zion Solutions	Purchase Order:	677118
2701 Deborah Ave	Analysis Category:	ENVIRONMENTAL
Zion, IL 60099	Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	4.10E-01	1.80E-01	1.82E-01	3.34E-01		pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	1.15E-02	4.04E-02	4.04E-02	6.38E-02	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-7.99E-02	1.09E-01	1.09E-01	1.29E-01	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	5.66E-02	4.01E-02	4.02E-02	7.43E-02	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	2.71E-01	1.09E-01	1.10E-01	1.71E-01		pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	4.93E-02	2.94E-02	2.95E-02	6.34E-02	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	1.53E-02	2.31E-02	2.31E-02	6.82E-02	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	2.29E+00	2.43E-01	2.70E-01	1.05E-01		pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	1.10E-02	1.27E-01	1.27E-01	2.03E-01	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	0.00E+00	6.24E-02	6.24E-02	1.04E-01	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	-6.58E-02	1.16E-01	1.16E-01	1.42E-01	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	3.52E-03	6.25E-02	6.25E-02	7.59E-02	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-4.47E-02	1.51E-01	1.52E-01	1.84E-01	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	9.09E+00	1.37E+00	1.45E+00	6.99E-01		pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-5.03E-02	4.46E-02	4.47E-02	5.14E-02	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	-1.28E-02	3.63E-02	3.63E-02	4.78E-02	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-6.57E-03	3.33E-02	3.33E-02	5.07E-02	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.30E+00	1.25E+00	1.25E+00	2.08E+00	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	3.80E-01	1.38E-01	1.40E-01	2.01E-01		pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	3.35E-01	1.22E-01	1.23E-01	2.09E-01		pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	5.29E-02	1.59E-01	1.59E-01	2.10E-01	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	2.71E-01	1.09E-01	1.10E-01	1.71E-01		pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	-2.75E-02	1.29E-01	1.29E-01	2.05E-01	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	8.53E-01	9.90E-01	9.91E-01	1.35E+00	U	pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	2.87E-01	1.35E-01	1.36E-01	2.17E-01		pCi/g
19-12037-03	DUP	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	-1.03E-01	3.25E-01	3.25E-01	4.10E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	3.44E-01	1.51E-01	1.52E-01	2.90E-01		pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-7.62E-03	4.12E-02	4.12E-02	6.22E-02	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-5.04E-02	1.08E-01	1.09E-01	1.31E-01	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-6.98E-03	4.28E-02	4.28E-02	8.80E-02	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	1.84E-01	9.82E-02	9.86E-02	6.69E-02		pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	5.49E-02	3.07E-02	3.09E-02	6.35E-02	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	8.78E-03	2.71E-02	2.71E-02	6.49E-02	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	2.35E+00	2.48E-01	2.76E-01	1.05E-01		pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	3.32E-02	1.70E-01	1.70E-01	2.01E-01	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	8.71E-02	1.12E-01	1.12E-01	9.90E-02	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	-9.54E-02	1.26E-01	1.26E-01	1.54E-01	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	-1.32E-02	3.98E-02	3.99E-02	7.47E-02	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-9.48E-04	1.41E-01	1.41E-01	1.83E-01	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	9.03E+00	1.36E+00	1.43E+00	6.39E-01		pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-8.51E-03	4.33E-02	4.33E-02	6.58E-02	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	2.79E-02	3.16E-02	3.16E-02	5.38E-02	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	3.23E-03	2.65E-02	2.65E-02	4.46E-02	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.14E+00	1.19E+00	1.19E+00	1.98E+00	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	4.12E-01	1.31E-01	1.32E-01	1.80E-01		pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	2.19E-01	1.36E-01	1.37E-01	2.66E-01	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	1.21E-01	1.58E-01	1.58E-01	2.16E-01	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	1.84E-01	9.82E-02	9.86E-02	6.69E-02		pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	4.78E-02	1.17E-01	1.17E-01	1.97E-01	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.42E-01	9.76E-01	9.76E-01	1.28E+00	U	pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	3.59E-01	1.21E-01	1.22E-01	1.69E-01		pCi/g
19-12037-04	DO	L1-10206-A-FSGS-003-SS-A	11/09/19 08:30	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	2.59E-01	3.00E-01	3.01E-01	4.25E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	4.42E-01	1.80E-01	1.81E-01	3.92E-01		pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-1.24E-02	1.85E-02	1.85E-02	6.74E-02	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-1.11E-01	1.01E-01	1.01E-01	1.47E-01	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	1.30E-02	2.37E-02	2.37E-02	1.25E-01	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	3.76E-01	1.16E-01	1.18E-01	2.32E-01		pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	5.60E-02	6.71E-02	6.72E-02	9.08E-02	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	-2.25E-01	9.89E-02	9.96E-02	7.67E-02	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	1.25E-01	6.46E-02	6.50E-02	9.62E-02		pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	-5.76E-02	1.43E-01	1.44E-01	2.03E-01	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	-1.21E-02	1.53E-01	1.53E-01	1.02E-01	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	-5.57E-04	9.94E-02	9.94E-02	1.65E-01	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	9.41E-02	5.00E-02	5.02E-02	8.03E-02		pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-1.18E-01	1.39E-01	1.39E-01	3.99E-01	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.16E+01	1.75E+00	1.85E+00	1.83E+00		pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	4.98E-02	5.13E-02	5.14E-02	9.21E-02	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	-1.78E-02	4.73E-02	4.73E-02	6.30E-02	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-4.65E-02	5.42E-02	5.43E-02	6.36E-02	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.40E+00	1.48E+00	1.48E+00	2.46E+00	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	4.05E-01	1.13E-01	1.15E-01	3.37E-01		pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	4.65E-01	1.34E-01	1.36E-01	2.37E-01		pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	1.15E-01	1.71E-01	1.71E-01	2.82E-01	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	3.76E-01	1.16E-01	1.18E-01	2.32E-01		pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	9.80E-02	1.17E-01	1.17E-01	2.01E-01	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.53E+00	8.52E-01	8.56E-01	1.47E+00	U	pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	4.08E-01	1.46E-01	1.47E-01	2.63E-01		pCi/g
19-12037-05	TRG	L1-10206-A-FSGS-011-SS-A	11/09/19 08:20	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	-3.17E-01	2.89E-01	2.89E-01	3.88E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	5.59E-01	1.99E-01	2.01E-01	3.24E-01		pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-1.09E-02	6.57E-02	6.57E-02	6.98E-02	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-1.39E-01	1.01E-01	1.01E-01	1.51E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	1.78E-02	3.26E-02	3.26E-02	1.26E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	4.78E-01	1.43E-01	1.45E-01	9.25E-02		pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	2.12E-02	6.49E-02	6.49E-02	1.06E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	6.32E-03	3.13E-02	3.13E-02	8.51E-02	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	2.27E-01	6.86E-02	6.95E-02	1.51E-01		pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	7.42E-02	1.10E-01	1.10E-01	2.08E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	3.87E-02	1.70E-01	1.70E-01	1.07E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	2.11E-01	1.19E-01	1.20E-01	2.00E-01		pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	-5.58E-02	9.33E-02	9.33E-02	8.32E-02	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	8.50E-02	2.59E-01	2.59E-01	4.24E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.17E+01	1.82E+00	1.92E+00	1.06E+00		pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-2.96E-02	5.86E-02	5.86E-02	8.06E-02	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	1.19E-02	4.36E-02	4.36E-02	5.52E-02	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-8.23E-04	4.11E-02	4.11E-02	6.54E-02	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.35E+00	1.59E+00	1.59E+00	2.66E+00	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	6.09E-01	1.67E-01	1.70E-01	2.14E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	5.70E-01	1.41E-01	1.44E-01	1.99E-01		pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	-1.36E-02	1.71E-01	1.71E-01	2.77E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	4.78E-01	1.43E-01	1.45E-01	9.25E-02		pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	7.96E-02	1.08E-01	1.08E-01	2.01E-01	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	8.57E-01	8.89E-01	8.91E-01	1.49E+00	U	pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	5.21E-01	1.74E-01	1.76E-01	1.58E-01		pCi/g
19-12037-06	TRG	L1-10206-A-FQGS-005-SS-A	11/09/19 08:05	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	6.98E-02	2.84E-01	2.84E-01	4.27E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	3.17E-01	1.65E-01	1.66E-01	2.85E-01		pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	1.50E-02	2.47E-02	2.47E-02	5.22E-02	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-5.80E-03	3.40E-02	3.40E-02	1.36E-01	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-2.77E-03	1.86E-02	1.86E-02	8.56E-02	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	3.30E-01	9.43E-02	9.58E-02	5.82E-02		pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	-2.22E-02	4.55E-02	4.55E-02	6.13E-02	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	2.51E-02	1.68E-02	1.68E-02	6.14E-02	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	5.13E-01	9.21E-02	9.58E-02	9.34E-02		pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	2.59E-02	6.04E-02	6.04E-02	1.71E-01	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	-5.90E-02	1.23E-01	1.23E-01	8.77E-02	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	-3.00E-02	1.04E-01	1.04E-01	1.48E-01	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	5.69E-03	6.96E-02	6.96E-02	6.50E-02	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-1.82E-01	1.66E-01	1.67E-01	2.21E-01	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	8.89E+00	1.36E+00	1.44E+00	8.52E-01		pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	6.66E-03	4.01E-02	4.01E-02	5.97E-02	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	-3.15E-02	4.14E-02	4.14E-02	5.05E-02	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	1.51E-02	4.15E-02	4.15E-02	5.74E-02	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	4.12E-01	8.92E-01	8.92E-01	1.35E+00	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	3.42E-01	1.20E-01	1.21E-01	1.74E-01		pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	3.63E-01	1.11E-01	1.13E-01	1.96E-01		pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	-4.03E-02	1.28E-01	1.28E-01	1.86E-01	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	3.30E-01	9.43E-02	9.58E-02	5.82E-02		pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	-3.72E-02	1.07E-01	1.07E-01	1.56E-01	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.52E+00	1.16E+00	1.16E+00	1.92E+00	U	pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	3.32E-01	1.15E-01	1.17E-01	1.65E-01		pCi/g
19-12037-07	TRG	L1-10206-A-FSGS-003-SB-A	11/22/19 08:04	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	-1.57E-01	2.61E-01	2.62E-01	3.64E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:		Work Order Details:	
Patricia Giza		SDG:	19-12037
Zion Solutions		Purchase Order:	677118
2701 Deborah Ave		Analysis Category:	ENVIRONMENTAL
Zion, IL 60099		Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	5.71E-01	2.05E-01	2.07E-01	4.45E-01		pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	5.52E-03	2.62E-02	2.62E-02	5.58E-02	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	7.50E-02	7.89E-02	7.90E-02	1.61E-01	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-3.83E-02	2.65E-02	2.66E-02	7.51E-02	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	6.09E-01	1.51E-01	1.54E-01	2.40E-01		pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	7.12E-02	5.01E-02	5.03E-02	7.47E-02	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	-3.10E-04	2.90E-02	2.90E-02	8.76E-02	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	1.70E-01	7.45E-02	7.50E-02	1.10E-01		pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	1.25E-01	1.28E-01	1.28E-01	2.30E-01	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	8.82E-02	1.57E-01	1.57E-01	1.15E-01	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	3.30E-02	1.41E-01	1.41E-01	1.85E-01	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	3.03E-02	7.62E-02	7.63E-02	8.35E-02	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	7.23E-02	1.27E-01	1.27E-01	1.86E-01	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.31E+01	1.86E+00	1.98E+00	1.12E+00		pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-1.67E-02	5.38E-02	5.38E-02	7.63E-02	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	2.70E-03	4.43E-02	4.43E-02	4.74E-02	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-6.87E-02	5.66E-02	5.67E-02	6.49E-02	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.22E+00	1.30E+00	1.30E+00	2.16E+00	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	4.31E-01	1.13E-01	1.15E-01	1.93E-01		pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	6.21E-01	1.47E-01	1.50E-01	2.37E-01		pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	1.82E-02	1.72E-01	1.72E-01	2.23E-01	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	6.09E-01	1.51E-01	1.54E-01	2.40E-01		pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	-3.67E-02	1.00E-01	1.00E-01	1.58E-01	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.01E+00	9.80E-01	9.81E-01	1.63E+00	U	pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	4.65E-01	1.44E-01	1.46E-01	2.21E-01		pCi/g
19-12037-08	TRG	L1-10206-B-FSGS-010-SS-A	10/28/19 13:18	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	4.22E-02	3.37E-01	3.37E-01	4.48E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:	
Patricia Giza	
Zion Solutions	
2701 Deborah Ave	
Zion, IL 60099	

Work Order Details:	
SDG:	19-12037
Purchase Order:	677118
Analysis Category:	ENVIRONMENTAL
Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	4.65E-01	2.55E-01	2.56E-01	4.47E-01		pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-8.50E-02	7.04E-02	7.05E-02	6.81E-02	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-2.45E-01	1.10E-01	1.11E-01	1.48E-01	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	2.07E-02	1.16E-01	1.16E-01	1.34E-01	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	5.15E-01	1.36E-01	1.39E-01	2.09E-01		pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	-1.83E-02	7.20E-02	7.20E-02	9.23E-02	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	-4.66E-01	1.62E-01	1.64E-01	8.27E-02	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	2.41E-01	7.48E-02	7.58E-02	1.79E-01		pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	1.26E-01	1.38E-01	1.38E-01	2.25E-01	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	1.30E-01	1.48E-01	1.48E-01	1.15E-01	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	2.92E-02	4.76E-02	4.76E-02	1.77E-01	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	-3.81E-02	8.39E-02	8.39E-02	8.93E-02	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-2.48E-01	2.64E-01	2.65E-01	3.85E-01	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.39E+01	2.05E+00	2.17E+00	1.31E+00		pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	4.07E-02	5.33E-02	5.33E-02	9.35E-02	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	2.14E-02	4.58E-02	4.58E-02	6.64E-02	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	1.30E-02	5.11E-02	5.11E-02	7.34E-02	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.33E+00	1.14E+00	1.14E+00	1.92E+00	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	8.83E-01	1.90E-01	1.96E-01	1.98E-01		pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	6.86E-01	1.77E-01	1.81E-01	2.66E-01		pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	-1.13E-01	1.75E-01	1.75E-01	2.69E-01	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	5.15E-01	1.36E-01	1.39E-01	2.09E-01		pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	-4.05E-02	1.44E-01	1.44E-01	2.05E-01	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.54E+00	9.21E-01	9.24E-01	1.56E+00	U	pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	4.57E-01	1.56E-01	1.58E-01	1.52E-01		pCi/g
19-12037-09	TRG	L1-10206-B-FSGS-012-SS-A	10/28/19 13:22	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	9.98E-02	3.09E-01	3.09E-01	4.63E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	5.01E-01	1.61E-01	1.63E-01	2.76E-01		pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	7.64E-03	3.14E-02	3.14E-02	5.59E-02	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-1.33E-01	1.13E-01	1.13E-01	1.51E-01	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	2.41E-03	1.96E-02	1.96E-02	9.77E-02	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	4.73E-01	1.24E-01	1.26E-01	1.97E-01		pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	1.55E-02	3.45E-02	3.45E-02	5.34E-02	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	-5.02E-03	2.24E-02	2.24E-02	7.64E-02	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	1.89E-01	7.34E-02	7.40E-02	1.09E-01		pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	2.17E-02	8.77E-02	8.77E-02	1.95E-01	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	1.54E-02	1.46E-01	1.46E-01	9.97E-02	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	3.44E-01	1.62E-01	1.63E-01	1.98E-01		pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	-1.05E-02	7.85E-02	7.85E-02	7.35E-02	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-9.59E-02	1.56E-01	1.56E-01	2.19E-01	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.35E+01	1.83E+00	1.95E+00	1.14E+00		pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	1.94E-02	4.54E-02	4.54E-02	6.65E-02	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	7.59E-03	3.90E-02	3.90E-02	4.14E-02	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	3.79E-03	4.37E-02	4.37E-02	6.16E-02	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.90E+00	9.66E-01	9.71E-01	1.53E+00	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	6.12E-01	1.52E-01	1.55E-01	1.95E-01		pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	4.88E-01	1.30E-01	1.32E-01	2.20E-01		pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	-1.03E-02	1.31E-01	1.31E-01	1.92E-01	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	4.73E-01	1.24E-01	1.26E-01	1.97E-01		pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	6.21E-02	1.13E-01	1.13E-01	1.74E-01	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.28E+00	1.24E+00	1.24E+00	2.07E+00	U	pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	3.77E-01	1.15E-01	1.17E-01	1.47E-01		pCi/g
19-12037-10	TRG	L1-10206-B-FIGS-004-SS-A	11/19/19 12:32	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	4.04E-02	2.85E-01	2.85E-01	4.22E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	4.92E-01	1.77E-01	1.78E-01	3.19E-01		pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-2.15E-03	2.53E-02	2.53E-02	5.47E-02	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-4.07E-02	1.22E-01	1.22E-01	1.52E-01	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	6.72E-03	3.62E-02	3.62E-02	7.06E-02	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	5.86E-01	1.17E-01	1.20E-01	3.35E-01		pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	2.45E-02	4.58E-02	4.59E-02	7.63E-02	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	-5.16E-03	3.09E-02	3.09E-02	6.91E-02	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	8.72E-02	5.16E-02	5.18E-02	1.28E-01	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	1.16E-02	1.94E-01	1.94E-01	1.96E-01	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	3.47E-02	1.42E-01	1.43E-01	1.00E-01	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	1.83E-01	9.61E-02	9.65E-02	2.05E-01	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	3.33E-02	7.76E-02	7.76E-02	7.69E-02	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	2.61E-03	1.36E-01	1.36E-01	1.78E-01	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.26E+01	1.83E+00	1.94E+00	1.26E+00		pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-1.68E-02	4.93E-02	4.93E-02	7.26E-02	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	-1.76E-02	3.36E-02	3.36E-02	4.81E-02	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	7.70E-03	4.07E-02	4.07E-02	6.62E-02	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.47E+00	1.12E+00	1.13E+00	1.62E+00	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	3.96E-01	9.69E-02	9.90E-02	2.34E-01		pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	5.84E-01	1.29E-01	1.32E-01	2.07E-01		pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	-1.64E-01	1.73E-01	1.74E-01	2.05E-01	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	5.86E-01	1.17E-01	1.20E-01	3.35E-01		pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	-2.45E-02	9.00E-02	9.00E-02	1.49E-01	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	7.56E-01	1.10E+00	1.10E+00	1.49E+00	U	pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	3.32E-01	1.38E-01	1.39E-01	2.74E-01		pCi/g
19-12037-11	TRG	L1-10206-C-FSGS-007-SS-A	10/28/19 09:12	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	1.80E-01	3.26E-01	3.26E-01	4.46E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:	
Patricia Giza	
Zion Solutions	
2701 Deborah Ave	
Zion, IL 60099	

Work Order Details:	
SDG:	19-12037
Purchase Order:	677118
Analysis Category:	ENVIRONMENTAL
Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	6.29E-01	2.00E-01	2.03E-01	3.22E-01		pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	3.08E-02	4.02E-02	4.02E-02	7.04E-02	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-1.73E-01	1.19E-01	1.19E-01	1.71E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-4.26E-02	1.50E-01	1.50E-01	1.44E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	7.81E-01	1.60E-01	1.65E-01	2.07E-01		pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	3.62E-02	7.93E-02	7.93E-02	1.04E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	3.94E-03	2.92E-02	2.92E-02	9.18E-02	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	1.57E-01	6.63E-02	6.68E-02	9.16E-02		pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	2.33E-02	1.45E-01	1.45E-01	2.25E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	2.29E-02	1.76E-01	1.76E-01	1.19E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	5.33E-02	1.36E-01	1.36E-01	2.01E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	1.72E-01	8.50E-02	8.55E-02	9.40E-02	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-4.46E-02	1.43E-01	1.43E-01	4.28E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.45E+01	2.15E+00	2.28E+00	1.24E+00		pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	3.09E-02	5.70E-02	5.71E-02	9.66E-02	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	4.26E-02	4.56E-02	4.57E-02	8.19E-02	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	6.94E-03	3.21E-02	3.21E-02	8.01E-02	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.24E+00	1.18E+00	1.18E+00	1.99E+00	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	6.12E-01	1.51E-01	1.54E-01	2.55E-01		pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	8.75E-01	1.91E-01	1.96E-01	2.29E-01		pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	-9.32E-02	1.90E-01	1.90E-01	2.98E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	7.81E-01	1.60E-01	1.65E-01	2.07E-01		pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	5.79E-02	1.50E-01	1.50E-01	2.39E-01	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	9.94E-01	1.02E+00	1.02E+00	1.70E+00	U	pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	4.29E-01	1.74E-01	1.75E-01	3.18E-01		pCi/g
19-12037-12	TRG	L1-10206-C-FSGS-011-SS-A	10/28/19 09:20	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	-6.02E-02	3.24E-01	3.24E-01	4.75E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	2.81E-01	1.83E-01	1.83E-01	3.39E-01	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-4.94E-03	4.93E-02	4.93E-02	5.30E-02	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-1.31E-01	1.02E-01	1.02E-01	1.31E-01	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-1.53E-02	7.57E-02	7.57E-02	9.38E-02	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	3.99E-01	9.52E-02	9.74E-02	5.37E-02		pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	8.37E-01	9.10E-02	1.01E-01	1.07E-01		pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	1.38E-02	2.44E-02	2.45E-02	8.07E-02	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	1.45E-01	7.53E-02	7.57E-02	1.18E-01		pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	-6.40E-02	1.66E-01	1.66E-01	1.86E-01	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	-5.21E-02	1.19E-01	1.19E-01	9.34E-02	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	-1.87E-03	1.02E-01	1.02E-01	1.48E-01	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	-4.02E-02	8.33E-02	8.34E-02	6.59E-02	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	5.74E-02	1.52E-01	1.52E-01	2.27E-01	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	7.73E+00	1.23E+00	1.29E+00	8.85E-01		pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-1.60E-02	5.40E-02	5.40E-02	7.16E-02	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	-1.17E-02	4.67E-02	4.67E-02	4.51E-02	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-8.34E-03	5.24E-02	5.24E-02	6.58E-02	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.27E+00	8.87E-01	8.89E-01	1.40E+00	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	3.44E-01	1.11E-01	1.12E-01	1.56E-01		pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	3.41E-01	1.09E-01	1.10E-01	2.23E-01		pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	3.09E-03	1.21E-01	1.21E-01	1.79E-01	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	3.99E-01	9.52E-02	9.74E-02	5.37E-02		pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	2.33E-02	1.08E-01	1.08E-01	1.68E-01	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.32E+00	1.24E+00	1.24E+00	2.07E+00	U	pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	2.67E-01	1.13E-01	1.13E-01	2.40E-01		pCi/g
19-12037-13	TRG	L1-10206-D-FIGS-001-SS-A	11/04/19 08:20	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	1.89E-01	2.45E-01	2.45E-01	3.79E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	2.73E-01	1.08E-01	1.09E-01	2.04E-01		pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	4.01E-03	1.31E-02	1.31E-02	4.23E-02	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	1.69E-02	5.56E-02	5.56E-02	1.08E-01	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	6.15E-03	2.46E-02	2.46E-02	5.36E-02	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	1.78E-01	9.19E-02	9.24E-02	1.61E-01		pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	4.91E-02	2.81E-02	2.82E-02	6.17E-02	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	4.06E-03	2.07E-02	2.07E-02	5.20E-02	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	1.26E-01	5.72E-02	5.75E-02	8.48E-02		pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	7.45E-02	9.13E-02	9.14E-02	1.49E-01	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	-8.84E-04	1.01E-01	1.01E-01	7.75E-02	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	-8.95E-02	1.01E-01	1.02E-01	1.21E-01	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	2.97E-03	6.23E-02	6.23E-02	5.69E-02	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	1.21E-02	8.52E-02	8.52E-02	1.19E-01	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	6.37E+00	1.06E+00	1.11E+00	6.46E-01		pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-1.30E-02	3.98E-02	3.98E-02	5.81E-02	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	2.72E-02	3.03E-02	3.03E-02	4.58E-02	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-7.47E-03	3.28E-02	3.28E-02	4.68E-02	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.05E+00	8.26E-01	8.28E-01	1.20E+00	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	2.79E-01	7.60E-02	7.73E-02	1.55E-01		pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	2.83E-01	9.06E-02	9.18E-02	1.39E-01		pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	-5.50E-02	1.22E-01	1.22E-01	1.48E-01	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	1.78E-01	9.19E-02	9.24E-02	1.61E-01		pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	1.78E-02	7.43E-02	7.43E-02	1.30E-01	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	9.20E-01	8.11E-01	8.12E-01	1.34E+00	U	pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	3.36E-01	1.08E-01	1.09E-01	3.76E-02		pCi/g
19-12037-14	TRG	L1-10206-D-FSGS-017-SS-A	11/04/19 08:52	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	1.31E-01	2.41E-01	2.41E-01	3.36E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	2.94E-01	1.81E-01	1.82E-01	3.28E-01	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-7.29E-03	4.85E-02	4.85E-02	5.41E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-1.63E-01	9.62E-02	9.66E-02	1.37E-01	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-5.34E-02	7.83E-02	7.84E-02	9.68E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	3.26E-01	1.14E-01	1.15E-01	8.84E-02		pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	1.41E-02	6.76E-02	6.76E-02	6.94E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	1.16E-03	2.90E-02	2.90E-02	6.83E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	4.07E-02	4.84E-02	4.84E-02	8.55E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	-2.01E-02	1.62E-01	1.62E-01	1.84E-01	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	1.36E-01	1.44E-01	1.44E-01	9.34E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	4.80E-02	8.86E-02	8.87E-02	1.50E-01	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	3.60E-02	8.73E-02	8.73E-02	7.21E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	1.18E-01	2.28E-01	2.28E-01	3.77E-01	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.48E+01	2.10E+00	2.23E+00	1.13E+00		pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-6.76E-02	5.81E-02	5.82E-02	6.98E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	4.51E-02	3.43E-02	3.44E-02	6.60E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-8.49E-03	4.66E-02	4.66E-02	6.51E-02	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	6.63E-01	1.01E+00	1.01E+00	1.69E+00	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	2.57E-01	9.60E-02	9.69E-02	1.89E-01		pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	2.26E-01	1.34E-01	1.34E-01	2.04E-01		pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	3.05E-02	1.52E-01	1.52E-01	2.50E-01	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	3.26E-01	1.14E-01	1.15E-01	8.84E-02		pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	1.28E-01	1.17E-01	1.17E-01	2.04E-01	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	2.31E+00	7.91E-01	8.00E-01	1.42E+00	U	pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	3.55E-01	1.32E-01	1.33E-01	1.51E-01		pCi/g
19-12037-15	TRG	L1-10206-E-FSGS-002-SS-A	11/05/19 09:02	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	-3.02E-01	2.66E-01	2.66E-01	3.55E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-12037
Zion Solutions	Purchase Order:	677118
2701 Deborah Ave	Analysis Category:	ENVIRONMENTAL
Zion, IL 60099	Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	1.35E-01	1.42E-01	1.42E-01	2.30E-01	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-1.17E-02	3.48E-02	3.48E-02	3.89E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-9.81E-02	7.93E-02	7.94E-02	1.03E-01	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-1.89E-03	2.24E-02	2.24E-02	6.07E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	1.75E-01	7.36E-02	7.41E-02	4.71E-02		pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	4.54E-03	2.97E-02	2.97E-02	3.94E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	-1.64E-03	1.91E-02	1.91E-02	5.61E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	1.35E-02	3.50E-02	3.50E-02	5.29E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	-3.24E-02	7.85E-02	7.85E-02	1.38E-01	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	-6.95E-03	9.67E-02	9.67E-02	6.98E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	-6.00E-02	8.05E-02	8.06E-02	1.10E-01	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	-1.67E-02	5.36E-02	5.36E-02	5.19E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-3.15E-02	1.22E-01	1.22E-01	1.77E-01	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	6.97E+00	1.10E+00	1.16E+00	7.88E-01		pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	2.73E-02	3.37E-02	3.38E-02	5.54E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	1.21E-02	2.52E-02	2.52E-02	2.56E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	1.57E-02	3.21E-02	3.21E-02	4.69E-02	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	6.24E-01	6.53E-01	6.54E-01	1.02E+00	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	1.64E-01	6.15E-02	6.20E-02	1.37E-01		pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	1.50E-01	7.89E-02	7.92E-02	1.45E-01		pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	6.41E-02	9.42E-02	9.42E-02	1.47E-01	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	1.75E-01	7.36E-02	7.41E-02	4.71E-02		pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	3.95E-02	8.06E-02	8.06E-02	1.25E-01	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	9.47E-01	6.84E-01	6.86E-01	1.07E+00	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	1.74E-01	1.02E-01	1.02E-01	1.75E-01	U	pCi/g
19-12037-16	TRG	L1-10206-E-FSGS-014-SS-A	11/05/19 09:26	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	3.10E-02	1.99E-01	1.99E-01	2.96E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	5.02E-01	2.21E-01	2.22E-01	3.53E-01		pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	-3.85E-02	5.51E-02	5.52E-02	4.64E-02	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-1.62E-01	1.30E-01	1.31E-01	1.46E-01	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-8.32E-02	7.29E-02	7.30E-02	7.63E-02	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	5.40E-01	1.34E-01	1.37E-01	2.30E-01		pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	-2.59E-02	6.51E-02	6.51E-02	6.96E-02	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	2.09E-04	2.86E-02	2.86E-02	6.89E-02	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	6.69E-02	6.06E-02	6.07E-02	9.91E-02	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	2.01E-01	1.37E-01	1.37E-01	2.14E-01	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	-8.54E-02	1.60E-01	1.60E-01	1.12E-01	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	-5.91E-02	1.39E-01	1.39E-01	1.74E-01	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	-4.61E-02	7.96E-02	7.97E-02	8.01E-02	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	9.12E-02	1.19E-01	1.19E-01	1.78E-01	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.51E+01	1.99E+00	2.14E+00	9.16E-01		pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-1.59E-02	5.72E-02	5.72E-02	8.34E-02	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	3.14E-03	4.40E-02	4.40E-02	5.92E-02	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-2.54E-02	4.76E-02	4.76E-02	6.69E-02	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.14E+00	1.17E+00	1.17E+00	1.63E+00	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	4.89E-01	1.08E-01	1.11E-01	2.14E-01		pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	7.38E-01	1.67E-01	1.71E-01	2.61E-01		pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	-4.31E-02	1.58E-01	1.58E-01	1.95E-01	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	5.40E-01	1.34E-01	1.37E-01	2.30E-01		pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	-3.89E-02	1.00E-01	1.00E-01	1.61E-01	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.63E+00	1.12E+00	1.12E+00	1.57E+00	U	pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	4.89E-01	1.34E-01	1.36E-01	4.36E-02		pCi/g
19-12037-17	TRG	L1-12205-B-FSGS-116-SB-A	10/01/19 08:35	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	-6.83E-02	3.34E-01	3.34E-01	4.20E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:	Work Order Details:	
Patricia Giza	SDG:	19-12037
Zion Solutions	Purchase Order:	677118
2701 Deborah Ave	Analysis Category:	ENVIRONMENTAL
Zion, IL 60099	Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	3.33E-01	1.87E-01	1.88E-01	3.60E-01	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	1.69E-03	2.35E-02	2.35E-02	5.89E-02	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-2.67E-01	1.04E-01	1.05E-01	1.41E-01	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	8.96E-03	2.50E-02	2.50E-02	1.11E-01	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	3.62E-01	1.24E-01	1.25E-01	9.12E-02		pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	-1.69E-02	7.22E-02	7.22E-02	8.12E-02	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	5.58E-03	2.69E-02	2.69E-02	8.11E-02	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	3.45E-03	5.41E-02	5.41E-02	8.46E-02	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	2.18E-02	1.84E-01	1.84E-01	1.98E-01	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	-6.08E-03	1.73E-01	1.73E-01	9.91E-02	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	-1.26E-01	1.08E-01	1.08E-01	1.47E-01	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	-5.12E-02	7.62E-02	7.63E-02	7.10E-02	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	-3.85E-02	2.32E-01	2.32E-01	3.75E-01	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.54E+01	2.18E+00	2.32E+00	1.19E+00		pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	-4.83E-03	5.91E-02	5.91E-02	9.08E-02	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	2.70E-02	3.90E-02	3.90E-02	5.98E-02	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	4.13E-02	4.58E-02	4.58E-02	8.36E-02	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	7.38E-01	1.02E+00	1.02E+00	1.69E+00	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	2.66E-01	9.59E-02	9.69E-02	1.88E-01		pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	3.41E-01	1.31E-01	1.33E-01	2.37E-01		pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	-7.94E-03	1.65E-01	1.65E-01	2.69E-01	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	3.62E-01	1.24E-01	1.25E-01	9.12E-02		pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	3.99E-02	1.32E-01	1.32E-01	2.06E-01	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.61E+00	8.41E-01	8.45E-01	1.46E+00	U	pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	2.89E-01	1.26E-01	1.27E-01	1.55E-01		pCi/g
19-12037-18	TRG	L1-12205-C-FSGS-109-SS-A	09/24/19 09:24	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	2.33E-01	2.70E-01	2.70E-01	4.24E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
2701 Deborah Ave
Zion, IL 60099

Work Order Details:
SDG: 19-12037
Purchase Order: 677118
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Qualifier	Report Units
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Actinium-228	EPA 901.1 Modified	8.24E-01	2.44E-01	2.47E-01	3.60E-01		pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Silver-108m	EPA 901.1 Modified	5.78E-03	3.39E-02	3.39E-02	5.93E-02	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Americium-241	EPA 901.1 Modified	-1.38E-01	1.37E-01	1.37E-01	1.88E-01	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Barium-133	EPA 901.1 Modified	-1.78E-01	1.45E-01	1.45E-01	1.18E-01	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Bismuth-214	EPA 901.1 Modified	7.26E-01	1.37E-01	1.42E-01	2.37E-01		pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Cobalt-60	EPA 901.1 Modified	8.89E-02	4.59E-02	4.62E-02	9.24E-02	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Cesium-134	EPA 901.1 Modified	7.79E-03	1.96E-02	1.96E-02	8.97E-02	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Cesium-137	EPA 901.1 Modified	2.07E-01	7.93E-02	8.00E-02	1.16E-01		pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Europium-152	EPA 901.1 Modified	-1.54E-01	2.33E-01	2.34E-01	2.45E-01	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Europium-154	EPA 901.1 Modified	9.31E-02	1.70E-01	1.70E-01	1.24E-01	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Europium-155	EPA 901.1 Modified	4.50E-02	1.46E-01	1.46E-01	2.14E-01	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Holmium-166m	EPA 901.1 Modified	3.44E-02	9.30E-02	9.30E-02	9.15E-02	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Iodine-129	EPA 901.1 Modified	3.24E-02	1.95E-01	1.95E-01	2.90E-01	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Potassium-40	EPA 901.1 Modified	1.69E+01	2.28E+00	2.44E+00	1.46E+00		pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Manganese-54	EPA 901.1 Modified	5.16E-02	5.35E-02	5.36E-02	8.64E-02	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Molybdenum-93	EPA 901.1 Modified	-2.18E-03	4.89E-02	4.89E-02	4.54E-02	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Niobium-94	EPA 901.1 Modified	-3.35E-03	3.51E-02	3.51E-02	7.55E-02	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Lead-210	EPA 901.1 Modified	1.32E+00	1.27E+00	1.27E+00	2.10E+00	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Lead-212	EPA 901.1 Modified	8.16E-01	1.85E-01	1.89E-01	2.22E-01		pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Lead-214	EPA 901.1 Modified	6.82E-01	1.54E-01	1.58E-01	4.59E-01		pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Promethium-145	EPA 901.1 Modified	6.06E-02	1.65E-01	1.65E-01	2.49E-01	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Radium-226	EPA 901.1 Modified	7.26E-01	1.37E-01	1.42E-01	2.37E-01		pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Antimony-125	EPA 901.1 Modified	6.31E-02	1.27E-01	1.27E-01	2.01E-01	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Thorium-234	EPA 901.1 Modified	1.63E+00	1.21E+00	1.22E+00	1.84E+00	U	pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Thallium-208	EPA 901.1 Modified	5.99E-01	1.82E-01	1.85E-01	3.35E-01		pCi/g
19-12037-19	TRG	L1-12209-C-FIGS-009-SS-A	11/22/19 14:34	12/9/2019	12/11/2019	19-12037	Uranium-235	EPA 901.1 Modified	1.64E-01	3.43E-01	3.43E-01	5.17E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank;DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

ZION SOLUTIONS LLC
An EnergySolutions Company

ZS-WM-131
Revision 0
Information Use

REC'D DEC 09 2019

19-12037

Attachment 1 – Chain-of-Custody Form

	Sample ID	Sample Log	Matrix	Sample Type	Sample Container Vol	Unit	Type	Qty	Sample Date	Sample Time	Analysis Type	Preservative	Remarks
4	L1-10206-A -FSGS-003-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/9/19**	**0830**	**5 ROC HTD**	**NA**	**704.46**
5	L1-10206-A-FSGS-011-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/9/19**	**0820**	**5 ROC HTD**	**NA**	**698.73**
6	L1-10206-A-FQGS-005-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/9/19**	**0805**	**5 ROC HTD**	**NA**	**652.41**
7	L1-10206-A-FSGS-003-SB-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/22/19**	**0804**	**5 ROC HTD**	**NA**	**699.36**
8	L1-10206-B-FSGS-010-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**10/28/19**	**1318**	**5 ROC HTD**	**NA**	**628.06**
9	L1-10206-B-FSGS-012-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**10/28/19**	**1322**	**5 ROC HTD**	**NA**	**736.13**
10	L1-10206-B-FIGS-004-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/19/19**	**1232**	**5 ROC HTD**	**NA**	**743.97**
11	L1-10206-C-FSGS-007-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**10/28/19**	**0912**	**5 ROC HTD**	**NA**	**671.93**
12	L1-10206-C-FSGS-011-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**10/28/19**	**0920**	**5 ROC HTD**	**NA**	**643.92**
13	L1-10206-D-FIGS-001-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/4/19**	**0820**	**5 ROC HTD**	**NA**	**755.09**
14	L1-10206-D-FSGS-017-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/4/19**	**0852**	**5 ROC HTD**	**NA**	**773.48**
15	L1-10206-E-FSGS-002-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/5/19**	**0902**	**5 ROC HTD**	**NA**	**692.88**
16	L1-10206-E-FSGS-014-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/5/19**	**0926**	**5 ROC HTD**	**NA**	**834.10**
17	L1-12205-B-FSGS-116-SB-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**10/1/19**	**0835**	**5 ROC HTD**	**NA**	**679.58**
18	L1-12205-C-FSGS-109-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**9/24/19**	**0924**	**5 ROC HTD**	**NA**	**681.98**
19	L1-12209-C-FIGS-009-SS-A	NA	NA	**SOIL**	500	ml	**MARINELLI**	1	**11/22/19**	**1434**	**5 ROC HTD**	**NA**	**661.17**

Rec BS 12-9-19 @ 1439

[311]

ZION SOLUTIONS LLC
An EnergySolutions Company

REC'D DEC 09 2019

19-12037

ZS-WM-131
Revision 0
Information Use

Laboratory:	Date Submitted To Lab:		Ship Container No.:	Cooler Temperature:	Airbill Number:
EBERLINE LABS			**NA**	**N/A**	FedEx Ground 7771 4626 0705

Relinquished by: Jack Lucia	Date (mm/dd/yyyy): 12/4/19	Time: 0910	Received by: Richard F. Rickert	Date: (mm/dd/yyyy): 12/04/2019	0910
Relinquished by: Richard F. Rickert	Date (mm/dd/yyyy): 12/05/2019	Time: 1600	Received by: FedEx Ground	Date: (mm/dd/yyyy): 12/05/2019	1600
Relinquished by: Fedex	Date (mm/dd/yyyy):	Time:	Received by: Randolph Spencer	Date: (mm/dd/yyyy): 12/9/2019	1434
Relinquished by:	Date (mm/dd/yyyy):	Time:	Received by:	Date: (mm/dd/yyyy):	

Comments

Po # 67718 HTD's

14 Day Turnaround

REC'D DEC 09 2019

[312]