





**ZION STATION RESTORATION PROJECT
FINAL STATUS SURVEY RELEASE RECORD**


CONSTRUCTION PARKING AREA

SURVEY UNIT 10214A

REVISION 1



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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	7
2. SURVEY UNIT DESCRIPTION	7
3. CLASSIFICATION BASIS	8
4. DATA QUALITY OBJECTIVES	10
5. SURVEY DESIGN	15
6. SURVEY IMPLEMENTATION.....	21
7. SURVEY RESULTS.....	22
8. QUALITY CONTROL	29
9. INVESTIGATIONS AND RESULTS	30
10. REMEDIATION AND RESULTS.....	31
11. CHANGES FROM THE SURVEY PLAN	31
12. DATA QUALITY ASSESSMENT.....	31
13. ANOMALIES.....	32
14. CONCLUSION	32
15. REFERENCES	32
16. ATTACHMENTS.....	33
ATTACHMENT 1 - FIGURES AND MAP	34
ATTACHMENT 2 - SCAN DATA.....	38
ATTACHMENT 3 - CONSULTATION TRIGGERS FOR RESIDENTIAL AND COMMERCIAL/INDUSTRIAL SOIL CONTAMINATION.....	51
ATTACHMENT 4 - SIGN TEST	53
ATTACHMENT 5 - QC SAMPLE ASSESSMENT	55
ATTACHMENT 6 - GRAPHICAL PRESENTATIONS	57
ATTACHMENT 7 - SAMPLE ANALYTICAL REPORTS.....	64
ATTACHMENT 8 - EBERLINE ANALYTICAL REPORTS.....	280

LIST OF TABLES

Table 1 - Dose Significant Radionuclides and Mixture.....	12
Table 2 - Base Case DCGLs for Surface Soils (BcDCGL _{SS}).....	13
Table 3 - Base Case DCGLs for Subsurface Soils (BcDCGL _{SB}).....	13
Table 4 - Operational DCGLs for Surface Soils (OpDCGL _{SS}).....	14
Table 5 - Operational DCGLs for Subsurface Soils (OpDCGL _{SB}).....	14
Table 6 - Surrogate Ratios.....	15
Table 7 - Investigation Levels.....	16
Table 8 - Systematic Sample Measurement Locations.....	18
Table 9 - Synopsis of Survey Design.....	20
Table 10 - Instruments and Detectors.....	22
Table 11 - Synopsis of Scan Results.....	22
Table 12 - Summary of Gamma Spectroscopy Results for Surface Soil Samples Comprising the Statistical Sample Population.....	25
Table 13 - Summary of Gamma Spectroscopy Results for Biased Surface Soil Samples.....	26
Table 14 - Summary of Gamma Spectroscopy Results for Subsurface Soil Samples.....	26
Table 15 - Off-Site Analysis Results.....	26
Table 16 - Summary of Gamma Spectroscopy Results for QC Soil Samples.....	27
Table 17 - Sum of Fractions for Surface Soil Samples, compared to the OpDCGLs (Systematic).....	28
Table 18 - Sum of Fractions for Biased Surface Soil Samples, compared to the OpDCGLs.....	29
Table 19 - Sum of Fractions for Subsurface Soil Samples, compared to the OpDCGLs.....	29
Table 20 - Sum of Fractions for QC Soil Samples, compared to the OpDCGLs.....	29
Table 21 - Basic Statistical Properties of Systematic Sample Population.....	29
Table 22 - Relocated Systematic Sample Locations.....	31

LIST OF FIGURES

Figure 1 - Class 3 Open Land Survey Units Outside of “Radiologically Restricted Area” from Figure 2-5 of the LTP.....	8
Figure 2 - The Four Class 2 and Two Class 1 Open Land Survey Units Created from the Original Class 3 Survey Unit 10214.....	10

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
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
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

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

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 10214A, “Construction Parking Area,” has been generated for the Zion Station Restoration Project (ZSRP) in accordance with ZionSolutions 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 (L2-10214A-F) was developed in accordance with ZionSolutions procedure ZS-LT-300-001-001, “*Final Status Survey Package Development*” (Reference 3), the 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 two. 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. Eighteen (18) systematic surface soil samples were acquired from the survey unit. In addition, surface scanning was performed on approximately 52% of the total surface area in the survey unit. Four (4) small areas of elevated activity were detected during the scans (see Section 9 for further discussion). The analytical results for all soil samples (systematic and investigation) taken in survey unit 10214A indicate that the Sum of Fractions (SOF) for each sample, when compared to the Operational Derived Concentration Guideline Levels (OpDCGL), was less than 1.0. For the systematic samples, the maximum Operational SOF (OpSOF) was 0.059 with a mean OpSOF of 0.036. The mean Base Case SOF (BcSOF), when the analytical results were compared to the Base Case DCGLs (BcDCGL), was 0.009, which results in a dose assigned to the survey unit of 0.230 mrem/year Total Effective Dose Equivalent (TEDE). Therefore, the null hypothesis is rejected and survey unit 10214A is acceptable for unrestricted release.

2. SURVEY UNIT DESCRIPTION

Survey unit 10214A, “Construction Parking Area,” is a Class 2 open land survey unit and is 8,542 m² in size. It is bounded on the west by a non-impacted area, the east by survey unit 10214B, the north by a non-impacted area and the south by survey unit 10205.

The topography of the survey unit is mainly flat with some small dips and depressions. Since this area was used for parking, the top surface is a mixture of gravel and loam. A paved road runs east to west in the northern part of the survey unit.

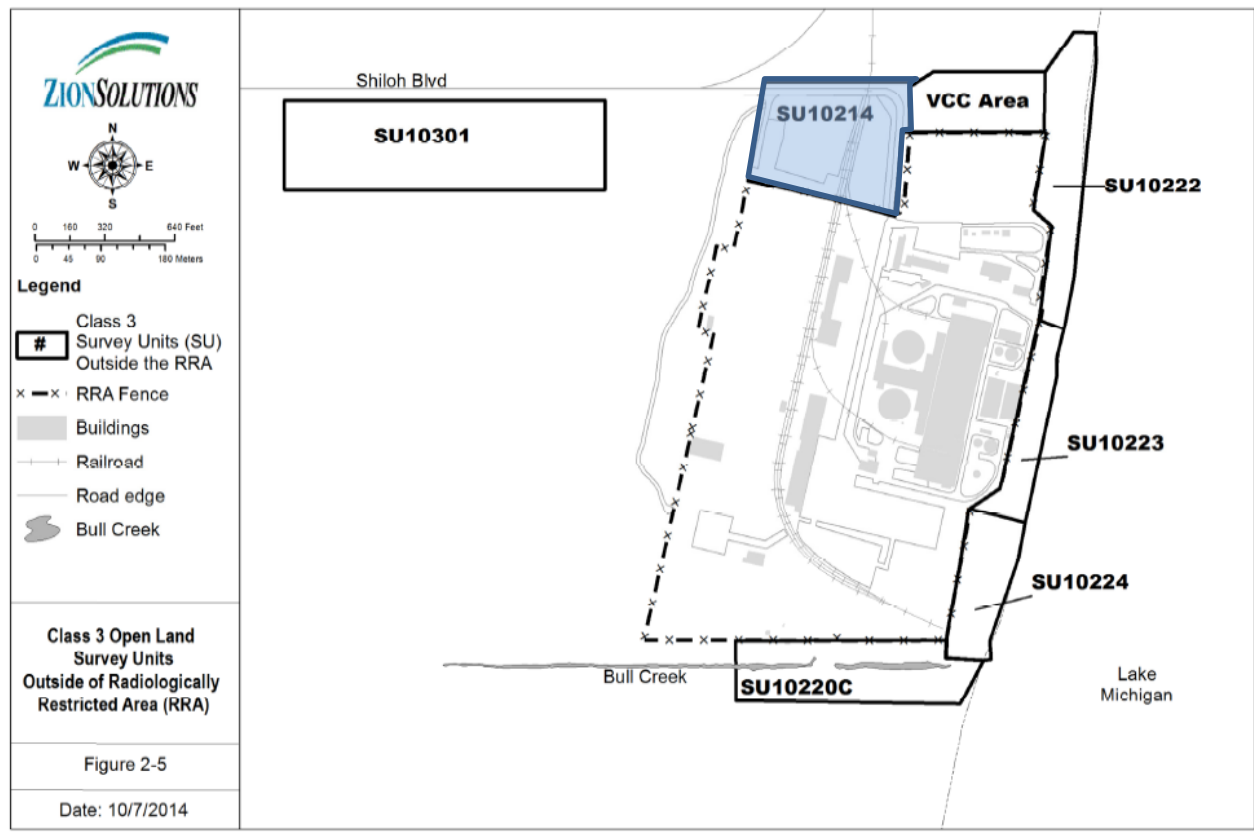
The boundary of the survey unit was defined using a Global Positioning System (GPS) based on the Illinois State Plane System North American Datum (NAD) 1983 East. The Illinois State Plane System Coordinates associated with the sample locations in this survey unit are presented in Table 8.

3. CLASSIFICATION BASIS

Survey unit 10214A was classified in accordance with ZionSolutions procedure ZS-LT-300-001-002, “Survey Unit Classification” (Reference 5).

The area encompassing this survey unit was described in the “Zion Station Historical Site Assessment” (HSA) (Reference 6) as the “Construction Parking Area” and was located within survey unit 10214 as identified in Figure 4 of the HSA. This area was subsequently described as the “Construction Parking Area” (survey unit 10214) in Table 2-4 of the LTP as represented in Figure 2-5 of the LTP and replicated below as Figure 1.

Figure 1 - Class 3 Open Land Survey Units Outside of “Radiologically Restricted Area” from Figure 2-5 of the LTP



The HSA states that this area contained the construction parking area which consisted of crushed rock.

Characterization surveys were performed in September and October of 2013 for the Class 3 survey unit 10214. The following data was obtained:

- Thirteen (13) judgmental surface samples taken at the direction of the cognizant Radiological Engineer (RE).
- Seventeen (17) random surface samples and three (3) random subsurface samples.
- One (1) investigation surface sample taken in an area identified by a scan alarm.
- Sodium iodide (NaI) walkover scans of approximately 10% of the surface area in survey unit.

The results of the characterization survey were:

- Three (3) of the thirteen (13) judgmental surface samples were positive for Cs-137 with the highest result being 0.11 pCi/g.
- All seventeen (17) of the random surface samples and the three (3) random subsurface samples were < Minimum Detectable Concentration (MDC) for the Radionuclides of Concern (ROC).
- The one (1) investigation surface sample was positive for Cs-137 with an activity of 0.09 pCi/g.

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 10214 was reclassified as Class 2, and divided into four survey units: 10214A, 10214B, 10214C and 10214D to comply with the survey unit size recommendations from MARSSIM Section 4.6.

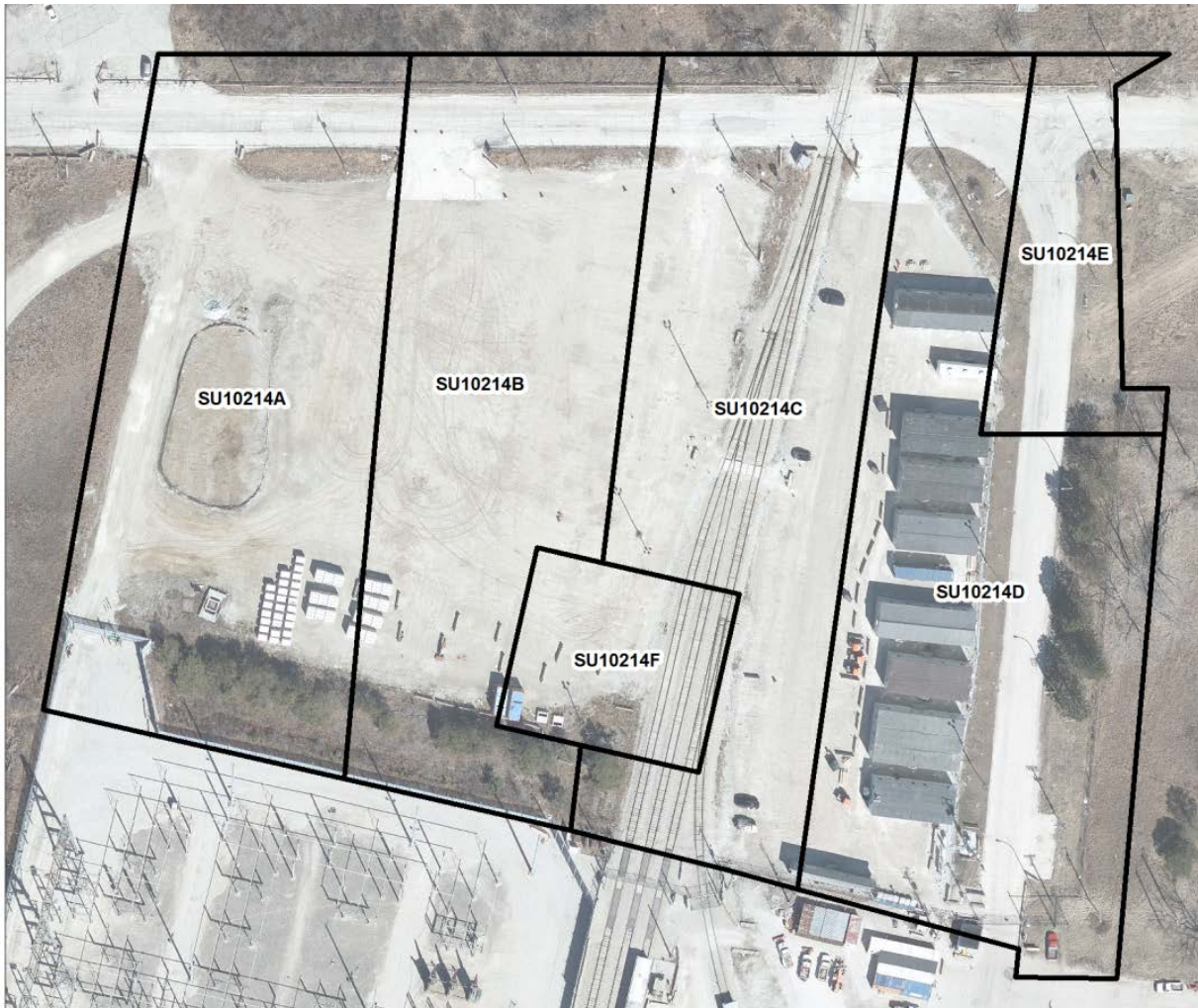
While performing an Radiological Assessment survey in March of 2019, a particle was found in the northeast portion of survey unit 10214D with an activity of 1.26 μ Ci. This area was subsequently reclassified as Class 1 and designated survey unit 10214E.

In November of 2019, a 0.02 μ Ci particle was discovered by the Radiation Protection group in the southwest portion of survey unit 10214C. This area was reclassified as Class 1 and designated survey unit 10214F.

These changes in classification, discussed above, were a conservative response and ensured that the survey unit was surveyed with the appropriate rigor.

Figure 2 below shows the boundaries of the 10214 survey units.

Figure 2 - The Four Class 2 and Two Class 1 Open Land Survey Units Created from the Original Class 3 Survey Unit 10214



An RE and a Characterization/License Termination (C/LT) Supervisor performed a visual inspection and walk-down of the survey unit on December 16, 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 10214A was correctly classified as Class 2.

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 10214A 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).

ZionSolutions 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).

ZionSolutions 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 ZNPS. 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 are 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. ZionSolutions 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 ZionSolutions 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, the ZSRP performed 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 2 open land survey units, is less than or 50% of the applicable OpDCGL. 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 10214A. 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 10214A, 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

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

- Where: DCGL_{Sur} = Surrogate radionuclide DCGL
 DCGL_{2,3...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

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

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

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

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.

The surrogate OpDCGL for Co-60 while inferring Ni-63 is 0.898 pCi/g, the surrogate OpDCGL for Cs-137 while inferring Sr-90 is 3.622 pCi/g and the OpDCGL for Cs-134 is 1.733 pCi/g. Using the normalized mixture for gamma emitting ROC from Table 1, the surrogate adjusted gamma DCGL is then calculated as follows:

Equation 4

$$Surrogate_{DCGL (gamma)} = \frac{1}{\left[\left(\frac{0.012}{0.898_{(Co-60)}}\right) + \left(\frac{0.0001}{1.733_{(Cs-134)}}\right) + \left(\frac{0.988}{3.622_{(Cs-137)}}\right)\right]} = 3.494 \text{ pCi/g}$$

The surrogate adjusted gamma DCGL that was used in this survey unit is 3.494 pCi/g.

For this Class 2 open land survey unit, the “Investigation Levels” for area scanning and soil sample measurement results are those levels specified in LTP, Table 5-25, and are reproduced below in Table 7.

Table 7 - Investigation Levels

Classification	Scan Investigation Levels	Direct Investigation Levels
Class 2	>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 ZionSolutions TSD-11-004, “Ludlum Model 44-10 Detector Sensitivity” (Reference 11) with the following parameters:

- background count rate of 3,000 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 2.90 pCi/g, which is less than the surrogate adjusted gamma DCGL calculated above. However, as a conservative measure, 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 . 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.

The calculated MDC_{scan} , 2.90 pCi/g, is less than the surrogate adjusted gamma DCGL calculated above, therefore, the spacing of the statistical systematic sampling and measurement locations was adequate. No adjustment to the sample number was required.

The implementation of quality control (QC) measures as referenced by LTP, Section 5.9 and ZionSolutions 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 (L2-10214A-FQGS-002-SS) was selected randomly for split

sample analysis for the FSS of this survey unit.

ZionSolutions procedure ZS-LT-01 also requires that replicate surveys be performed on 5% of all scan locations chosen at random. This requirement is being met by performing QC replicate scans on 5% of the total area scanned in Class 2 open land areas. A replicate measurement is an independent direct measurement performed by a qualified technician, other than the one who obtained the original measurement, with a separate but similar instrument. Rows 71 through 77 were chosen at random for QC replicate scans. These rows represent approximately 9% of the total area scanned in this survey unit (403 m² of 4,483 m² total area scanned).

The locations of the seventeen (17) systematic 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)
L2-10214A-FSGS-001-SS	642050.50	343476.69
L2-10214A-FSGS-002-SS	642071.37	343440.56
L2-10214A-FSGS-003-SS	642071.37	343464.65
L2-10214A-FSGS-004-SS	642092.23	343428.51
L2-10214A-FSGS-005-SS	642092.23	343452.60
L2-10214A-FSGS-006-SS	642092.23	343476.69
L2-10214A-FSGS-007-SS	642113.09	343440.56
L2-10214A-FSGS-008-SS	642113.09	343464.65
L2-10214A-FSGS-009-SS	642133.95	343452.60
L2-10214A-FSGS-010-SS	642133.95	343476.69
L2-10214A-FSGS-011-SS	642154.81	343440.56
L2-10214A-FSGS-012-SS	642154.81	343464.65
L2-10214A-FSGS-013-SS	642154.81	343488.73
L2-10214A-FSGS-014-SS	642175.67	343452.60
L2-10214A-FSGS-015-SS	642175.67	343476.69
L2-10214A-FSGS-016-SS	642196.53	343464.65
L2-10214A-FSGS-017-SS	642196.53	343488.73

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.

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. This threshold was not encountered during the FSS of survey unit 10214A.

Three (3) soil samples, L2-10214A-FIGS-001-SS, L2-10214A-QIGS-001-SS and L2-10214A-FIGS-002-SS, were selected to meet the requirement that 10% of the samples collected during FSS of open land survey units be analyzed for HTD ROC. These samples were selected based on exhibiting the highest concentrations of Cs-137 among all the samples. 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.

Table 9 provides a synopsis of the survey design for survey unit 10214A.

Table 9 - Synopsis of Survey Design

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Area	8,542 m ²	GPS measurements of area
Number of Surface Soil Samples	17 (Systematic)	<ul style="list-style-type: none"> • $\sigma = 0.30$ • UBGR = SOF of 1 • LBGR = SOF of 0.5 • Type I error = 0.05 • Type II error = 0.05 • $\Delta/\sigma = 1.67$ (MARSSIM Table 5.5)
Grid Spacing	24.1 m	(LTP, Section 5.6.4.5.2)
DCGLs	<ul style="list-style-type: none"> • 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, Table 5-7)
HTD ROC Analysis	A minimum of two (2) soil samples selected for HTD ROC analysis	(LTP, Section 5.1)
Measurement Investigation Level	Operational DCGL	(LTP, Table 5-25)
Scan Survey Area Coverage	50% (Class 2) Replicate scans on 5% of the total area scanned	(LTP, Table 5-24)
QC	Two (2) samples selected randomly for split sample analysis (1 systematic, 1 investigation)	(LTP, Section 5.9)

6. SURVEY IMPLEMENTATION

Survey instructions for this FSS were incorporated into and performed in accordance with FSS sample plan L2-10214A-F, which was developed in accordance with ZS-LT-300-001-001. The FSS unit was inspected and controlled in accordance with *ZionSolutions* procedure ZS-LT-300-001-003, “*Isolation and Control for Final Status Survey*” (Reference 13).

For survey unit 10214A, 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, 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. This threshold was encountered during the FSS of survey unit 10214A while performing gamma scans in rows 5, 6, 10 and 56 (see Section 9 for further discussion). Surface and subsurface investigation soil samples were taken at these locations (L2-10214A-FIGS-001-SS to L2-10214A-FIGS-005-SS and L2-10214A-FIGS-001-SB to L2-10214A-FIGS-005-SB).

FSS field activities were conducted under FSS sample plan L2-10214A-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.

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 December 16, 2019, and concluding on December 17, 2019. The QC replicate scan surveys were performed on December 17, 2019.

The seventeen (17) systematic surface soil sample locations were marked with flags based on GPS coordinates provided by VSP. Two (2) samples were relocated due to the original locations being located over a fiber optic cable. The relocated sample points are listed in Table 22.

Gamma scans were performed on approximately 52% (4,483 m²) of the surface area of the survey unit (8,542 m²) using a Ludlum 2350-1 paired with a Model 44-10 (2” x 2”) 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. Four (4) areas of elevated activity were detected on the scans (see Section 9 for further discussion).

Daily, prior to and following use, each detector was subjected to an Operational Response Check in accordance with *ZionSolutions* 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	216173/ES0118	10/07/2020 ⁽¹⁾
Ludlum 2350-1/Ludlum 44-10	304718/PR363311	09/19/2020 ⁽¹⁾
Ludlum 2350-1/Ludlum 44-10	293136/PR316938	06/18/2020 ⁽¹⁾
Ludlum 2350-1/Ludlum 44-10	266656/PR311750	07/24/2020 ⁽¹⁾
Ludlum 2350-1/Ludlum 44-10	304712/PR372143	09/09/2020 ⁽¹⁾
Ludlum 2350-1/Ludlum 44-10	304708/PR321892	09/04/2020 ⁽¹⁾
Ludlum 2350-1/Ludlum 44-10	304712/PR372143	09/09/2020 ⁽²⁾

- (1) Instruments used for the initial FSS scans
- (2) Instruments used for the QC replicate scans

In accordance with the survey design, seventeen (17) surface soil samples were collected at the designated systematic sample points. In addition, five (5) surface samples and five (5) subsurface samples were collected as part of the investigation of four (4) areas of elevated activity identified during the surface scans.

Three (3) samples (L2-10214A-FIGS-001-SS, L2-10214A-QIGS-001-SS and L2-10214A-FIGS-002-SS) were selected for HTD radionuclide analysis. One (1) surface soil sample (L2-10214A-FQGS-002-SS) was selected randomly for QC sample analysis. One (1) additional QC split sample was obtained at investigational sample location L2-10214A-QIGS-001-SS.

7. SURVEY RESULTS

Approximately 52% (4,483 m²) of the surface area of the survey unit (8,542 m²) was scanned for elevated radiation levels. Seventy-nine (79) 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. Four (4) elevated measurement locations were identified by surface scan in rows 5, 6, 10 and 56 (one area in each row). See Section 9 for further discussion. 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	1771	1788	None	None
Row 2	1679	1788	None	None
Row 3	1435	1788	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 4	1575	1788	None	None
Row 5	2301	1788	1	L2-10214A-FIGS-001-SS/SB
Row 6	2198	1788	1	L2-10214A-FIGS-002-SS/SB
Row 7	1601	1788	None	None
Row 8	1591	1788	None	None
Row 9	3134	3608	None	None
Row 10	5038	3608	1	L2-10214A-FIGS-003-SS/SB, L2-10214A-FIGS-004-SS/SB
Row 11	3495	3536	None	None
Row 12	3176	3536	None	None
Row 13	3265	3536	None	None
Row 14	3300	3536	None	None
Row 15	3407	3536	None	None
Row 16	3278	3612	None	None
Row 17	3110	3612	None	None
Row 18	2763	3183	None	None
Row 19	2892	3183	None	None
Row 20	1792	1892	None	None
Row 21	1289	1503	None	None
Row 22	1339	1503	None	None
Row 23	1339	1503	None	None
Row 24	1231	1503	None	None
Row 25	1336	1503	None	None
Row 26	1222	1503	None	None
Row 27	1663	1902	None	None
Row 28	1666	1902	None	None
Row 29	1662	1902	None	None
Row 30	1684	1902	None	None
Row 31	1476	1890	None	None
Row 32	1475	1890	None	None
Row 33	1544	1890	None	None
Row 34	1674	1890	None	None
Row 35	1577	1890	None	None
Row 36	1572	1890	None	None
Row 37	1621	1890	None	None
Row 38	1518	1890	None	None
Row 39	1581	1890	None	None
Row 40	1559	1890	None	None
Row 41	1642	1890	None	None
Row 42	1563	1890	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 43	1551	1890	None	None
Row 44	1439	1721	None	None
Row 45	1469	1721	None	None
Row 46	1476	1721	None	None
Row 47	1476	1721	None	None
Row 48	1503	1721	None	None
Row 49	1363	1721	None	None
Row 50	1521	1721	None	None
Row 51	1499	1721	None	None
Row 52	1532	1721	None	None
Row 53	1493	1721	None	None
Row 54	1526	1721	None	None
Row 55	1515	1721	None	None
Row 56	4486	1721	1	L2-10214A-FIGS-005-SS/SB
Row 57	1465	1783	None	None
Row 58	1496	1783	None	None
Row 59	1523	1783	None	None
Row 60	1523	1783	None	None
Row 61	1502	1783	None	None
Row 62	1527	1783	None	None
Row 63	1448	1783	None	None
Row 64	1595	1783	None	None
Row 65	1464	1783	None	None
Row 66	1634	1783	None	None
Row 67	1677	1783	None	None
Row 68	1568	1783	None	None
Row 69	1553	1783	None	None
Row 70	1748	1861	None	None
Row 71	1529	1869	None	None
Row 72	1515	1869	None	None
Row 73	1500	1869	None	None
Row 74	1477	1869	None	None
Row 75	1549	1869	None	None
Row 76	1613	1869	None	None
Row 77	1668	1869	None	None
Row 78	1688	1869	None	None
Row 79	1668	1869	None	None

1) The action level is based on the measurement Minimum Detectable Count Rate (MDCR) plus background in accordance with the FSS plan

The seventeen (17) systematic surface soil samples taken for non-parametric statistical testing, the five (5) biased surface soil samples (investigation) and the five (5) subsurface soil samples (investigation) 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. For the systematic samples, the gamma spectroscopy results revealed three (3) samples with activity levels above MDC for Cs-137 and no samples with activity levels above MDC for Co-60 or Cs-134. The concentration 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 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 ZionSolutions 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)
L2-10214A-FSGS-001-SS	1.39E-02	1.14E-02	3.96E-02	2.51E+00	7.92E-05
L2-10214A-FSGS-002-SS	2.82E-02	2.21E-02	3.28E-02	5.09E+00	6.56E-05
L2-10214A-FSGS-003-SS	1.67E-02	5.05E-02	2.81E-02	3.01E+00	5.62E-05
L2-10214A-FSGS-004-SS	2.65E-02	4.11E-02	1.72E-02	4.78E+00	3.44E-05
L2-10214A-FSGS-005-SS	1.81E-02	2.43E-02	0.00E+00	3.27E+00	0.00E+00
L2-10214A-FSGS-006-SS	3.23E-02	2.30E-02	1.73E-02	5.83E+00	3.46E-05
L2-10214A-FSGS-007-SS	1.20E-02	0.00E+00	4.62E-03	2.17E+00	9.24E-06
L2-10214A-FSGS-008-SS	0.00E+00	0.00E+00	7.39E-03	0.00E+00	1.48E-05
L2-10214A-FSGS-009-SS	1.74E-02	1.56E-03	3.24E-02	3.14E+00	6.48E-05
L2-10214A-FSGS-010-SS	3.77E-02	9.93E-03	2.07E-02	6.80E+00	4.14E-05
L2-10214A-FSGS-011-SS	1.21E-02	1.15E-02	1.10E-02	2.18E+00	2.20E-05
L2-10214A-FSGS-012-SS	5.05E-02	4.62E-03	0.00E+00	9.11E+00	0.00E+00
L2-10214A-FSGS-013-SS	2.11E-02	0.00E+00	0.00E+00	3.81E+00	0.00E+00
L2-10214A-FSGS-014-SS	1.54E-02	0.00E+00	2.85E-02	2.78E+00	5.70E-05
L2-10214A-FSGS-015-SS	1.14E-02	3.38E-02	3.22E-02	2.06E+00	6.44E-05
L2-10214A-FSGS-016-SS	0.00E+00	8.38E-03	8.22E-02	0.00E+00	1.64E-04
L2-10214A-FSGS-017-SS	0.00E+00	1.41E-02	5.55E-02	0.00E+00	1.11E-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 13 - Summary of Gamma Spectroscopy Results for Biased Surface 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)
L2-10214A-FIGS-001-SS	2.04E-02	5.89E-02	9.50E-02	3.68E+00	1.90E-04
L2-10214A-FIGS-002-SS	1.45E-02	0.00E+00	1.18E-01	2.62E+00	2.36E-04
L2-10214A-FIGS-003-SS	0.00E+00	2.70E-02	8.33E-02	0.00E+00	1.67E-04
L2-10214A-FIGS-004-SS	3.98E-02	5.45E-02	5.98E-04	7.18E+00	1.20E-06
L2-10214A-FIGS-005-SS	3.50E-02	0.00E+00	2.72E-02	6.32E+00	5.44E-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.

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)
L2-10214A-FIGS-001-SB	9.94E-03	0.00E+00	3.61E-02	1.79E+00	7.22E-05
L2-10214A-FIGS-002-SB	2.27E-02	2.20E-02	3.45E-02	4.10E+00	6.90E-05
L2-10214A-FIGS-003-SB	0.00E+00	0.00E+00	5.06E-02	0.00E+00	1.01E-04
L2-10214A-FIGS-004-SB	1.82E-02	1.08E-02	6.19E-03	3.28E+00	1.24E-05
L2-10214A-FIGS-005-SB	0.00E+00	2.50E-02	1.47E-03	0.00E+00	2.94E-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.

The off-site laboratory, Eberline Analytical, processed the three (3) samples selected for HTD ROC analysis as specified in the survey design. Samples L2-10214A-FIGS-001-SS-A, L2-10214A-QIGS-001-SS-A and L2-10214A-FIGS-002-SS-A 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 positively 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 # L2-10214A-FIGS-001-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	-1.93E-02	5.58E-02	5.83E-02	No
Cs-134	-6.47E-03	2.38E-02	7.00E-02	No
Cs-137	1.92E-01	8.62E-02	1.31E-01	Yes
Ni-63	-6.03E-01	1.83E+00	3.18E+00	No
Sr-90	3.22E-01	2.95E-01	7.12E-01	No

Table 15 (continued) - Off-Site Analysis Results

Sample # L2-10214A-QIGS-001-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.89E-02	5.61E-02	6.61E-02	No
Cs-134	2.89E-03	2.88E-02	9.34E-02	No
Cs-137	2.19E-01	9.35E-02	1.42E-01	Yes
Ni-63	5.49E-01	1.98E+00	3.38E+00	No
Sr-90	5.59E-01	2.56E-01	5.69E-01	No

Sample # L2-10214A-FIGS-002-SS-A

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	-1.69E-02	6.32E-02	8.83E-02	No
Cs-134	3.16E-03	2.85E-02	8.42E-02	No
Cs-137	2.32E-01	6.07E-02	9.32E-02	Yes
Ni-63	-7.54E-01	2.00E+00	3.48E+00	No
Sr-90	3.37E-01	3.12E-01	7.56E-01	No

The implementation of survey specific QC measures included the collection of one (1) systematic sample (L2-10214A-FQGS-002-SS) and one (1) biased sample (L2-10214A-QIGS-001-SS) for “split sample” analysis. The on-site laboratory analyzed the designated QC samples using the on-site gamma spectroscopy system. Gamma spectroscopy results are summarized in Table 16. The concentration for Ni-63 and Sr-90 are 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)
L2-10214A-FQGS-002-SS	0.00E+00	1.21E-02	7.34E-02	0.00E+00	1.47E-04
L2-10214A-QIGS-001-SS	1.15E-02	3.13E-03	1.14E-01	2.08E+00	2.28E-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.

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 5

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

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 10214A are provided in Table 17. The results of the unity rule calculations for the ROC for the biased surface samples are provided in Table 18, the results for the subsurface samples are provided in Table 19, and the results for the QC samples are provided in Table 20.

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

MEASUREMENT ID	Fraction of the OpDCGLs for Surface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L2-10214A-FSGS-001-SS	1.27E-02	6.58E-03	1.09E-02	2.74E-03	2.56E-05	0.033
L2-10214A-FSGS-002-SS	2.58E-02	1.28E-02	9.04E-03	5.56E-03	2.12E-05	0.053
L2-10214A-FSGS-003-SS	1.53E-02	2.91E-02	7.74E-03	3.30E-03	1.82E-05	0.056
L2-10214A-FSGS-004-SS	2.43E-02	2.37E-02	4.74E-03	5.23E-03	1.11E-05	0.058
L2-10214A-FSGS-005-SS	1.66E-02	1.40E-02	0.00E+00	3.57E-03	0.00E+00	0.034
L2-10214A-FSGS-006-SS	2.96E-02	1.33E-02	4.77E-03	6.37E-03	1.12E-05	0.054
L2-10214A-FSGS-007-SS	1.10E-02	0.00E+00	1.27E-03	2.37E-03	2.99E-06	0.015
L2-10214A-FSGS-008-SS	0.00E+00	0.00E+00	2.04E-03	0.00E+00	4.78E-06	0.002
L2-10214A-FSGS-009-SS	1.59E-02	9.00E-04	8.93E-03	3.43E-03	2.09E-05	0.029
L2-10214A-FSGS-010-SS	3.46E-02	5.73E-03	5.70E-03	7.44E-03	1.34E-05	0.053
L2-10214A-FSGS-011-SS	1.11E-02	6.64E-03	3.03E-03	2.39E-03	7.11E-06	0.023
L2-10214A-FSGS-012-SS	4.63E-02	2.67E-03	0.00E+00	9.97E-03	0.00E+00	0.059
L2-10214A-FSGS-013-SS	1.93E-02	0.00E+00	0.00E+00	4.16E-03	0.00E+00	0.024
L2-10214A-FSGS-014-SS	1.41E-02	0.00E+00	7.85E-03	3.04E-03	1.84E-05	0.025
L2-10214A-FSGS-015-SS	1.04E-02	1.95E-02	8.87E-03	2.25E-03	2.08E-05	0.041
L2-10214A-FSGS-016-SS	0.00E+00	4.84E-03	2.26E-02	0.00E+00	5.31E-05	0.028
L2-10214A-FSGS-017-SS	0.00E+00	8.14E-03	1.53E-02	0.00E+00	3.59E-05	0.023

Systematic Measurements

Number of Systematic Measurements =	17
# of Systematic Measurements with OpSOF ≥ 1 =	0
# of Systematic Measurements with OpSOF > 0.1 (HTD Assessment) =	0
Max Individual Systematic Measurement OpSOF =	0.059
Mean Systematic Measurement OpSOF =	0.036

Table 18 - Sum of Fractions for Biased 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	
L2-10214A-FIGS-001-SS	1.87E-02	3.40E-02	2.62E-02	4.03E-03	6.14E-05	0.083
L2-10214A-FIGS-002-SS	1.33E-02	0.00E+00	3.25E-02	2.86E-03	7.63E-05	0.049
L2-10214A-FIGS-003-SS	0.00E+00	1.56E-02	2.29E-02	0.00E+00	5.38E-05	0.039
L2-10214A-FIGS-004-SS	3.65E-02	3.14E-02	1.65E-04	7.85E-03	3.86E-07	0.076
L2-10214A-FIGS-005-SS	3.21E-02	0.00E+00	7.49E-03	6.91E-03	1.76E-05	0.046

Table 19 - Sum of Fractions for Subsurface Soil Samples, compared to the OpDCGLs

MEASUREMENT ID	Fraction of the OpDCGLs for Subsurface Soils					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L2-10214A-FIGS-001-SB	1.13E-02	0.00E+00	1.82E-02	9.18E-03	1.70E-04	0.039
L2-10214A-FIGS-002-SB	2.58E-02	1.93E-02	1.74E-02	2.10E-02	1.62E-04	0.084
L2-10214A-FIGS-003-SB	0.00E+00	0.00E+00	2.55E-02	0.00E+00	2.38E-04	0.026
L2-10214A-FIGS-004-SB	2.07E-02	9.50E-03	3.12E-03	1.68E-02	2.91E-05	0.050
L2-10214A-FIGS-005-SB	0.00E+00	2.20E-02	7.41E-04	0.00E+00	6.92E-06	0.023

Table 20 - Sum of Fractions for QC 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	
L2-10214A-FQGS-002-SS	0.00E+00	6.98E-03	2.02E-02	0.00E+00	4.74E-05	0.027
L2-10214A-QIGS-001-SS	1.05E-02	1.81E-03	3.14E-02	2.27E-03	7.37E-05	0.046

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	1.84E-02	1.67E-02	5.05E-02	0.00E+00	0.014	4.26	4.33E-03	1.08E-01
Cs-134	1.51E-02	1.14E-02	5.05E-02	0.00E+00	0.015	6.77	2.23E-03	5.57E-02
Cs-137	2.41E-02	2.07E-02	8.22E-02	0.00E+00	0.022	14.18	1.70E-03	4.25E-02
Ni-63	3.33E+00	3.01E+00	9.11E+00	0.00E+00	2.448	3572.1	9.31E-04	2.33E-02
Sr-90	4.82E-05	4.14E-05	1.64E-04	0.00E+00	0.000	12.09	3.98E-06	9.96E-05

The mean BcSOF for survey unit 10214A is 0.009, which equates to a dose of 0.230 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 two (2) split samples, L2-10214A-FQGS-002-SS and L2-10214A-QIGS-001-SS, using gamma spectroscopy analysis. The data was evaluated using

acceptance criteria specified in ZS-LT-01, “*Quality Assurance Project Plan (for Characterization and FSS)*.” For the systematic sample L2-10214A-FQGS-002-SS, the standard sample and the QC did not both have a positive result for a gamma emitting ROC; therefore, K-40 was used in the QC comparison. For investigation sample L2-10214A-QIGS-001-SS, the standard sample and QC sample both had positive activity for Cs-137. There was acceptable agreement between standard and comparison results. Refer to Attachment 5 for data and QC analysis results.

QC replicate scans were performed in rows 71 through 77 of the survey unit. These rows represent approximately 9% of the total area scanned in this survey unit (403 m² of 4,483 m² total area scanned). The results were evaluated using acceptance criteria specified in the ZS-LT-01. The QC replicate scans were in agreement with the original scans. No elevated measurement locations were identified in either the original survey or the replicate survey in these rows. Complete QC replicate scan results are provided in Attachment 2.

9. INVESTIGATIONS AND RESULTS

Investigations were performed following scan alarms in rows 5, 6, 10 and 56 on December 16, 2019. Four (4) areas were identified: a 2 ft² area in row 5, a 2 ft² area in row 6, a 3 m² (1 meter by 3 meters) area in row 10 and a 1 ft² area in row 56. The maximum count rates were 2,301 cpm, 2,198 cpm, 5,038 cpm and 4,486 cpm respectively (a map of the areas is included in Attachment 1). One (1) surface and one (1) subsurface soil sample were taken in each elevated area in rows 5, 6 and 56: L2-10214A-FIGS-001-SS, L2-10214A-FIGS-002-SS, L2-10214A-FIGS-005-SS, L2-10214A-FIGS-001-SB, L2-10214A-FIGS-002-SB and L2-10214A-FIGS-005-SB. Two (2) surface and two (2) subsurface soil samples were taken in the elevated area located in row 10: L2-10214A-FIGS-003-SS, L2-10214A-FIGS-004-SS, L2-10214A-FIGS-003-SB and L2-10214A-FIGS-004-SB. Gamma spectroscopy results revealed three (3) samples with activity levels above MDC for Cs-137 and no samples with activity levels above MDC for Co-60 or Cs-134. The OpSOF for the investigation samples were all less than 1.0, with a maximum OpSOF of 0.084 for sample L2-10214A-FIGS-002-SB.

On December 17, 2019, the area identified in row 56 was re-scanned because it exhibited the highest maximum count rate of 2,765 cpm above the alarm set point (1,721 cpm) on the initial scan. The alarm could not be reproduced and the maximum count rate was 1,426 cpm. No further action was necessary.

The investigation is documented in an Attachment 13 (from ZS- LT-300-001-004), “Final Status Survey Investigation.” The gamma spectroscopy results are summarized in Table 13 for the surface samples and Table 14 for the subsurface samples. The OpSOF are summarized in Table 18 for the surface samples and Table 19 for the subsurface samples.

10. REMEDIATION AND RESULTS

No remediation was performed in Class 2 open land survey unit 10214A. In accordance with LTP Section 5.6.4.6.1, if contamination is present in a Class 2 open land survey unit in excess of the OpDCGL, then all or part of the survey unit will be reclassified as Class 1 and the survey strategy for that survey unit will be redesigned as discussed above for Class 1. This threshold was not encountered during the FSS of survey unit 10214A.

11. CHANGES FROM THE SURVEY PLAN

Two (2) systematic soil samples were relocated to the closest adjacent suitable location (a distance of one meter) due to the original locations being located over a fiber optic cable. The coordinates of the relocated samples are listed in the table below.

Table 22 - Relocated Systematic Sample Locations

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L1-10214A-FSGS-001-SS	642051.50	343476.69
L1-10214A-FSGS-002-SS	642072.37	343440.56

12. DATA QUALITY ASSESSMENT

The DQO sample design and data were reviewed in accordance with *ZionSolutions* 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

The technicians who collected the systematic soil samples did not document in their FSS field log, as per ZS-LT-300-001-001, that two (2) samples were relocated as discussed in Section 11 above. This was due to an oversight by FSS supervision and the technicians.

14. CONCLUSION

Survey unit 10214A has met the DQOs of the FSS plan. The ALARA criteria for soils as specified in Chapter 4 of the LTP were achieved.

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 exceed 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 0.009, which results in a dose contribution from soil in survey unit 10214A of 0.230 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 10214A is acceptable for unrestricted release.

15. REFERENCES

1. ZionSolutions procedure ZS-LT-300-001-005, “Final Status Survey Data Reporting”
2. Zion Station Restoration Project License Termination Plan
3. ZionSolutions procedure ZS-LT-300-001-001, “Final Status Survey Package Development”
4. NUREG-1575, “Multi-Agency Radiation Survey and Site Investigation Manual”
5. ZionSolutions procedure ZS-LT-300-001-002, “Survey Unit Classification”
6. “Zion Station Historical Site Assessment”
7. ZionSolutions TSD 11-001, “Technical Support Document for Potential Radionuclides of Concern During the Decommissioning of the Zion Station”

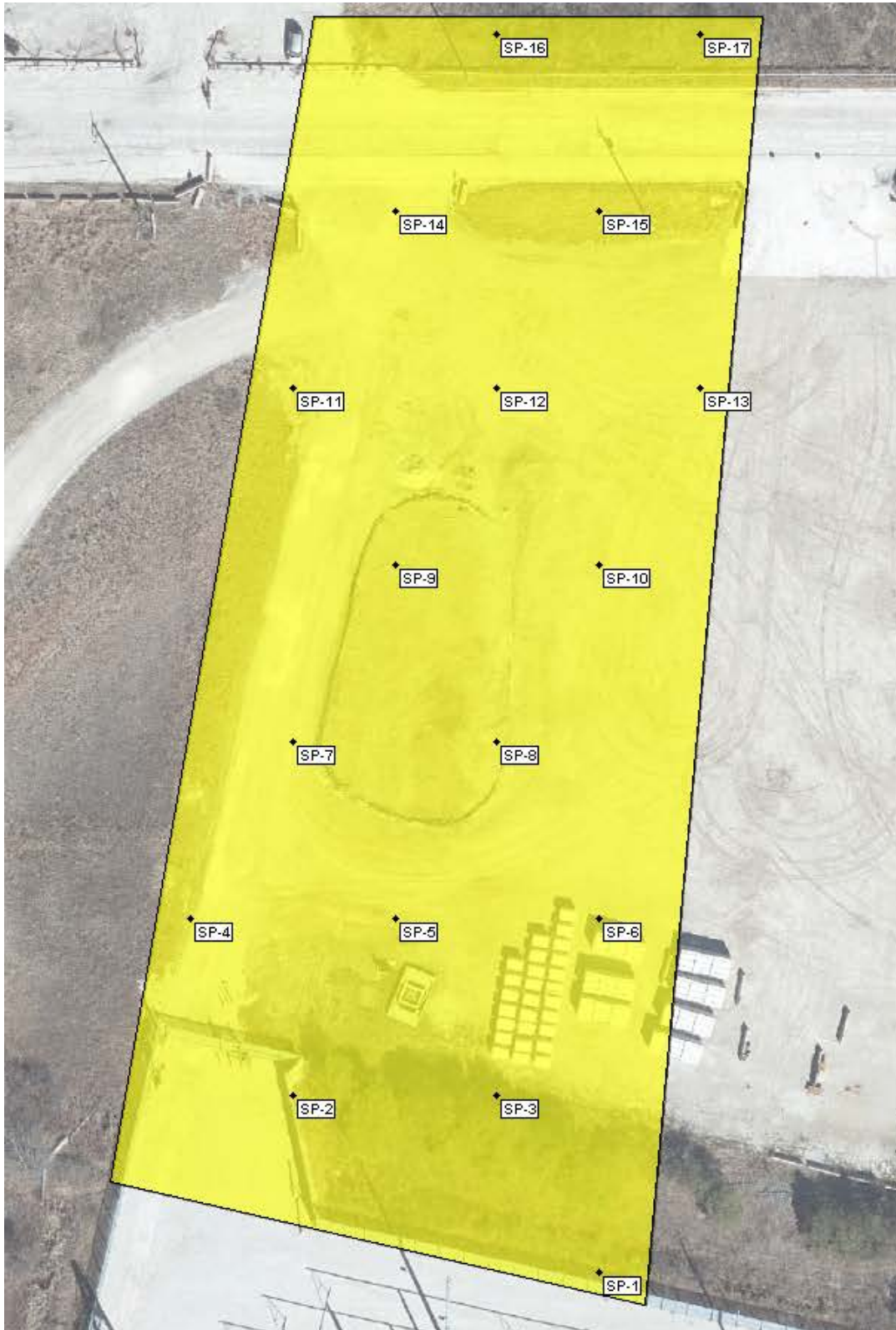
8. *ZionSolutions* TSD 14-019, “Radionuclides of Concern for Soil and Basement Fill Model Source Terms”
9. *ZionSolutions* TSD 14-011, “Soil Area Factors”
10. *ZionSolutions* TSD 17-004, “Operational Derived Concentration Guideline Levels for Final Status Survey”
11. *ZionSolutions* TSD 11-004, “Ludlum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

16. ATTACHMENTS

1. Attachment 1 - Figures 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
FIGURES AND MAP**

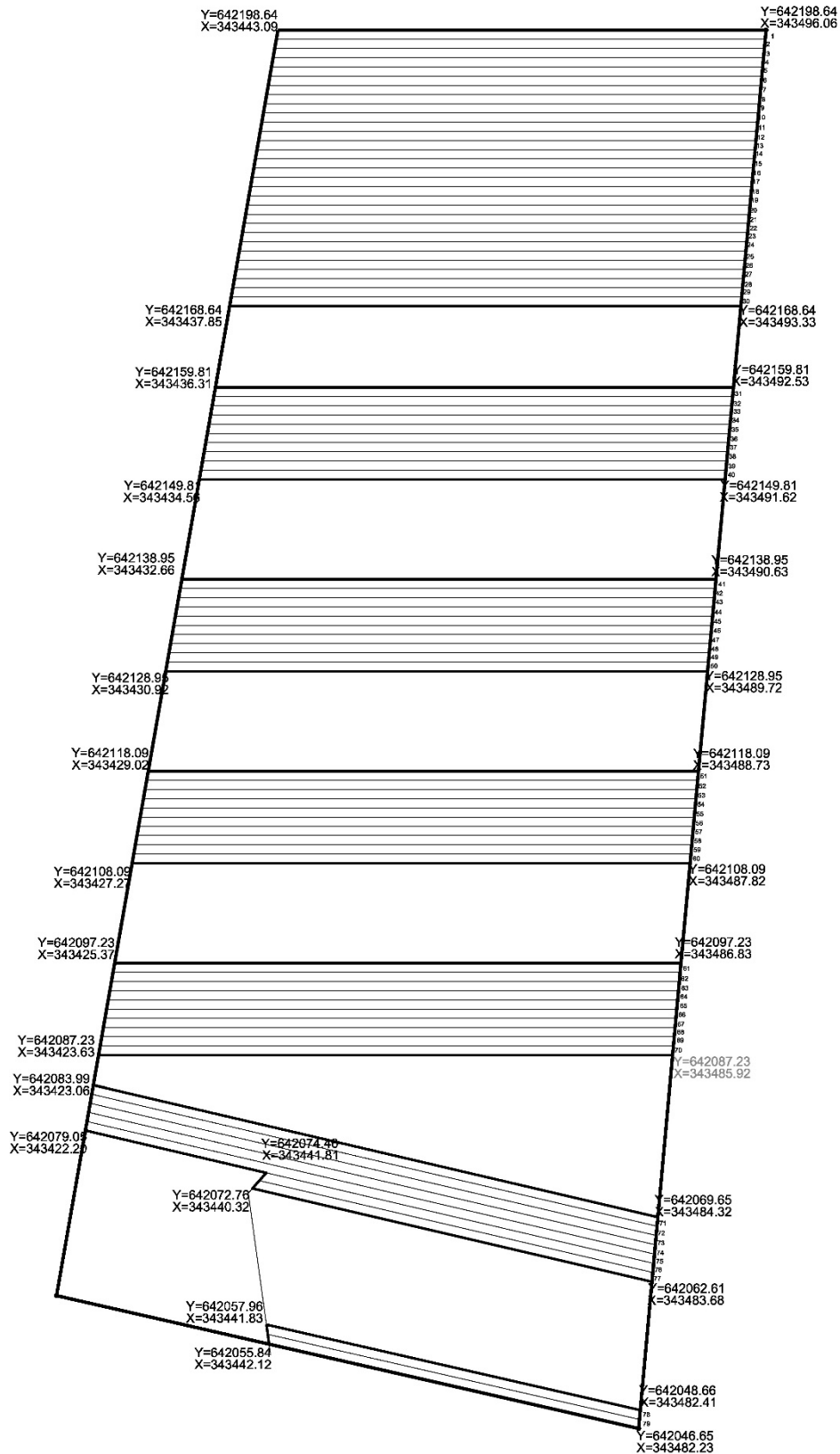
Survey Unit 10214A Final Status Survey Boundaries and Systematic Sample Points



Survey Unit 10214A Investigation Sample Points



Survey Unit 10214A 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
ORIGINAL SCANS									
44-10	PR363311	304718	10214A	GS001	12/16/2019 10:02	1391	1253	1788	No
44-10	PR363311	304718	10214A	GS001	12/16/2019 10:04	1433	1253	1788	No
44-10	PR363311	304718	10214A	GS001	12/16/2019 10:06	1301	1253	1788	No
44-10	PR363311	304718	10214A	GS001	12/16/2019 10:11	1294	1253	1788	No
44-10	PR363311	304718	10214A	GS001	12/16/2019 10:13	1277	1253	1788	No
44-10	PR363311	304718	10214A	GS001	12/16/2019 10:14	1771	1253	1788	No
44-10	PR363311	304718	10214A	GS002	12/16/2019 10:15	1679	1253	1788	No
44-10	PR363311	304718	10214A	GS002	12/16/2019 10:17	1474	1253	1788	No
44-10	PR363311	304718	10214A	GS002	12/16/2019 10:19	1264	1253	1788	No
44-10	PR363311	304718	10214A	GS002	12/16/2019 10:21	1336	1253	1788	No
44-10	PR363311	304718	10214A	GS002	12/16/2019 10:23	1396	1253	1788	No
44-10	PR363311	304718	10214A	GS002	12/16/2019 10:25	1343	1253	1788	No
44-10	PR363311	304718	10214A	GS003	12/16/2019 10:27	1382	1253	1788	No
44-10	PR363311	304718	10214A	GS003	12/16/2019 10:29	1393	1253	1788	No
44-10	PR363311	304718	10214A	GS003	12/16/2019 10:31	1290	1253	1788	No
44-10	PR363311	304718	10214A	GS003	12/16/2019 10:33	1276	1253	1788	No
44-10	PR363311	304718	10214A	GS003	12/16/2019 10:35	1435	1253	1788	No
44-10	PR363311	304718	10214A	GS003	12/16/2019 10:36	1429	1253	1788	No
44-10	PR363311	304718	10214A	GS004	12/16/2019 10:37	1529	1253	1788	No
44-10	PR363311	304718	10214A	GS004	12/16/2019 10:39	1575	1253	1788	No
44-10	PR363311	304718	10214A	GS004	12/16/2019 10:41	1392	1253	1788	No
44-10	PR363311	304718	10214A	GS004	12/16/2019 10:43	1545	1253	1788	No
44-10	PR363311	304718	10214A	GS004	12/16/2019 10:45	1472	1253	1788	No
44-10	PR363311	304718	10214A	GS004	12/16/2019 10:47	1410	1253	1788	No
44-10	PR363311	304718	10214A	GS005	12/16/2019 12:24	1684	1253	1788	No
44-10	PR363311	304718	10214A	GS005	12/16/2019 12:27	1730	1253	1788	No
44-10	PR363311	304718	10214A	GS005	12/16/2019 12:29	1398	1253	1788	No
44-10	PR363311	304718	10214A	GS005	12/16/2019 12:34	2301	1253	1788	Yes
44-10	PR363311	304718	10214A	GS005	12/16/2019 12:40	1442	1253	1788	No
44-10	PR363311	304718	10214A	GS005	12/16/2019 12:43	1459	1253	1788	No
44-10	PR363311	304718	10214A	GS006	12/16/2019 12:45	1343	1253	1788	No
44-10	PR363311	304718	10214A	GS006	12/16/2019 12:47	2198	1253	1788	Yes
44-10	PR363311	304718	10214A	GS006	12/16/2019 12:50	1683	1253	1788	No
44-10	PR363311	304718	10214A	GS006	12/16/2019 12:52	1371	1253	1788	No
44-10	PR363311	304718	10214A	GS006	12/16/2019 12:54	1408	1253	1788	No
44-10	PR363311	304718	10214A	GS006	12/16/2019 12:55	1432	1253	1788	No
44-10	PR363311	304718	10214A	GS007	12/16/2019 12:56	1420	1253	1788	No
44-10	PR363311	304718	10214A	GS007	12/16/2019 12:58	1601	1253	1788	No
44-10	PR363311	304718	10214A	GS007	12/16/2019 13:00	1457	1253	1788	No
44-10	PR363311	304718	10214A	GS007	12/16/2019 13:03	1375	1253	1788	No
44-10	PR363311	304718	10214A	GS007	12/16/2019 13:09	1363	1253	1788	No
44-10	PR363311	304718	10214A	GS007	12/16/2019 13:11	1292	1253	1788	No
44-10	PR363311	304718	10214A	GS008	12/16/2019 13:14	1347	1253	1788	No
44-10	PR363311	304718	10214A	GS008	12/16/2019 13:19	1351	1253	1788	No
44-10	PR363311	304718	10214A	GS008	12/16/2019 13:22	1457	1253	1788	No

FSS RELEASE RECORD – REV. 1
 CONSTRUCTION PARKING AREA
 SURVEY UNIT 10214A



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	10214A	GS008	12/16/2019 13:24	1467	1253	1788	No
44-10	PR363311	304718	10214A	GS008	12/16/2019 13:26	1591	1253	1788	No
44-10	PR363311	304718	10214A	GS008	12/16/2019 13:27	1360	1253	1788	No
44-10	PR363311	304718	10214A	GS009	12/16/2019 13:55	3123	2807	3608	No
44-10	PR363311	304718	10214A	GS009	12/16/2019 13:59	2861	2807	3608	No
44-10	PR363311	304718	10214A	GS009	12/16/2019 14:01	2867	2807	3608	No
44-10	PR363311	304718	10214A	GS009	12/16/2019 14:05	3134	2807	3608	No
44-10	PR363311	304718	10214A	GS009	12/16/2019 14:08	2816	2807	3608	No
44-10	PR363311	304718	10214A	GS009	12/16/2019 14:10	2855	2807	3608	No
44-10	PR363311	304718	10214A	GS010	12/16/2019 14:14	2816	2807	3608	No
44-10	PR363311	304718	10214A	GS010	12/16/2019 14:18	2937	2807	3608	No
44-10	PR363311	304718	10214A	GS010	12/16/2019 14:21	3141	2807	3608	No
44-10	PR363311	304718	10214A	GS010	12/16/2019 14:22	5038	2807	3608	Yes
44-10	PR363311	304718	10214A	GS010	12/16/2019 14:33	3150	2807	3608	No
44-10	PR363311	304718	10214A	GS010	12/16/2019 14:36	3002	2807	3608	No
44-10	PR363311	304718	10214A	GS011	12/17/2019 8:50	3495	2744	3536	No
44-10	PR363311	304718	10214A	GS011	12/17/2019 8:52	3316	2744	3536	No
44-10	PR363311	304718	10214A	GS011	12/17/2019 8:54	2999	2744	3536	No
44-10	PR363311	304718	10214A	GS011	12/17/2019 8:56	3128	2744	3536	No
44-10	PR363311	304718	10214A	GS011	12/17/2019 8:58	2952	2744	3536	No
44-10	PR363311	304718	10214A	GS012	12/17/2019 9:00	3031	2744	3536	No
44-10	PR363311	304718	10214A	GS012	12/17/2019 9:02	2883	2744	3536	No
44-10	PR363311	304718	10214A	GS012	12/17/2019 9:04	2976	2744	3536	No
44-10	PR363311	304718	10214A	GS012	12/17/2019 9:07	2907	2744	3536	No
44-10	PR363311	304718	10214A	GS012	12/17/2019 9:09	3154	2744	3536	No
44-10	PR363311	304718	10214A	GS012	12/17/2019 9:11	3176	2744	3536	No
44-10	PR363311	304718	10214A	GS013	12/17/2019 9:13	3265	2744	3536	No
44-10	PR363311	304718	10214A	GS013	12/17/2019 9:15	3084	2744	3536	No
44-10	PR363311	304718	10214A	GS013	12/17/2019 9:17	2865	2744	3536	No
44-10	PR363311	304718	10214A	GS013	12/17/2019 9:20	3231	2744	3536	No
44-10	PR363311	304718	10214A	GS013	12/17/2019 9:22	3082	2744	3536	No
44-10	PR363311	304718	10214A	GS013	12/17/2019 9:23	3121	2744	3536	No
44-10	PR363311	304718	10214A	GS014	12/17/2019 9:24	3110	2744	3536	No
44-10	PR363311	304718	10214A	GS014	12/17/2019 9:26	2957	2744	3536	No
44-10	PR363311	304718	10214A	GS014	12/17/2019 9:28	3300	2744	3536	No
44-10	PR363311	304718	10214A	GS014	12/17/2019 9:30	2967	2744	3536	No
44-10	PR363311	304718	10214A	GS014	12/17/2019 9:32	2957	2744	3536	No
44-10	PR363311	304718	10214A	GS014	12/17/2019 9:34	3092	2744	3536	No
44-10	PR363311	304718	10214A	GS015	12/17/2019 9:36	3262	2744	3536	No
44-10	PR363311	304718	10214A	GS015	12/17/2019 9:38	3238	2744	3536	No
44-10	PR363311	304718	10214A	GS015	12/17/2019 9:40	3151	2744	3536	No
44-10	PR363311	304718	10214A	GS015	12/17/2019 9:42	3077	2744	3536	No
44-10	PR363311	304718	10214A	GS015	12/17/2019 9:44	3407	2744	3536	No
44-10	PR363311	304718	10214A	GS015	12/17/2019 9:46	3241	2744	3536	No
44-10	PR363311	304718	10214A	GS011	12/17/2019 13:15	2983	2744	3536	No
44-10	PR311750	266656	10214A	GS016	12/16/2019 9:53	3045	2811	3612	No

FSS RELEASE RECORD – REV. 1
 CONSTRUCTION PARKING AREA
 SURVEY UNIT 10214A



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	10214A	GS016	12/16/2019 9:56	3278	2811	3612	No
44-10	PR311750	266656	10214A	GS016	12/16/2019 9:58	3063	2811	3612	No
44-10	PR311750	266656	10214A	GS016	12/16/2019 10:01	3123	2811	3612	No
44-10	PR311750	266656	10214A	GS016	12/16/2019 10:04	3208	2811	3612	No
44-10	PR311750	266656	10214A	GS016	12/16/2019 10:07	3276	2811	3612	No
44-10	PR311750	266656	10214A	GS017	12/16/2019 10:10	2968	2811	3612	No
44-10	PR311750	266656	10214A	GS017	12/16/2019 10:14	2856	2811	3612	No
44-10	PR311750	266656	10214A	GS017	12/16/2019 10:16	2944	2811	3612	No
44-10	PR311750	266656	10214A	GS017	12/16/2019 10:19	3008	2811	3612	No
44-10	PR311750	266656	10214A	GS017	12/16/2019 10:22	2885	2811	3612	No
44-10	PR311750	266656	10214A	GS017	12/16/2019 10:24	3110	2811	3612	No
44-10	PR311750	266656	10214A	GS018	12/16/2019 12:27	2763	2437	3183	No
44-10	PR311750	266656	10214A	GS018	12/16/2019 12:29	2543	2437	3183	No
44-10	PR311750	266656	10214A	GS018	12/16/2019 12:31	2540	2437	3183	No
44-10	PR311750	266656	10214A	GS018	12/16/2019 12:34	2658	2437	3183	No
44-10	PR311750	266656	10214A	GS018	12/16/2019 12:36	2667	2437	3183	No
44-10	PR311750	266656	10214A	GS018	12/16/2019 12:38	2516	2437	3183	No
44-10	PR311750	266656	10214A	GS019	12/16/2019 12:40	2525	2437	3183	No
44-10	PR311750	266656	10214A	GS019	12/16/2019 12:42	2568	2437	3183	No
44-10	PR311750	266656	10214A	GS019	12/16/2019 12:44	2455	2437	3183	No
44-10	PR311750	266656	10214A	GS019	12/16/2019 12:48	2505	2437	3183	No
44-10	PR311750	266656	10214A	GS019	12/16/2019 12:50	2892	2437	3183	No
44-10	PR311750	266656	10214A	GS019	12/16/2019 12:52	2488	2437	3183	No
44-10	PR311750	266656	10214A	GS020	12/16/2019 13:25	1442	1339	1892	No
44-10	PR311750	266656	10214A	GS020	12/16/2019 13:27	1613	1339	1892	No
44-10	PR311750	266656	10214A	GS020	12/16/2019 13:29	1476	1339	1892	No
44-10	PR311750	266656	10214A	GS020	12/16/2019 13:31	1792	1339	1892	No
44-10	PR311750	266656	10214A	GS020	12/16/2019 13:33	1776	1339	1892	No
44-10	PR311750	266656	10214A	GS020	12/16/2019 13:36	1575	1339	1892	No
44-10	PR311750	266656	10214A	GS021	12/16/2019 13:55	1289	1020	1503	No
44-10	PR311750	266656	10214A	GS021	12/16/2019 13:57	1124	1020	1503	No
44-10	PR311750	266656	10214A	GS021	12/16/2019 14:00	1143	1020	1503	No
44-10	PR311750	266656	10214A	GS021	12/16/2019 14:02	1259	1020	1503	No
44-10	PR311750	266656	10214A	GS021	12/16/2019 14:04	1152	1020	1503	No
44-10	PR311750	266656	10214A	GS021	12/16/2019 14:06	1160	1020	1503	No
44-10	PR311750	266656	10214A	GS022	12/16/2019 14:08	1257	1020	1503	No
44-10	PR311750	266656	10214A	GS022	12/16/2019 14:10	1324	1020	1503	No
44-10	PR311750	266656	10214A	GS022	12/16/2019 14:12	1339	1020	1503	No
44-10	PR311750	266656	10214A	GS022	12/16/2019 14:14	1268	1020	1503	No
44-10	PR311750	266656	10214A	GS022	12/16/2019 14:17	1042	1020	1503	No
44-10	PR311750	266656	10214A	GS022	12/16/2019 14:19	1040	1020	1503	No
44-10	PR311750	266656	10214A	GS023	12/16/2019 14:21	1065	1020	1503	No
44-10	PR311750	266656	10214A	GS023	12/16/2019 14:23	1120	1020	1503	No
44-10	PR311750	266656	10214A	GS023	12/16/2019 14:25	1339	1020	1503	No
44-10	PR311750	266656	10214A	GS023	12/16/2019 14:27	1320	1020	1503	No
44-10	PR311750	266656	10214A	GS023	12/16/2019 14:29	1238	1020	1503	No

FSS RELEASE RECORD – REV. 1
 CONSTRUCTION PARKING AREA
 SURVEY UNIT 10214A



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	10214A	GS023	12/16/2019 14:31	1154	1020	1503	No
44-10	PR311750	266656	10214A	GS024	12/16/2019 14:35	1150	1020	1503	No
44-10	PR311750	266656	10214A	GS024	12/16/2019 14:38	1143	1020	1503	No
44-10	PR311750	266656	10214A	GS024	12/16/2019 14:40	1231	1020	1503	No
44-10	PR311750	266656	10214A	GS024	12/16/2019 14:42	1139	1020	1503	No
44-10	PR311750	266656	10214A	GS024	12/16/2019 14:44	1050	1020	1503	No
44-10	PR311750	266656	10214A	GS024	12/16/2019 14:46	1141	1020	1503	No
44-10	PR311750	266656	10214A	GS025	12/16/2019 14:48	1304	1020	1503	No
44-10	PR311750	266656	10214A	GS025	12/16/2019 14:51	1046	1020	1503	No
44-10	PR311750	266656	10214A	GS025	12/16/2019 14:53	1264	1020	1503	No
44-10	PR311750	266656	10214A	GS025	12/16/2019 14:55	1336	1020	1503	No
44-10	PR311750	266656	10214A	GS025	12/16/2019 14:57	1161	1020	1503	No
44-10	PR311750	266656	10214A	GS025	12/16/2019 15:00	1166	1020	1503	No
44-10	PR311750	266656	10214A	GS026	12/16/2019 15:03	1151	1020	1503	No
44-10	PR311750	266656	10214A	GS026	12/16/2019 15:05	1148	1020	1503	No
44-10	PR311750	266656	10214A	GS026	12/16/2019 15:07	1215	1020	1503	No
44-10	PR311750	266656	10214A	GS026	12/16/2019 15:09	1214	1020	1503	No
44-10	PR311750	266656	10214A	GS026	12/16/2019 15:11	1046	1020	1503	No
44-10	PR311750	266656	10214A	GS026	12/16/2019 15:13	1222	1020	1503	No
44-10	PR311750	266656	10214A	GS027	12/17/2019 8:48	1621	1347	1902	No
44-10	PR311750	266656	10214A	GS027	12/17/2019 8:50	1377	1347	1902	No
44-10	PR311750	266656	10214A	GS027	12/17/2019 8:52	1479	1347	1902	No
44-10	PR311750	266656	10214A	GS027	12/17/2019 8:54	1649	1347	1902	No
44-10	PR311750	266656	10214A	GS027	12/17/2019 8:56	1629	1347	1902	No
44-10	PR311750	266656	10214A	GS027	12/17/2019 8:58	1663	1347	1902	No
44-10	PR311750	266656	10214A	GS028	12/17/2019 9:00	1666	1347	1902	No
44-10	PR311750	266656	10214A	GS028	12/17/2019 9:02	1517	1347	1902	No
44-10	PR311750	266656	10214A	GS028	12/17/2019 9:04	1594	1347	1902	No
44-10	PR311750	266656	10214A	GS028	12/17/2019 9:06	1470	1347	1902	No
44-10	PR311750	266656	10214A	GS028	12/17/2019 9:08	1431	1347	1902	No
44-10	PR311750	266656	10214A	GS028	12/17/2019 9:10	1646	1347	1902	No
44-10	PR311750	266656	10214A	GS029	12/17/2019 9:12	1662	1347	1902	No
44-10	PR311750	266656	10214A	GS029	12/17/2019 9:14	1371	1347	1902	No
44-10	PR311750	266656	10214A	GS029	12/17/2019 9:16	1464	1347	1902	No
44-10	PR311750	266656	10214A	GS029	12/17/2019 9:18	1593	1347	1902	No
44-10	PR311750	266656	10214A	GS029	12/17/2019 9:20	1502	1347	1902	No
44-10	PR311750	266656	10214A	GS029	12/17/2019 9:22	1553	1347	1902	No
44-10	PR311750	266656	10214A	GS030	12/17/2019 9:24	1648	1347	1902	No
44-10	PR311750	266656	10214A	GS030	12/17/2019 9:26	1386	1347	1902	No
44-10	PR311750	266656	10214A	GS030	12/17/2019 9:28	1421	1347	1902	No
44-10	PR311750	266656	10214A	GS030	12/17/2019 9:30	1421	1347	1902	No
44-10	PR311750	266656	10214A	GS030	12/17/2019 9:32	1471	1347	1902	No
44-10	PR311750	266656	10214A	GS030	12/17/2019 9:34	1684	1347	1902	No
44-10	PR316938	293136	10214A	GS031	12/17/2019 8:16	1409	1337	1890	No
44-10	PR316938	293136	10214A	GS031	12/17/2019 8:18	1374	1337	1890	No
44-10	PR316938	293136	10214A	GS031	12/17/2019 8:20	1334	1337	1890	No

FSS RELEASE RECORD – REV. 1
 CONSTRUCTION PARKING AREA
 SURVEY UNIT 10214A



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	PR316938	293136	10214A	GS031	12/17/2019 8:22	1375	1337	1890	No
44-10	PR316938	293136	10214A	GS031	12/17/2019 8:24	1466	1337	1890	No
44-10	PR316938	293136	10214A	GS031	12/17/2019 8:26	1476	1337	1890	No
44-10	PR316938	293136	10214A	GS032	12/17/2019 8:28	1475	1337	1890	No
44-10	PR316938	293136	10214A	GS032	12/17/2019 8:30	1408	1337	1890	No
44-10	PR316938	293136	10214A	GS032	12/17/2019 8:32	1416	1337	1890	No
44-10	PR316938	293136	10214A	GS032	12/17/2019 8:34	1391	1337	1890	No
44-10	PR316938	293136	10214A	GS032	12/17/2019 8:36	1429	1337	1890	No
44-10	PR316938	293136	10214A	GS032	12/17/2019 8:38	1374	1337	1890	No
44-10	PR316938	293136	10214A	GS033	12/17/2019 8:40	1343	1337	1890	No
44-10	PR316938	293136	10214A	GS033	12/17/2019 8:43	1318	1337	1890	No
44-10	PR316938	293136	10214A	GS033	12/17/2019 8:45	1345	1337	1890	No
44-10	PR316938	293136	10214A	GS033	12/17/2019 8:47	1413	1337	1890	No
44-10	PR316938	293136	10214A	GS033	12/17/2019 8:49	1468	1337	1890	No
44-10	PR316938	293136	10214A	GS033	12/17/2019 8:51	1544	1337	1890	No
44-10	PR316938	293136	10214A	GS034	12/17/2019 8:53	1674	1337	1890	No
44-10	PR316938	293136	10214A	GS034	12/17/2019 8:55	1490	1337	1890	No
44-10	PR316938	293136	10214A	GS034	12/17/2019 8:57	1412	1337	1890	No
44-10	PR316938	293136	10214A	GS034	12/17/2019 8:59	1372	1337	1890	No
44-10	PR316938	293136	10214A	GS034	12/17/2019 9:01	1363	1337	1890	No
44-10	PR316938	293136	10214A	GS034	12/17/2019 9:03	1412	1337	1890	No
44-10	PR316938	293136	10214A	GS035	12/17/2019 9:05	1350	1337	1890	No
44-10	PR316938	293136	10214A	GS035	12/17/2019 9:07	1354	1337	1890	No
44-10	PR316938	293136	10214A	GS035	12/17/2019 9:09	1445	1337	1890	No
44-10	PR316938	293136	10214A	GS035	12/17/2019 9:11	1525	1337	1890	No
44-10	PR316938	293136	10214A	GS035	12/17/2019 9:13	1487	1337	1890	No
44-10	PR316938	293136	10214A	GS035	12/17/2019 9:15	1577	1337	1890	No
44-10	PR316938	293136	10214A	GS036	12/17/2019 9:17	1572	1337	1890	No
44-10	PR316938	293136	10214A	GS036	12/17/2019 9:19	1445	1337	1890	No
44-10	PR316938	293136	10214A	GS036	12/17/2019 9:21	1426	1337	1890	No
44-10	PR316938	293136	10214A	GS036	12/17/2019 9:23	1449	1337	1890	No
44-10	PR316938	293136	10214A	GS036	12/17/2019 9:25	1279	1337	1890	No
44-10	PR316938	293136	10214A	GS036	12/17/2019 9:27	1361	1337	1890	No
44-10	PR316938	293136	10214A	GS037	12/17/2019 9:29	1344	1337	1890	No
44-10	PR316938	293136	10214A	GS037	12/17/2019 9:31	1421	1337	1890	No
44-10	PR316938	293136	10214A	GS037	12/17/2019 9:33	1337	1337	1890	No
44-10	PR316938	293136	10214A	GS037	12/17/2019 9:35	1460	1337	1890	No
44-10	PR316938	293136	10214A	GS037	12/17/2019 9:37	1503	1337	1890	No
44-10	PR316938	293136	10214A	GS037	12/17/2019 9:39	1621	1337	1890	No
44-10	PR316938	293136	10214A	GS038	12/17/2019 9:41	1518	1337	1890	No
44-10	PR316938	293136	10214A	GS038	12/17/2019 9:43	1403	1337	1890	No
44-10	PR316938	293136	10214A	GS038	12/17/2019 9:45	1501	1337	1890	No
44-10	PR316938	293136	10214A	GS038	12/17/2019 9:47	1405	1337	1890	No
44-10	PR316938	293136	10214A	GS038	12/17/2019 9:49	1346	1337	1890	No
44-10	PR316938	293136	10214A	GS038	12/17/2019 9:51	1322	1337	1890	No
44-10	PR316938	293136	10214A	GS039	12/17/2019 9:53	1491	1337	1890	No

FSS RELEASE RECORD – REV. 1
CONSTRUCTION PARKING AREA
SURVEY UNIT 10214A



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	PR316938	293136	10214A	GS039	12/17/2019 9:55	1356	1337	1890	No
44-10	PR316938	293136	10214A	GS039	12/17/2019 9:57	1500	1337	1890	No
44-10	PR316938	293136	10214A	GS039	12/17/2019 9:59	1457	1337	1890	No
44-10	PR316938	293136	10214A	GS039	12/17/2019 10:01	1377	1337	1890	No
44-10	PR316938	293136	10214A	GS039	12/17/2019 10:03	1581	1337	1890	No
44-10	PR316938	293136	10214A	GS040	12/17/2019 10:06	1559	1337	1890	No
44-10	PR316938	293136	10214A	GS040	12/17/2019 10:08	1383	1337	1890	No
44-10	PR316938	293136	10214A	GS040	12/17/2019 10:10	1440	1337	1890	No
44-10	PR316938	293136	10214A	GS040	12/17/2019 10:12	1421	1337	1890	No
44-10	PR316938	293136	10214A	GS040	12/17/2019 10:14	1367	1337	1890	No
44-10	PR316938	293136	10214A	GS040	12/17/2019 10:16	1350	1337	1890	No
44-10	PR316938	293136	10214A	GS041	12/17/2019 10:18	1415	1337	1890	No
44-10	PR316938	293136	10214A	GS041	12/17/2019 10:20	1400	1337	1890	No
44-10	PR316938	293136	10214A	GS041	12/17/2019 10:22	1488	1337	1890	No
44-10	PR316938	293136	10214A	GS041	12/17/2019 10:24	1405	1337	1890	No
44-10	PR316938	293136	10214A	GS041	12/17/2019 10:26	1447	1337	1890	No
44-10	PR316938	293136	10214A	GS041	12/17/2019 10:28	1642	1337	1890	No
44-10	PR316938	293136	10214A	GS042	12/17/2019 10:30	1563	1337	1890	No
44-10	PR316938	293136	10214A	GS042	12/17/2019 10:32	1395	1337	1890	No
44-10	PR316938	293136	10214A	GS042	12/17/2019 10:34	1513	1337	1890	No
44-10	PR316938	293136	10214A	GS042	12/17/2019 10:36	1431	1337	1890	No
44-10	PR316938	293136	10214A	GS042	12/17/2019 10:38	1469	1337	1890	No
44-10	PR316938	293136	10214A	GS042	12/17/2019 10:40	1332	1337	1890	No
44-10	PR316938	293136	10214A	GS043	12/17/2019 10:42	1444	1337	1890	No
44-10	PR316938	293136	10214A	GS043	12/17/2019 10:44	1429	1337	1890	No
44-10	PR316938	293136	10214A	GS043	12/17/2019 10:46	1451	1337	1890	No
44-10	PR316938	293136	10214A	GS043	12/17/2019 10:48	1462	1337	1890	No
44-10	PR316938	293136	10214A	GS043	12/17/2019 10:50	1365	1337	1890	No
44-10	PR316938	293136	10214A	GS043	12/17/2019 10:52	1551	1337	1890	No
44-10	PR321892	304708	10214A	GS044	12/16/2019 9:44	1439	1198	1721	No
44-10	PR321892	304708	10214A	GS044	12/16/2019 9:46	1268	1198	1721	No
44-10	PR321892	304708	10214A	GS044	12/16/2019 9:48	1317	1198	1721	No
44-10	PR321892	304708	10214A	GS044	12/16/2019 9:50	1211	1198	1721	No
44-10	PR321892	304708	10214A	GS044	12/16/2019 9:52	1221	1198	1721	No
44-10	PR321892	304708	10214A	GS044	12/16/2019 9:54	1282	1198	1721	No
44-10	PR321892	304708	10214A	GS045	12/16/2019 9:56	1267	1198	1721	No
44-10	PR321892	304708	10214A	GS045	12/16/2019 9:58	1290	1198	1721	No
44-10	PR321892	304708	10214A	GS045	12/16/2019 10:00	1295	1198	1721	No
44-10	PR321892	304708	10214A	GS045	12/16/2019 10:02	1392	1198	1721	No
44-10	PR321892	304708	10214A	GS045	12/16/2019 10:04	1329	1198	1721	No
44-10	PR321892	304708	10214A	GS045	12/16/2019 10:06	1469	1198	1721	No
44-10	PR321892	304708	10214A	GS046	12/16/2019 10:08	1476	1198	1721	No
44-10	PR321892	304708	10214A	GS046	12/16/2019 10:10	1349	1198	1721	No
44-10	PR321892	304708	10214A	GS046	12/16/2019 10:12	1358	1198	1721	No
44-10	PR321892	304708	10214A	GS046	12/16/2019 10:14	1358	1198	1721	No
44-10	PR321892	304708	10214A	GS046	12/16/2019 10:16	1267	1198	1721	No

FSS RELEASE RECORD – REV. 1
 CONSTRUCTION PARKING AREA
 SURVEY UNIT 10214A



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	10214A	GS046	12/16/2019 10:18	1212	1198	1721	No
44-10	PR321892	304708	10214A	GS047	12/16/2019 10:20	1204	1198	1721	No
44-10	PR321892	304708	10214A	GS047	12/16/2019 10:22	1231	1198	1721	No
44-10	PR321892	304708	10214A	GS047	12/16/2019 10:24	1389	1198	1721	No
44-10	PR321892	304708	10214A	GS047	12/16/2019 10:26	1349	1198	1721	No
44-10	PR321892	304708	10214A	GS047	12/16/2019 10:28	1354	1198	1721	No
44-10	PR321892	304708	10214A	GS047	12/16/2019 10:30	1476	1198	1721	No
44-10	PR321892	304708	10214A	GS048	12/16/2019 10:32	1503	1198	1721	No
44-10	PR321892	304708	10214A	GS048	12/16/2019 10:34	1347	1198	1721	No
44-10	PR321892	304708	10214A	GS048	12/16/2019 10:36	1373	1198	1721	No
44-10	PR321892	304708	10214A	GS048	12/16/2019 10:39	1408	1198	1721	No
44-10	PR321892	304708	10214A	GS048	12/16/2019 10:41	1286	1198	1721	No
44-10	PR321892	304708	10214A	GS048	12/16/2019 10:43	1231	1198	1721	No
44-10	PR321892	304708	10214A	GS049	12/16/2019 12:27	1243	1198	1721	No
44-10	PR321892	304708	10214A	GS049	12/16/2019 12:29	1340	1198	1721	No
44-10	PR321892	304708	10214A	GS049	12/16/2019 12:31	1353	1198	1721	No
44-10	PR321892	304708	10214A	GS049	12/16/2019 12:33	1363	1198	1721	No
44-10	PR321892	304708	10214A	GS049	12/16/2019 12:35	1242	1198	1721	No
44-10	PR321892	304708	10214A	GS049	12/16/2019 12:37	1256	1198	1721	No
44-10	PR321892	304708	10214A	GS050	12/16/2019 12:39	1211	1198	1721	No
44-10	PR321892	304708	10214A	GS050	12/16/2019 12:41	1222	1198	1721	No
44-10	PR321892	304708	10214A	GS050	12/16/2019 12:43	1378	1198	1721	No
44-10	PR321892	304708	10214A	GS050	12/16/2019 12:45	1320	1198	1721	No
44-10	PR321892	304708	10214A	GS050	12/16/2019 12:47	1362	1198	1721	No
44-10	PR321892	304708	10214A	GS050	12/16/2019 12:49	1521	1198	1721	No
44-10	PR321892	304708	10214A	GS051	12/16/2019 12:51	1499	1198	1721	No
44-10	PR321892	304708	10214A	GS051	12/16/2019 12:53	1427	1198	1721	No
44-10	PR321892	304708	10214A	GS051	12/16/2019 12:55	1450	1198	1721	No
44-10	PR321892	304708	10214A	GS051	12/16/2019 12:57	1449	1198	1721	No
44-10	PR321892	304708	10214A	GS051	12/16/2019 12:59	1251	1198	1721	No
44-10	PR321892	304708	10214A	GS051	12/16/2019 13:01	1236	1198	1721	No
44-10	PR321892	304708	10214A	GS052	12/16/2019 13:03	1272	1198	1721	No
44-10	PR321892	304708	10214A	GS052	12/16/2019 13:05	1252	1198	1721	No
44-10	PR321892	304708	10214A	GS052	12/16/2019 13:07	1391	1198	1721	No
44-10	PR321892	304708	10214A	GS052	12/16/2019 13:09	1355	1198	1721	No
44-10	PR321892	304708	10214A	GS052	12/16/2019 13:11	1532	1198	1721	No
44-10	PR321892	304708	10214A	GS052	12/16/2019 13:13	1507	1198	1721	No
44-10	PR321892	304708	10214A	GS053	12/16/2019 13:15	1493	1198	1721	No
44-10	PR321892	304708	10214A	GS053	12/16/2019 13:17	1372	1198	1721	No
44-10	PR321892	304708	10214A	GS053	12/16/2019 13:19	1402	1198	1721	No
44-10	PR321892	304708	10214A	GS053	12/16/2019 13:21	1384	1198	1721	No
44-10	PR321892	304708	10214A	GS053	12/16/2019 13:23	1241	1198	1721	No
44-10	PR321892	304708	10214A	GS053	12/16/2019 13:25	1245	1198	1721	No
44-10	PR321892	304708	10214A	GS054	12/16/2019 13:27	1253	1198	1721	No
44-10	PR321892	304708	10214A	GS054	12/16/2019 13:29	1217	1198	1721	No
44-10	PR321892	304708	10214A	GS054	12/16/2019 13:31	1387	1198	1721	No

FSS RELEASE RECORD – REV. 1
 CONSTRUCTION PARKING AREA
 SURVEY UNIT 10214A



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	10214A	GS054	12/16/2019 13:33	1397	1198	1721	No
44-10	PR321892	304708	10214A	GS054	12/16/2019 13:35	1440	1198	1721	No
44-10	PR321892	304708	10214A	GS054	12/16/2019 13:37	1526	1198	1721	No
44-10	PR321892	304708	10214A	GS055	12/16/2019 13:39	1515	1198	1721	No
44-10	PR321892	304708	10214A	GS055	12/16/2019 13:41	1439	1198	1721	No
44-10	PR321892	304708	10214A	GS055	12/16/2019 13:43	1351	1198	1721	No
44-10	PR321892	304708	10214A	GS055	12/16/2019 13:45	1353	1198	1721	No
44-10	PR321892	304708	10214A	GS055	12/16/2019 13:47	1294	1198	1721	No
44-10	PR321892	304708	10214A	GS055	12/16/2019 13:49	1210	1198	1721	No
44-10	PR321892	304708	10214A	GS056	12/16/2019 13:52	1225	1198	1721	No
44-10	PR321892	304708	10214A	GS056	12/16/2019 13:54	1233	1198	1721	No
44-10	PR321892	304708	10214A	GS056	12/16/2019 13:56	1389	1198	1721	No
44-10	PR321892	304708	10214A	GS056	12/16/2019 14:01	4486	1198	1721	Yes
44-10	PR321892	304708	10214A	GS056	12/16/2019 14:06	1429	1198	1721	No
44-10	PR321892	304708	10214A	GS056	12/16/2019 14:09	1388	1198	1721	No
44-10	PR321892	304708	10214A	GS056	12/16/2019 14:11	1432	1198	1721	No
44-10	PR372143	304712	10214A	GS057	12/16/2019 9:32	1465	1248	1783	No
44-10	PR372143	304712	10214A	GS057	12/16/2019 9:34	1462	1248	1783	No
44-10	PR372143	304712	10214A	GS057	12/16/2019 9:36	1353	1248	1783	No
44-10	PR372143	304712	10214A	GS057	12/16/2019 9:38	1368	1248	1783	No
44-10	PR372143	304712	10214A	GS057	12/16/2019 9:40	1340	1248	1783	No
44-10	PR372143	304712	10214A	GS057	12/16/2019 9:42	1288	1248	1783	No
44-10	PR372143	304712	10214A	GS058	12/16/2019 9:44	1242	1248	1783	No
44-10	PR372143	304712	10214A	GS058	12/16/2019 9:46	1343	1248	1783	No
44-10	PR372143	304712	10214A	GS058	12/16/2019 9:48	1445	1248	1783	No
44-10	PR372143	304712	10214A	GS058	12/16/2019 9:50	1436	1248	1783	No
44-10	PR372143	304712	10214A	GS058	12/16/2019 9:52	1496	1248	1783	No
44-10	PR372143	304712	10214A	GS058	12/16/2019 9:54	1369	1248	1783	No
44-10	PR372143	304712	10214A	GS059	12/16/2019 9:56	1494	1248	1783	No
44-10	PR372143	304712	10214A	GS059	12/16/2019 9:58	1431	1248	1783	No
44-10	PR372143	304712	10214A	GS059	12/16/2019 10:00	1363	1248	1783	No
44-10	PR372143	304712	10214A	GS059	12/16/2019 10:02	1523	1248	1783	No
44-10	PR372143	304712	10214A	GS059	12/16/2019 10:04	1351	1248	1783	No
44-10	PR372143	304712	10214A	GS059	12/16/2019 10:06	1292	1248	1783	No
44-10	PR372143	304712	10214A	GS060	12/16/2019 10:08	1272	1248	1783	No
44-10	PR372143	304712	10214A	GS060	12/16/2019 10:10	1349	1248	1783	No
44-10	PR372143	304712	10214A	GS060	12/16/2019 10:12	1380	1248	1783	No
44-10	PR372143	304712	10214A	GS060	12/16/2019 10:14	1391	1248	1783	No
44-10	PR372143	304712	10214A	GS060	12/16/2019 10:16	1432	1248	1783	No
44-10	PR372143	304712	10214A	GS060	12/16/2019 10:18	1523	1248	1783	No
44-10	PR372143	304712	10214A	GS061	12/16/2019 10:20	1502	1248	1783	No
44-10	PR372143	304712	10214A	GS061	12/16/2019 10:22	1365	1248	1783	No
44-10	PR372143	304712	10214A	GS061	12/16/2019 10:24	1475	1248	1783	No
44-10	PR372143	304712	10214A	GS061	12/16/2019 10:26	1399	1248	1783	No
44-10	PR372143	304712	10214A	GS061	12/16/2019 10:28	1420	1248	1783	No
44-10	PR372143	304712	10214A	GS061	12/16/2019 10:30	1347	1248	1783	No

FSS RELEASE RECORD – REV. 1
 CONSTRUCTION PARKING AREA
 SURVEY UNIT 10214A



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	PR372143	304712	10214A	GS062	12/16/2019 10:34	1289	1248	1783	No
44-10	PR372143	304712	10214A	GS062	12/16/2019 10:36	1342	1248	1783	No
44-10	PR372143	304712	10214A	GS062	12/16/2019 10:38	1348	1248	1783	No
44-10	PR372143	304712	10214A	GS062	12/16/2019 10:40	1408	1248	1783	No
44-10	PR372143	304712	10214A	GS062	12/16/2019 10:42	1527	1248	1783	No
44-10	PR372143	304712	10214A	GS062	12/16/2019 10:44	1519	1248	1783	No
44-10	PR372143	304712	10214A	GS063	12/16/2019 12:22	1440	1248	1783	No
44-10	PR372143	304712	10214A	GS063	12/16/2019 12:24	1448	1248	1783	No
44-10	PR372143	304712	10214A	GS063	12/16/2019 12:26	1391	1248	1783	No
44-10	PR372143	304712	10214A	GS063	12/16/2019 12:28	1315	1248	1783	No
44-10	PR372143	304712	10214A	GS063	12/16/2019 12:30	1332	1248	1783	No
44-10	PR372143	304712	10214A	GS063	12/16/2019 12:32	1322	1248	1783	No
44-10	PR372143	304712	10214A	GS064	12/16/2019 12:34	1242	1248	1783	No
44-10	PR372143	304712	10214A	GS064	12/16/2019 12:36	1293	1248	1783	No
44-10	PR372143	304712	10214A	GS064	12/16/2019 12:38	1362	1248	1783	No
44-10	PR372143	304712	10214A	GS064	12/16/2019 12:40	1388	1248	1783	No
44-10	PR372143	304712	10214A	GS064	12/16/2019 12:42	1586	1248	1783	No
44-10	PR372143	304712	10214A	GS064	12/16/2019 12:44	1595	1248	1783	No
44-10	PR372143	304712	10214A	GS065	12/16/2019 12:47	1403	1248	1783	No
44-10	PR372143	304712	10214A	GS065	12/16/2019 12:49	1464	1248	1783	No
44-10	PR372143	304712	10214A	GS065	12/16/2019 12:51	1421	1248	1783	No
44-10	PR372143	304712	10214A	GS065	12/16/2019 12:53	1388	1248	1783	No
44-10	PR372143	304712	10214A	GS065	12/16/2019 12:55	1331	1248	1783	No
44-10	PR372143	304712	10214A	GS065	12/16/2019 12:57	1262	1248	1783	No
44-10	PR372143	304712	10214A	GS066	12/16/2019 12:59	1289	1248	1783	No
44-10	PR372143	304712	10214A	GS066	12/16/2019 13:01	1311	1248	1783	No
44-10	PR372143	304712	10214A	GS066	12/16/2019 13:03	1330	1248	1783	No
44-10	PR372143	304712	10214A	GS066	12/16/2019 13:05	1425	1248	1783	No
44-10	PR372143	304712	10214A	GS066	12/16/2019 13:07	1634	1248	1783	No
44-10	PR372143	304712	10214A	GS066	12/16/2019 13:09	1534	1248	1783	No
44-10	PR372143	304712	10214A	GS067	12/16/2019 13:12	1519	1248	1783	No
44-10	PR372143	304712	10214A	GS067	12/16/2019 13:14	1677	1248	1783	No
44-10	PR372143	304712	10214A	GS067	12/16/2019 13:16	1427	1248	1783	No
44-10	PR372143	304712	10214A	GS067	12/16/2019 13:18	1423	1248	1783	No
44-10	PR372143	304712	10214A	GS067	12/16/2019 13:20	1329	1248	1783	No
44-10	PR372143	304712	10214A	GS067	12/16/2019 13:22	1334	1248	1783	No
44-10	PR372143	304712	10214A	GS068	12/16/2019 13:24	1267	1248	1783	No
44-10	PR372143	304712	10214A	GS068	12/16/2019 13:26	1326	1248	1783	No
44-10	PR372143	304712	10214A	GS068	12/16/2019 13:28	1369	1248	1783	No
44-10	PR372143	304712	10214A	GS068	12/16/2019 13:30	1418	1248	1783	No
44-10	PR372143	304712	10214A	GS068	12/16/2019 13:32	1568	1248	1783	No
44-10	PR372143	304712	10214A	GS068	12/16/2019 13:34	1546	1248	1783	No
44-10	PR372143	304712	10214A	GS069	12/16/2019 13:37	1527	1248	1783	No
44-10	PR372143	304712	10214A	GS069	12/16/2019 13:39	1553	1248	1783	No
44-10	PR372143	304712	10214A	GS069	12/16/2019 13:41	1487	1248	1783	No
44-10	PR372143	304712	10214A	GS069	12/16/2019 13:43	1395	1248	1783	No

FSS RELEASE RECORD – REV. 1
 CONSTRUCTION PARKING AREA
 SURVEY UNIT 10214A



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	PR372143	304712	10214A	GS069	12/16/2019 13:45	1439	1248	1783	No
44-10	PR372143	304712	10214A	GS069	12/16/2019 13:47	1366	1248	1783	No
44-10	ES0118	216173	10214A	GS070	12/17/2019 9:10	1425	1313	1861	No
44-10	ES0118	216173	10214A	GS070	12/17/2019 9:12	1449	1313	1861	No
44-10	ES0118	216173	10214A	GS070	12/17/2019 9:14	1547	1313	1861	No
44-10	ES0118	216173	10214A	GS070	12/17/2019 9:17	1577	1313	1861	No
44-10	ES0118	216173	10214A	GS070	12/17/2019 9:19	1748	1313	1861	No
44-10	ES0118	216173	10214A	GS070	12/17/2019 9:22	1571	1313	1861	No
44-10	ES0118	216173	10214A	GS056	12/17/2019 10:09	1426	1313	1861	No
44-10	ES0118	216173	10214A	GS071	12/16/2019 9:47	1418	1320	1869	No
44-10	ES0118	216173	10214A	GS071	12/16/2019 9:50	1529	1320	1869	No
44-10	ES0118	216173	10214A	GS071	12/16/2019 9:52	1427	1320	1869	No
44-10	ES0118	216173	10214A	GS071	12/16/2019 9:54	1436	1320	1869	No
44-10	ES0118	216173	10214A	GS071	12/16/2019 9:57	1327	1320	1869	No
44-10	ES0118	216173	10214A	GS071	12/16/2019 9:59	1391	1320	1869	No
44-10	ES0118	216173	10214A	GS072	12/16/2019 10:01	1436	1320	1869	No
44-10	ES0118	216173	10214A	GS072	12/16/2019 10:03	1442	1320	1869	No
44-10	ES0118	216173	10214A	GS072	12/16/2019 10:06	1456	1320	1869	No
44-10	ES0118	216173	10214A	GS072	12/16/2019 10:08	1391	1320	1869	No
44-10	ES0118	216173	10214A	GS072	12/16/2019 10:10	1433	1320	1869	No
44-10	ES0118	216173	10214A	GS072	12/16/2019 10:12	1515	1320	1869	No
44-10	ES0118	216173	10214A	GS073	12/16/2019 10:15	1435	1320	1869	No
44-10	ES0118	216173	10214A	GS073	12/16/2019 10:17	1500	1320	1869	No
44-10	ES0118	216173	10214A	GS073	12/16/2019 10:19	1326	1320	1869	No
44-10	ES0118	216173	10214A	GS073	12/16/2019 10:22	1488	1320	1869	No
44-10	ES0118	216173	10214A	GS073	12/16/2019 10:24	1384	1320	1869	No
44-10	ES0118	216173	10214A	GS073	12/16/2019 10:26	1360	1320	1869	No
44-10	ES0118	216173	10214A	GS074	12/16/2019 10:28	1391	1320	1869	No
44-10	ES0118	216173	10214A	GS074	12/16/2019 10:31	1391	1320	1869	No
44-10	ES0118	216173	10214A	GS074	12/16/2019 10:33	1451	1320	1869	No
44-10	ES0118	216173	10214A	GS074	12/16/2019 10:35	1432	1320	1869	No
44-10	ES0118	216173	10214A	GS074	12/16/2019 10:38	1473	1320	1869	No
44-10	ES0118	216173	10214A	GS074	12/16/2019 10:40	1477	1320	1869	No
44-10	ES0118	216173	10214A	GS075	12/16/2019 12:50	1446	1320	1869	No
44-10	ES0118	216173	10214A	GS075	12/16/2019 12:52	1354	1320	1869	No
44-10	ES0118	216173	10214A	GS075	12/16/2019 12:55	1487	1320	1869	No
44-10	ES0118	216173	10214A	GS075	12/16/2019 12:57	1529	1320	1869	No
44-10	ES0118	216173	10214A	GS075	12/16/2019 12:59	1498	1320	1869	No
44-10	ES0118	216173	10214A	GS075	12/16/2019 13:02	1549	1320	1869	No
44-10	ES0118	216173	10214A	GS076	12/16/2019 13:04	1459	1320	1869	No
44-10	ES0118	216173	10214A	GS076	12/16/2019 13:06	1613	1320	1869	No
44-10	ES0118	216173	10214A	GS076	12/16/2019 13:08	1548	1320	1869	No
44-10	ES0118	216173	10214A	GS076	12/16/2019 13:11	1546	1320	1869	No
44-10	ES0118	216173	10214A	GS076	12/16/2019 13:12	1360	1320	1869	No
44-10	ES0118	216173	10214A	GS077	12/16/2019 13:15	1560	1320	1869	No
44-10	ES0118	216173	10214A	GS077	12/16/2019 13:17	1566	1320	1869	No

FSS RELEASE RECORD – REV. 1
 CONSTRUCTION PARKING AREA
 SURVEY UNIT 10214A



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	10214A	GS077	12/16/2019 13:19	1549	1320	1869	No
44-10	ES0118	216173	10214A	GS077	12/16/2019 13:21	1661	1320	1869	No
44-10	ES0118	216173	10214A	GS077	12/16/2019 13:23	1668	1320	1869	No
44-10	ES0118	216173	10214A	GS078	12/16/2019 13:27	1672	1320	1869	No
44-10	ES0118	216173	10214A	GS078	12/16/2019 13:29	1654	1320	1869	No
44-10	ES0118	216173	10214A	GS078	12/16/2019 13:31	1628	1320	1869	No
44-10	ES0118	216173	10214A	GS078	12/16/2019 13:34	1688	1320	1869	No
44-10	ES0118	216173	10214A	GS079	12/16/2019 13:36	1658	1320	1869	No
44-10	ES0118	216173	10214A	GS079	12/16/2019 13:38	1668	1320	1869	No
44-10	ES0118	216173	10214A	GS079	12/16/2019 13:41	1476	1320	1869	No
44-10	ES0118	216173	10214A	GS079	12/16/2019 13:43	1552	1320	1869	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
QC REPLICATE SCANS									
44-10	PR372143	304712	10214A	GS071	12/17/2019 9:47	1317	1260	1796	No
44-10	PR372143	304712	10214A	GS071	12/17/2019 9:49	1499	1260	1796	No
44-10	PR372143	304712	10214A	GS071	12/17/2019 9:51	1517	1260	1796	No
44-10	PR372143	304712	10214A	GS071	12/17/2019 9:53	1518	1260	1796	No
44-10	PR372143	304712	10214A	GS071	12/17/2019 9:55	1573	1260	1796	No
44-10	PR372143	304712	10214A	GS071	12/17/2019 9:57	1616	1260	1796	No
44-10	PR372143	304712	10214A	GS072	12/17/2019 9:59	1549	1260	1796	No
44-10	PR372143	304712	10214A	GS072	12/17/2019 10:01	1509	1260	1796	No
44-10	PR372143	304712	10214A	GS072	12/17/2019 10:03	1405	1260	1796	No
44-10	PR372143	304712	10214A	GS072	12/17/2019 10:05	1573	1260	1796	No
44-10	PR372143	304712	10214A	GS072	12/17/2019 10:07	1408	1260	1796	No
44-10	PR372143	304712	10214A	GS072	12/17/2019 10:09	1392	1260	1796	No
44-10	PR372143	304712	10214A	GS073	12/17/2019 10:11	1419	1260	1796	No
44-10	PR372143	304712	10214A	GS073	12/17/2019 10:13	1480	1260	1796	No
44-10	PR372143	304712	10214A	GS073	12/17/2019 10:15	1477	1260	1796	No
44-10	PR372143	304712	10214A	GS073	12/17/2019 10:17	1467	1260	1796	No
44-10	PR372143	304712	10214A	GS073	12/17/2019 10:19	1500	1260	1796	No
44-10	PR372143	304712	10214A	GS073	12/17/2019 10:21	1475	1260	1796	No
44-10	PR372143	304712	10214A	GS074	12/17/2019 10:23	1628	1260	1796	No
44-10	PR372143	304712	10214A	GS074	12/17/2019 10:25	1650	1260	1796	No
44-10	PR372143	304712	10214A	GS074	12/17/2019 10:27	1394	1260	1796	No
44-10	PR372143	304712	10214A	GS074	12/17/2019 10:29	1514	1260	1796	No
44-10	PR372143	304712	10214A	GS074	12/17/2019 10:31	1480	1260	1796	No
44-10	PR372143	304712	10214A	GS074	12/17/2019 10:34	1517	1260	1796	No
44-10	PR372143	304712	10214A	GS075	12/17/2019 12:49	1302	1260	1796	No
44-10	PR372143	304712	10214A	GS075	12/17/2019 12:51	1462	1260	1796	No
44-10	PR372143	304712	10214A	GS075	12/17/2019 12:53	1636	1260	1796	No
44-10	PR372143	304712	10214A	GS075	12/17/2019 12:55	1668	1260	1796	No
44-10	PR372143	304712	10214A	GS075	12/17/2019 12:57	1539	1260	1796	No
44-10	PR372143	304712	10214A	GS075	12/17/2019 12:59	1600	1260	1796	No
44-10	PR372143	304712	10214A	GS076	12/17/2019 13:01	1595	1260	1796	No
44-10	PR372143	304712	10214A	GS076	12/17/2019 13:03	1682	1260	1796	No
44-10	PR372143	304712	10214A	GS076	12/17/2019 13:05	1640	1260	1796	No
44-10	PR372143	304712	10214A	GS076	12/17/2019 13:07	1644	1260	1796	No
44-10	PR372143	304712	10214A	GS076	12/17/2019 13:08	1550	1260	1796	No
44-10	PR372143	304712	10214A	GS077	12/17/2019 13:09	1710	1260	1796	No
44-10	PR372143	304712	10214A	GS077	12/17/2019 13:11	1733	1260	1796	No
44-10	PR372143	304712	10214A	GS077	12/17/2019 13:13	1542	1260	1796	No
44-10	PR372143	304712	10214A	GS077	12/17/2019 13:15	1605	1260	1796	No
44-10	PR372143	304712	10214A	GS077	12/17/2019 13:17	1661	1260	1796	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

Attachment 12
Sign Statistical Test

ZS-LT-300-001-004
Revision 7
Information Use

Survey Area: No. 10200 **Description:** Radiological Restricted Area Grounds
Survey Unit: No. 10214A **Description:** Construction Parking Area
Classification: 2 **Type I (α) Error:** 0.05 **Number of Samples:** 17

#	Fraction of the Release Criterion					Activity or SOF (as applicable)	Weighted Sum (W _s)	1-W _s	Sign
	Radionuclides of Concern								
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90				
1	1.27E-02	6.58E-03	1.09E-02	2.74E-03	2.56E-05	SOF	0.033	0.967	+
2	2.58E-02	1.28E-02	9.04E-03	5.56E-03	2.12E-05	SOF	0.053	0.947	+
3	1.53E-02	2.91E-02	7.74E-03	3.30E-03	1.82E-05	SOF	0.056	0.944	+
4	2.43E-02	2.37E-02	4.74E-03	5.23E-03	1.11E-05	SOF	0.058	0.942	+
5	1.66E-02	1.40E-02	0.00E+00	3.57E-03	0.00E+00	SOF	0.034	0.966	+
6	2.96E-02	1.33E-02	4.77E-03	6.37E-03	1.12E-05	SOF	0.054	0.946	+
7	1.10E-02	0.00E+00	1.27E-03	2.37E-03	2.99E-06	SOF	0.015	0.985	+
8	0.00E+00	0.00E+00	2.04E-03	0.00E+00	4.78E-06	SOF	0.002	0.998	+
9	1.59E-02	9.00E-04	8.93E-03	3.43E-03	2.09E-05	SOF	0.029	0.971	+
10	3.46E-02	5.73E-03	5.70E-03	7.44E-03	1.34E-05	SOF	0.053	0.947	+
11	1.11E-02	6.64E-03	3.03E-03	2.39E-03	7.11E-06	SOF	0.023	0.977	+
12	4.63E-02	2.67E-03	0.00E+00	9.97E-03	0.00E+00	SOF	0.059	0.941	+
13	1.93E-02	0.00E+00	0.00E+00	4.16E-03	0.00E+00	SOF	0.024	0.976	+
14	1.41E-02	0.00E+00	7.85E-03	3.04E-03	1.84E-05	SOF	0.025	0.975	+
15	1.04E-02	1.95E-02	8.87E-03	2.25E-03	2.08E-05	SOF	0.041	0.959	+
16	0.00E+00	4.84E-03	2.26E-02	0.00E+00	5.31E-05	SOF	0.028	0.972	+
17	0.00E+00	8.14E-03	1.53E-02	0.00E+00	3.59E-05	SOF	0.023	0.977	+

Critical Value (Table I.3 of MARSSIM) = 12 Number of Positive Differences (S+) = 17

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

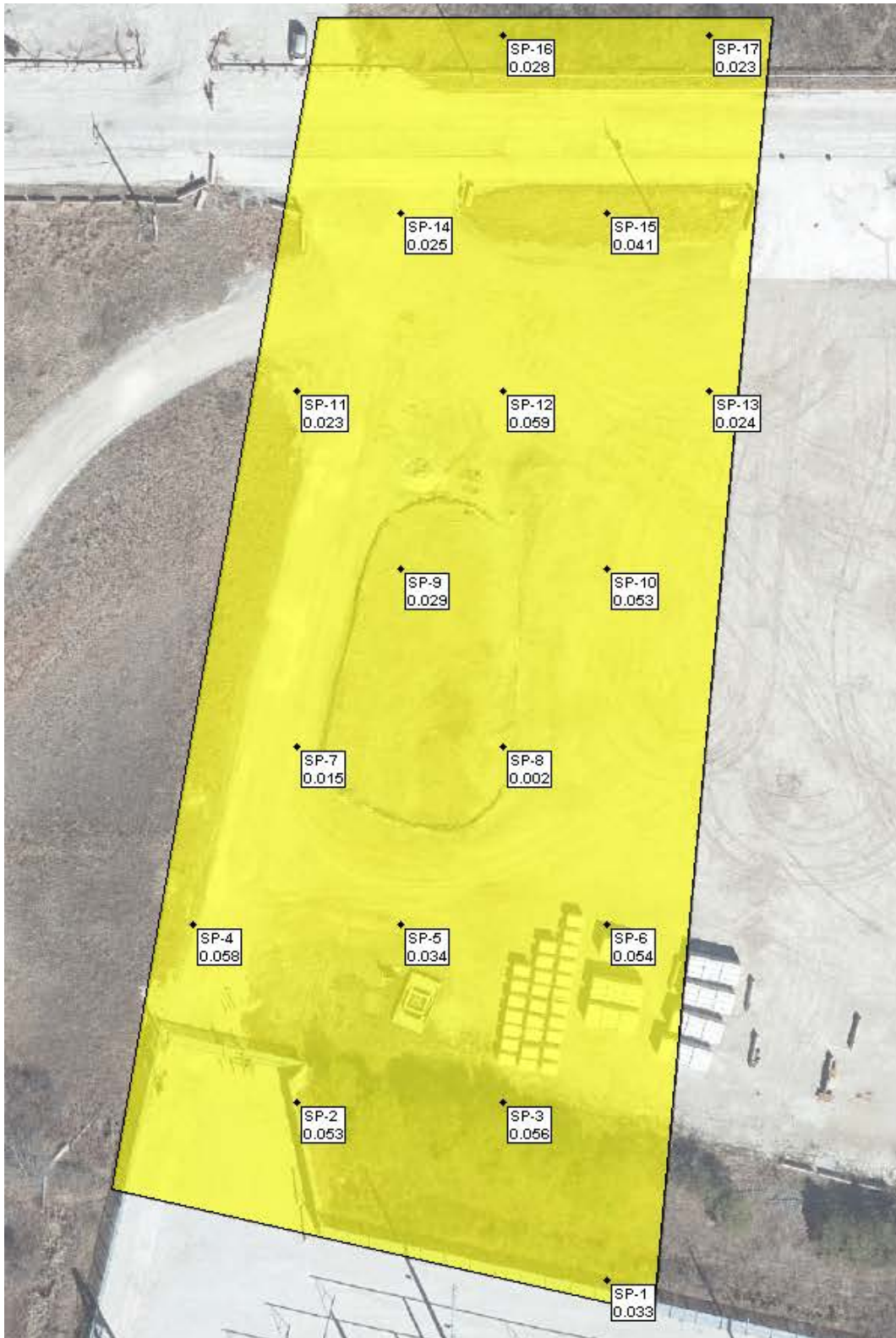
Prepared By (RE): R.S. Mandia (Print Name) [Signature] (Signature) 2-5-20 (Date)
Peer Reviewed By (RE): T. Brogan (Print Name) [Signature] (Signature) 2/5/2020 (Date)

ATTACHMENT 5
QC SAMPLE ASSESSMENT

Duplicate Sample Assessment Form																						
Survey Area #: 10200		Survey Unit #: 10214A		Survey Unit Name: Construction Parking Area																		
Sample Plan#: L2-10214A-F																						
Sample Description: Comparison of split samples collected from systematic surface soil sample location #2 and investigation surface soil sample #1 and analyzed using gamma spectroscopy by on-site HPGe system. The standard/comparison samples were L2-10214A-FSGS-002SS/L2-10214A-FQGS-002SS and L2-10214A-FIGS-001SS/L2-10214A-QIGS-001SS																						
STANDARD					COMPARISON																	
Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)														
Systematic Sample #2																						
K-40	5.52E+00	4.16E-01	13.27	0.6-1.66	5.34E+00	4.12E-01	1.03	Y														
Investigation Sample #1																						
Cs-137	9.50E-02	2.27E-02	4.19	0.5-2.0	1.14E-01	2.11E-02	0.83	Y														
Comments/Corrective Actions: For systematic sample #2, 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. For investigation sample #1, the standard sample and QC sample both had positive activity for Cs-137. There was acceptable agreement on the Cs-137 results for this sample.					Table 4-1 from the QAPP is reproduced below to show acceptance criteria used to assess split samples. <table style="margin-left: auto; margin-right: auto; border: none;"> <thead> <tr> <th style="text-align: center;"><u>Resolution</u></th> <th style="text-align: center;"><u>Acceptable Ratio</u></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><4</td> <td style="text-align: center;">not comparable</td> </tr> <tr> <td style="text-align: center;">4-7</td> <td style="text-align: center;">0.5-2.0</td> </tr> <tr> <td style="text-align: center;">8-15</td> <td style="text-align: center;">0.6-1.66</td> </tr> <tr> <td style="text-align: center;">16-50</td> <td style="text-align: center;">0.75-1.33</td> </tr> <tr> <td style="text-align: center;">51-200</td> <td style="text-align: center;">0.80-1.25</td> </tr> <tr> <td style="text-align: center;">>200</td> <td style="text-align: center;">0.85-1.18</td> </tr> </tbody> </table>				<u>Resolution</u>	<u>Acceptable Ratio</u>	<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
<u>Resolution</u>	<u>Acceptable Ratio</u>																					
<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																					
Performed by: <i>R.S. Mandia / jmb</i>		Date: <i>2-5-20</i>		Reveiwed by: <i>J. Graham</i>			Date: <i>2/5/2020</i>															

ATTACHMENT 6
GRAPHICAL PRESENTATIONS

Posting Plot

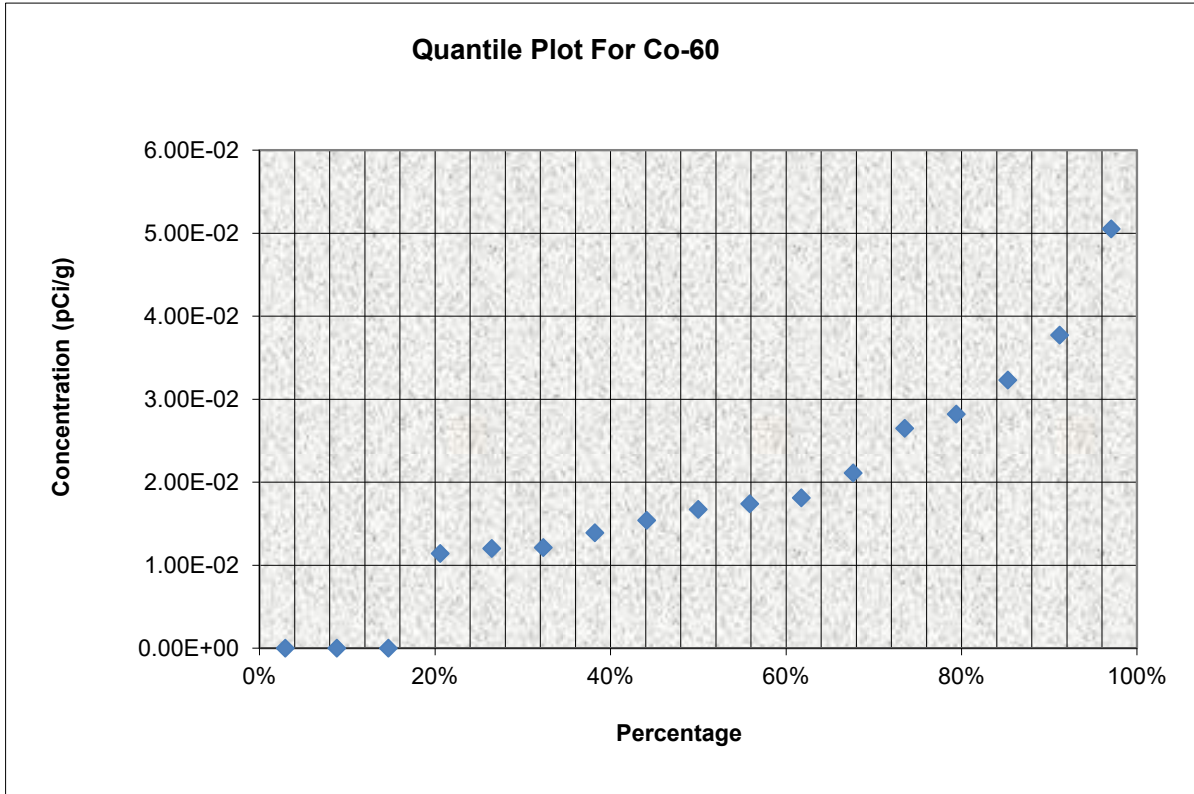


QUANTILE PLOT FOR Co-60

Survey Unit: 10214A

Survey Unit Name: Construction Parking Area

Mean: 1.84E-02 pCi/g

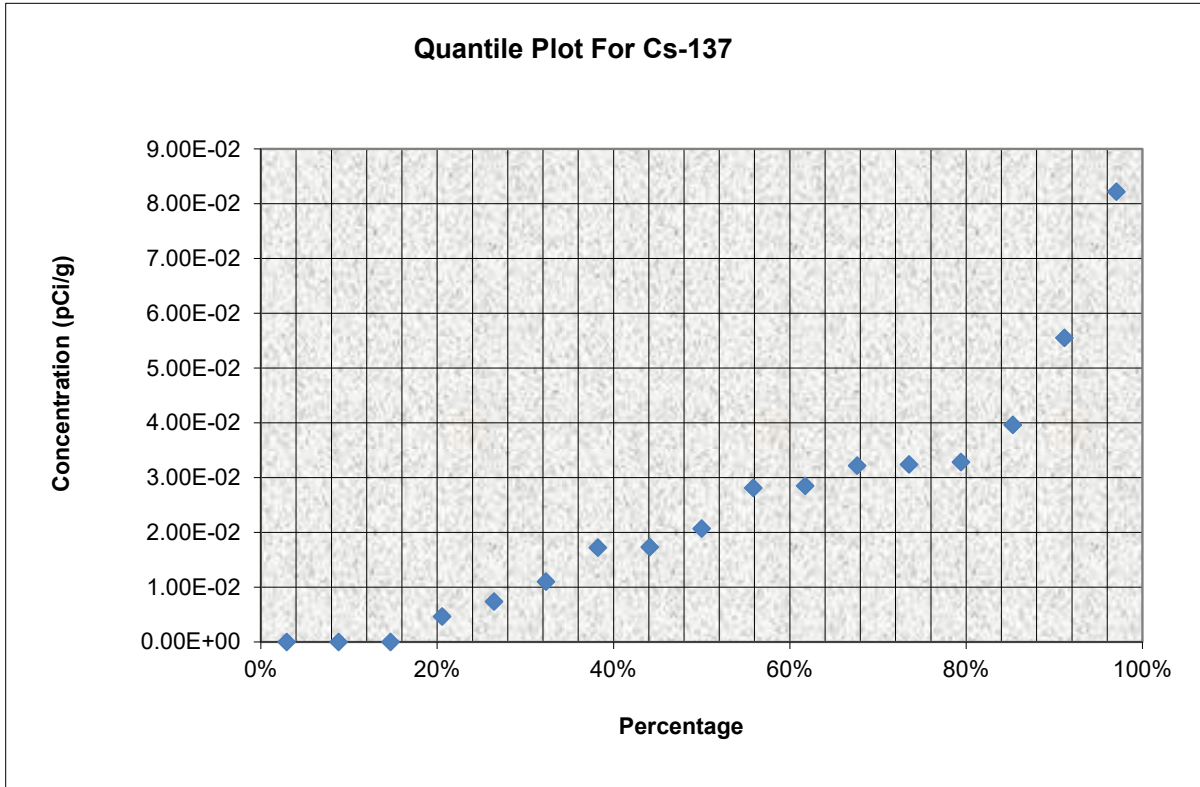


QUANTILE PLOT FOR Cs-137

Survey Unit: 10214A

Survey Unit Name: Construction Parking Area

Mean: 2.41E-02 pCi/g



HISTOGRAM FOR Co-60

Survey Unit: 10214A

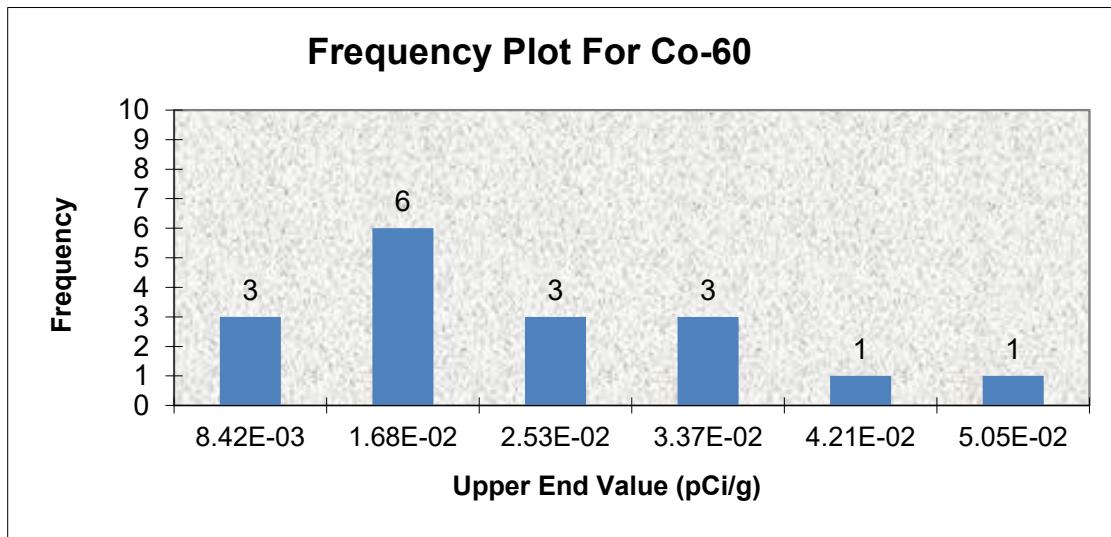
Survey Unit Name: Construction Parking Area

Mean: 1.84E-02 pCi/g

Median: 1.67E-02 pCi/g

ST DEV: 0.014

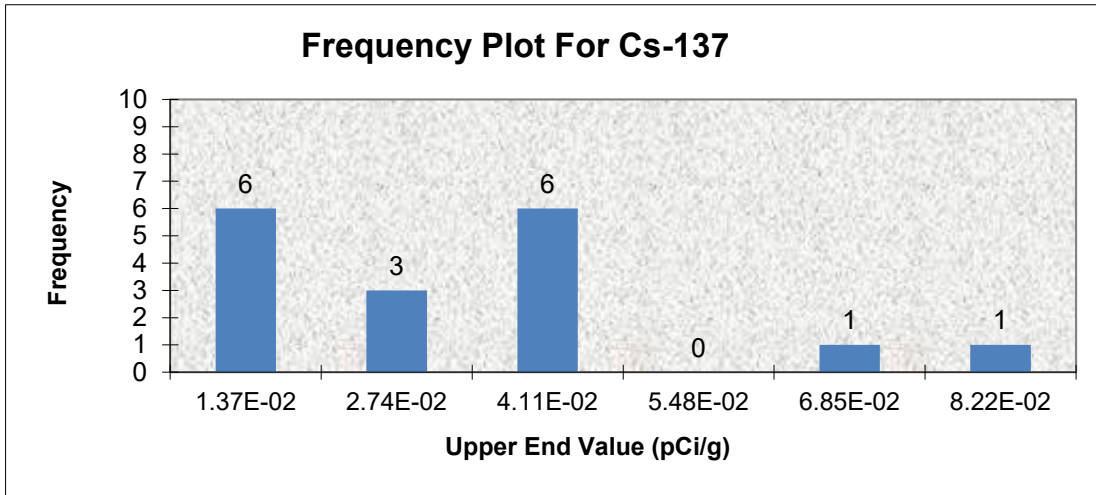
Skew: 0.696



Upper Value	Observation Frequency	Observation %
8.42E-03	3	18%
1.68E-02	6	35%
2.53E-02	3	18%
3.37E-02	3	18%
4.21E-02	1	6%
5.05E-02	1	6%
TOTAL	17	100%

HISTOGRAM FOR Cs-137

Survey Unit: 10214A
Survey Unit Name: Construction Parking Area
Mean: 2.41E-02 pCi/g
Median: 2.07E-02 pCi/g
ST DEV: 0.022
Skew: 1.222

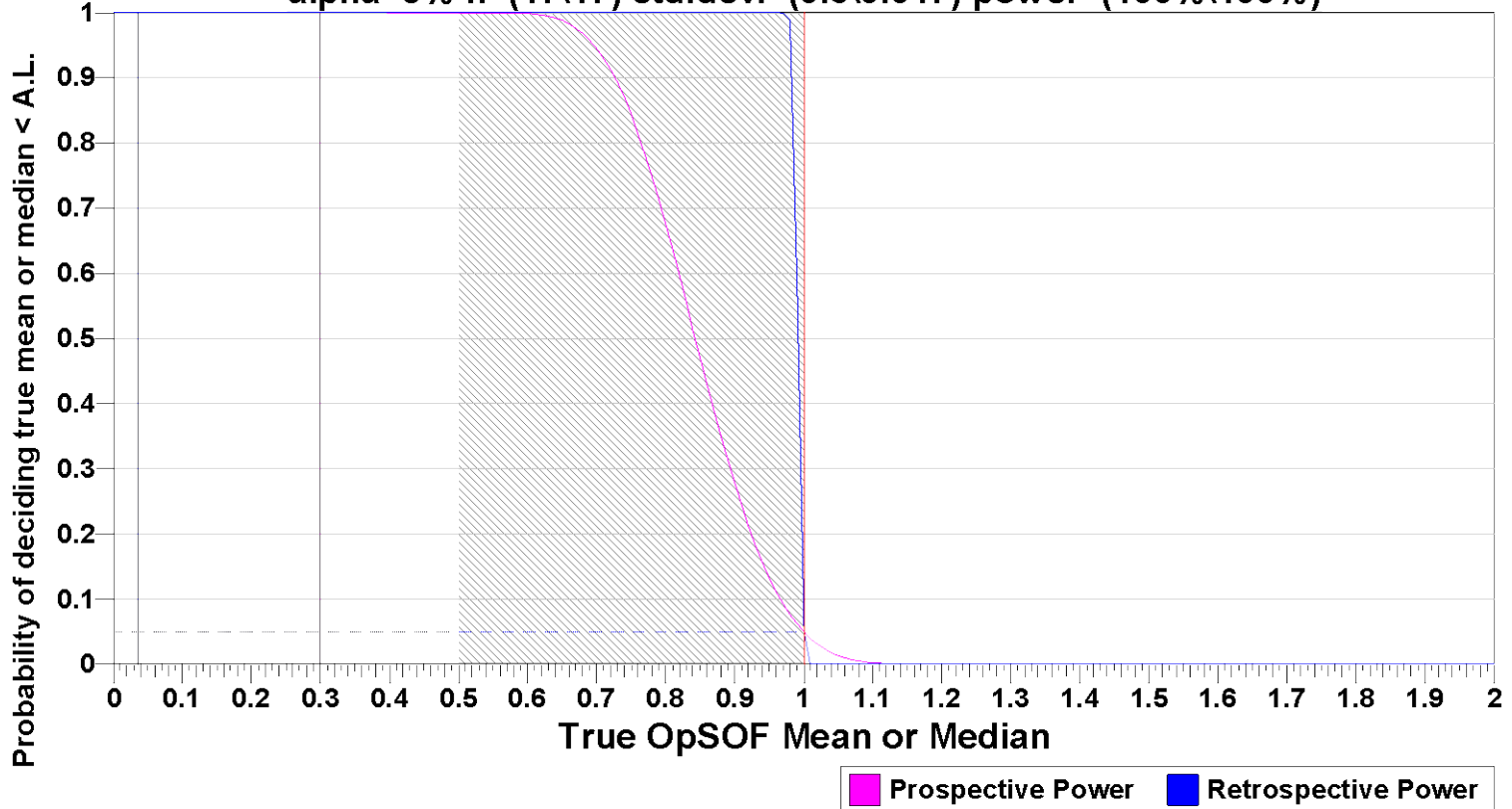


Upper Value	Observation Frequency	Observation %
1.37E-02	6	35%
2.74E-02	3	18%
4.11E-02	6	35%
5.48E-02	0	0%
6.85E-02	1	6%
8.22E-02	1	6%
TOTAL	17	100%

Prospective and Retrospective Power Curves for Survey Unit 10214A

MARSSIM Sign Test (Pro\Retrospective) Power

alpha=5% n=(17\17) std.dev.=(0.3\0.017) power=(100%\100%)



ATTACHMENT 7
SAMPLE ANALYTICAL REPORTS

Analysis Report for 17-Dec-19-10012
L2-10214A-FSGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10012
Sample Description : L2-10214A-FSGS-001SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.331E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:00:00PM
Acquisition Started : 12/17/2019 9:03:35AM

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82224
Fill Height : 1330.99 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:18:37AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12/17/19

Analysis Report for 17-Dec-19-10012
L2-10214A-FSGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.16	304 -	315	309.93	2.60E+01	13.76	6.40E+01	0.93
2	238.68	949 -	961	955.17	9.12E+01	15.71	5.88E+01	0.85
3	295.17	1176 -	1186	1180.92	2.23E+01	9.42	2.77E+01	0.54
4	351.91	1400 -	1415	1407.64	7.52E+01	12.85	2.88E+01	1.13
5	583.18	2326 -	2340	2332.06	4.19E+01	9.39	1.61E+01	0.80
6	609.21	2430 -	2444	2436.09	4.49E+01	9.42	1.41E+01	0.95
7	661.63	2639 -	2651	2645.71	2.46E+01	6.94	8.41E+00	0.83
8	911.31	3636 -	3650	3644.27	3.83E+01	7.41	5.70E+00	0.54
9	968.70	3868 -	3879	3873.89	2.38E+01	6.32	6.18E+00	0.76
10	1460.86	5831 -	5855	5843.80	2.72E+02	17.24	6.20E+00	1.54

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	1.00	1460.82 *	10.66	5.94E+00	4.57E-01
Cs-137	1.00	661.66 *	85.10	3.96E-02	1.14E-02
Tl-208	1.00	583.19 *	85.00	6.21E-02	1.44E-02
Bi-211	0.89	351.07 *	13.02	5.17E-01	9.75E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.47E-01	2.80E-02
		300.09	3.30		

[66]

Analysis Report for 17-Dec-19-10012

L2-10214A-FSGS-001SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	1.00	74.82	10.28		
		77.11 *	17.10	2.47E-01	1.33E-01
		87.35	3.97		
		89.78	1.46		
Bi-214	0.99	609.32 *	45.49	1.28E-01	2.79E-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	9.57E-02	4.11E-02
		351.93 *	35.60	1.89E-01	3.56E-02
Pb214-XR	1.00	785.96	1.06		
		74.82	5.80		
		77.11 *	9.70	4.35E-01	2.35E-01
Ac-228	0.99	87.35	2.24		
		89.78	0.82		
		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	2.52E-01	4.99E-02
964.77	4.99				
968.97 *	15.80	2.66E-01	7.16E-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 17-Dec-19-10012
L2-10214A-FSGS-001SS

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	1.000	5.94E+00	4.57E-01	
Cs-137	1.000	3.96E-02	1.14E-02	
Tl-208	1.000	6.21E-02	1.44E-02	
Bi-211	0.893	2.55E-01	1.49E-01	
Pb-212	1.000	1.47E-01	2.80E-02	
? Pb212-XR	1.000	2.47E-01	1.33E-01	
Bi-214	0.999	1.28E-01	2.79E-02	
Pb-214	1.000	9.57E-02	4.11E-02	
? Pb214-XR	1.000	4.35E-01	2.35E-01	
Ac-228	0.997	2.56E-01	4.09E-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 17-Dec-19-10012
L2-10214A-FSGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:18:37AM
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	5.59E-02	5.14E-02	5.14E-02
	BE-7	477.60	10.44	2.40E-01	3.89E-01	3.89E-01
+	K-40	1460.82	* 10.66	5.94E+00	4.38E-01	4.38E-01
	Mn-54	834.85	99.98	7.18E-03	4.87E-02	4.87E-02
	Co-60	1173.23	99.85	1.39E-02	4.53E-02	5.57E-02
		1332.49	99.98	-1.33E-02		4.53E-02
	Nb-94	702.65	99.81	7.87E-03	3.32E-02	4.10E-02
		871.09	99.89	-1.73E-02		3.32E-02
	Ag-108m	79.13	6.60	2.11E-01	3.66E-02	1.37E+00
		433.94	90.50	-2.66E-03		3.66E-02
		614.28	89.80	1.78E-02		6.41E-02
		722.94	90.80	5.05E-02		5.49E-02
	Sb-125	176.31	6.84	-1.14E-01	1.21E-01	4.31E-01
		380.45	1.52	8.65E-02		2.18E+00
		427.87	29.60	-5.71E-03		1.21E-01
		463.36	10.49	-2.83E-02		3.65E-01
		600.60	17.65	8.19E-02		2.47E-01
		606.71	4.98	1.35E+00		1.24E+00
		635.95	11.22	1.61E-01		3.77E-01

Analysis Report for 17-Dec-19-10012
L2-10214A-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.43E+00	1.21E-01	2.15E+00
Ba-133	79.61	2.65	5.88E-02	7.79E-02	3.27E+00
	81.00	32.90	-7.22E-02		2.12E-01
	276.40	7.16	2.95E-02		4.76E-01
	302.85	18.34	1.58E-02		1.87E-01
	356.01	62.05	7.06E-03		7.79E-02
	383.85	8.94	1.49E-01		3.61E-01
Cs-134	475.36	1.48	1.61E+00	5.20E-02	2.71E+00
	563.25	8.34	2.45E-02		4.56E-01
	569.33	15.37	-1.52E-01		2.59E-01
	604.72	97.62	-2.98E-02		5.91E-02
	795.86	85.46	1.14E-02		5.20E-02
	801.95	8.69	-5.87E-01		4.90E-01
	1038.61	0.99	1.08E+00		4.93E+00
	1167.97	1.79	-2.15E+00		2.83E+00
	1365.19	3.02	-1.49E+00		1.58E+00
+ Cs-137	661.66	* 85.10	3.96E-02	3.11E-02	3.11E-02
Eu-152	121.78	28.67	-6.29E-03	1.21E-01	1.34E-01
	244.70	7.61	3.95E-01		4.89E-01
	295.94	0.45	7.41E+00		8.94E+00
	344.28	26.60	-1.27E-01		1.21E-01
	367.79	0.86	1.31E+00		3.71E+00
	411.12	2.24	4.38E-01		1.54E+00
	443.96	2.83	-1.79E-01		1.14E+00
	488.68	0.42	1.88E+00		8.22E+00
	563.99	0.49	1.30E+00		7.94E+00
	586.26	0.46	1.59E+01		1.21E+01
	678.62	0.47	3.90E+00		1.00E+01
	688.67	0.86	4.55E+00		5.38E+00
	719.35	0.28	8.85E+00		1.60E+01
	778.90	12.96	-1.78E-01		2.93E-01
	810.45	0.32	7.72E+00		1.49E+01
	867.37	4.26	6.83E-02		9.35E-01
	919.33	0.43	-8.40E+00		1.05E+01
	964.08	14.65	3.81E-01		4.88E-01
	1085.87	10.24	4.64E-02		5.25E-01
	1089.74	1.73	2.51E+00		3.49E+00
	1112.07	13.69	-3.35E-01		3.58E-01
	1212.95	1.43	-1.61E+00		4.18E+00
	1249.94	0.19	1.34E+01		3.12E+01
	1299.14	1.63	1.40E-01		2.82E+00
	1408.01	21.07	-1.75E-01		2.10E-01
	1457.64	0.50	1.22E+02		3.87E+01
	1528.10	0.28	-3.98E+00		1.16E+01
Eu-154	123.07	40.40	-2.84E-02	9.43E-02	9.43E-02
	247.93	6.89	-3.16E-01		4.57E-01
	591.76	4.95	-3.17E-01		6.65E-01
	692.42	1.78	-1.06E+00		2.35E+00
	723.30	20.06	2.66E-01		2.46E-01
	756.80	4.52	1.13E-01		1.01E+00
	873.18	12.08	-4.59E-02		2.92E-01

Analysis Report for 17-Dec-19-10012
L2-10214A-FSGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.38E-01	9.43E-02	4.85E-01
	1004.76	18.01	1.81E-02		2.84E-01
	1274.43	34.80	-9.97E-02		1.44E-01
	1596.48	1.80	-1.79E+00		2.98E+00
Eu-155	45.30	1.31	-3.57E+00	1.92E-01	1.76E+01
	60.01	1.22	-8.19E+00		1.99E+01
	86.55	30.70	-4.95E-02		2.07E-01
	105.31	21.10	-4.40E-02		1.92E-01
Ra-226	186.21	3.64	6.17E-01	1.04E+00	1.04E+00
Pa-231	27.36	10.30	1.69E+00	1.45E+00	2.19E+00
	283.69	1.70	8.94E-01		2.02E+00
	300.07	2.47	-1.07E+00		1.45E+00
	302.65	2.20	-5.81E-01		1.54E+00
	330.06	1.40	-1.81E+00		2.68E+00
U-235	143.76	10.96	-6.85E-02	6.78E-02	3.26E-01
	163.33	5.08	-1.69E-01		6.00E-01
	185.71	57.20	9.77E-02		6.78E-02
	202.11	1.08	1.26E+00		3.04E+00
	205.31	5.01	-6.55E-02		6.75E-01
Am-241	59.54	35.90	3.88E-02	7.23E-01	7.23E-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

Analysis Report for 17-Dec-19-10013
L2-10214A-FSGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10013
Sample Description : L2-10214A-FSGS-002SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.184E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:02:00PM
Acquisition Started : 12/17/2019 9:22:45AM

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 : 0.05 %

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

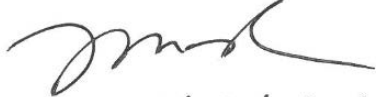
Energy Calibration Used Done On : 11/4/2019
Efficiency Calibration Used Done On : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82225
Fill Height : 1184.44 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:37:48AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1530 12/17/19

Analysis Report for 17-Dec-19-10013
L2-10214A-FSGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.57	472 -	481	477.33	1.41E+02	18.74	9.05E+01	1.19
2	295.18	585 -	595	590.42	3.73E+01	14.05	6.57E+01	0.98
3	351.78	700 -	708	703.51	8.13E+01	11.69	2.57E+01	1.51
4	582.94	1159 -	1171	1165.49	4.98E+01	9.61	1.63E+01	1.11
5	609.04	1213 -	1223	1217.65	5.65E+01	10.26	2.05E+01	1.69
6	911.01	1816 -	1826	1821.47	3.40E+01	7.13	6.96E+00	1.36
7	1460.44	2913 -	2928	2920.92	2.69E+02	16.57	1.88E+00	1.41

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	5.52E+00	4.16E-01
Tl-208	0.99	583.19 *	85.00	6.91E-02	1.40E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.09E-01	3.27E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.51E-01	2.89E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

[73]

Analysis Report for 17-Dec-19-10013
L2-10214A-FSGS-002SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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			1.49E-01	5.73E-02
351.93 *	35.60			1.91E-01	3.13E-02
Ac-228	0.99	785.96	1.06		
		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	2.10E-01	4.49E-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 17-Dec-19-10013
 L2-10214A-FSGS-002SS

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>	
	K-40	0.976	5.52E+00	4.16E-01	
	Tl-208	0.990	6.91E-02	1.40E-02	
X	Bi-211	0.922			
	Pb-212	0.999	2.09E-01	3.27E-02	
	Bi-214	0.995	1.51E-01	2.89E-02	
	Pb-214	0.998	1.81E-01	2.75E-02	
	Ac-228	0.998	2.10E-01	4.49E-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 17-Dec-19-10013
L2-10214A-FSGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:37:48AM
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	4.95E-02	5.02E-02	5.02E-02
	BE-7	477.60	10.44	2.74E-01	4.09E-01	4.09E-01
+	K-40	1460.82	* 10.66	5.52E+00	2.21E-01	2.21E-01
	Mn-54	834.85	99.98	-1.57E-02	4.18E-02	4.18E-02
	Co-60	1173.23	99.85	2.82E-02	5.08E-02	5.64E-02
		1332.49	99.98	2.22E-02		5.08E-02
	Nb-94	702.65	99.81	-1.30E-02	3.03E-02	3.03E-02
		871.09	99.89	2.16E-02		4.70E-02
	Ag-108m	79.13	6.60	2.53E-01	3.78E-02	1.01E+00
		433.94	90.50	4.34E-03		3.78E-02
		614.28	89.80	-1.50E-02		4.91E-02
		722.94	90.80	1.58E-02		4.17E-02
	Sb-125	176.31	6.84	-2.11E-01	1.04E-01	4.69E-01
		380.45	1.52	1.14E+00		2.18E+00
		427.87	29.60	4.14E-02		1.04E-01
		463.36	10.49	1.08E-01		3.41E-01
		600.60	17.65	4.11E-02		2.08E-01
		606.71	4.98	-2.79E-01		1.19E+00
		635.95	11.22	-7.25E-02		2.83E-01

Analysis Report for 17-Dec-19-10013
L2-10214A-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.65E-02	1.04E-01	1.84E+00
Ba-133	79.61	2.65	3.94E-01	6.49E-02	2.36E+00
	81.00	32.90	-1.83E-01		1.60E-01
	276.40	7.16	8.09E-02		4.53E-01
	302.85	18.34	1.07E-01		1.76E-01
	356.01	62.05	-2.24E-02		6.49E-02
	383.85	8.94	-5.66E-02		3.37E-01
Cs-134	475.36	1.48	1.49E+00	5.17E-02	2.72E+00
	563.25	8.34	1.74E-01		4.27E-01
	569.33	15.37	-6.80E-02		1.92E-01
	604.72	97.62	-1.67E-02		5.51E-02
	795.86	85.46	2.21E-02		5.17E-02
	801.95	8.69	-3.78E-01		3.61E-01
	1038.61	0.99	1.27E-01		4.87E+00
	1167.97	1.79	-8.24E-01		2.76E+00
	1365.19	3.02	-6.03E-01		1.19E+00
Cs-137	661.66	85.10	3.28E-02	5.66E-02	5.66E-02
Eu-152	121.78	28.67	3.88E-03	1.01E-01	1.09E-01
	244.70	7.61	-1.66E-01		4.43E-01
	295.94	0.45	-1.19E+00		8.75E+00
	344.28	26.60	-1.28E-01		1.01E-01
	367.79	0.86	7.79E-01		3.74E+00
	411.12	2.24	-4.07E-01		1.64E+00
	443.96	2.83	-3.65E-01		1.15E+00
	488.68	0.42	2.30E+00		7.59E+00
	563.99	0.49	1.77E+00		7.35E+00
	586.26	0.46	-3.54E+00		1.10E+01
	678.62	0.47	3.85E+00		8.76E+00
	688.67	0.86	-6.67E-02		3.65E+00
	719.35	0.28	2.32E+00		1.33E+01
	778.90	12.96	-2.17E-01		2.07E-01
	810.45	0.32	-3.43E+00		9.82E+00
	867.37	4.26	-4.97E-01		1.02E+00
	919.33	0.43	-7.48E-01		8.90E+00
	964.08	14.65	1.77E-01		3.57E-01
	1085.87	10.24	-4.07E-02		4.51E-01
	1089.74	1.73	8.53E-01		2.52E+00
	1112.07	13.69	-3.42E-02		3.29E-01
	1212.95	1.43	2.01E+00		3.98E+00
	1249.94	0.19	1.88E+00		2.73E+01
	1299.14	1.63	2.10E+00		2.80E+00
	1408.01	21.07	1.21E-01		1.97E-01
	1457.64	0.50	-3.69E+00		3.57E+01
	1528.10	0.28	-6.29E+00		8.98E+00
Eu-154	123.07	40.40	-1.77E-02	7.46E-02	7.46E-02
	247.93	6.89	2.47E-01		4.69E-01
	591.76	4.95	-2.94E-01		6.81E-01
	692.42	1.78	-7.17E-01		1.45E+00
	723.30	20.06	1.12E-01		1.92E-01
	756.80	4.52	2.10E-01		8.04E-01
	873.18	12.08	-2.32E-02		3.84E-01

Analysis Report for 17-Dec-19-10013
L2-10214A-FSGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)		
Eu-154	996.29	10.48	-8.11E-02	7.46E-02	3.55E-01		
	1004.76	18.01	1.08E-01		2.39E-01		
	1274.43	34.80	5.41E-02		1.45E-01		
	1596.48	1.80	-8.76E-01		2.25E+00		
Eu-155	45.30	1.31	-1.36E+00	1.64E-01	1.00E+01		
	60.01	1.22	-9.13E+00		1.10E+01		
	86.55	30.70	1.85E-02		1.64E-01		
Ra-226	105.31	21.10	2.23E-02	1.11E+00	1.79E-01		
Ra-226	186.21	3.64	1.19E+00	1.11E+00	1.11E+00		
	Pa-231	27.36	10.30		2.56E-01	9.47E-01	
Pa-231	283.69	1.70	1.37E-01	9.47E-01	1.76E+00		
	300.07	2.47	4.86E-01		1.34E+00		
	302.65	2.20	8.93E-01		1.46E+00		
	330.06	1.40	2.48E-01		2.51E+00		
	U-235	143.76	10.96		1.02E-01	7.16E-02	2.90E-01
		163.33	5.08		2.61E-02		6.36E-01
185.71		57.20	9.30E-02	7.16E-02			
202.11		1.08	-1.12E+00	2.84E+00			
205.31		5.01	-5.03E-01	6.12E-01			
Am-241	59.54	35.90	-5.19E-02	4.07E-01	4.07E-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

Analysis Report for 17-Dec-19-10014
L2-10214A-FQGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10014
Sample Description : L2-10214A-FQGS-002SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.090E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:02:00PM
Acquisition Started : 12/17/2019 9:42:37AM

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82229
Fill Height : 1090.14 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:57:40AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1530 12-17-19^[79]

Analysis Report for 17-Dec-19-10014
L2-10214A-FQGS-002SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.58	472 -	481	477.34	1.32E+02	18.96	9.85E+01	1.13
2	351.78	698 -	708	703.50	1.09E+02	14.64	4.38E+01	1.21
3	477.22	951 -	959	954.17	2.85E+01	8.43	1.95E+01	1.04
4	583.15	1162 -	1171	1165.90	5.09E+01	9.39	1.61E+01	1.59
5	609.09	1212 -	1223	1217.76	7.77E+01	11.81	2.43E+01	1.42
6	661.60	1316 -	1328	1322.73	4.70E+01	8.63	9.97E+00	1.31
7	911.11	1816 -	1828	1821.66	5.54E+01	8.67	7.61E+00	1.44
8	1460.28	2913 -	2927	2920.61	2.51E+02	16.02	1.87E+00	2.01

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	0.97	477.60 *	10.44	2.94E-01	8.96E-02
K-40	0.95	1460.82 *	10.66	5.34E+00	4.12E-01
Cs-137	0.99	661.66 *	85.10	7.34E-02	1.42E-02
Tl-208	1.00	583.19 *	85.00	7.30E-02	1.42E-02
Bi-211	0.92	351.07 *	13.02	7.21E-01	1.13E-01
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	2.02E-01	3.33E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.14E-01	3.51E-02 [80]

Analysis Report for 17-Dec-19-10014

L2-10214A-FQGS-002SS

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	0.51	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	2.64E-01	4.12E-02
Ac-228	1.00	785.96	1.06		
		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	3.54E-01	5.74E-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 17-Dec-19-10014
 L2-10214A-FQGS-002SS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BE-7	0.976	2.94E-01	8.96E-02	
K-40	0.954	5.34E+00	4.12E-01	
Cs-137	0.999	7.34E-02	1.42E-02	
Tl-208	1.000	7.30E-02	1.42E-02	
? Bi-211	0.923	7.21E-01	1.13E-01	
Pb-212	1.000	2.02E-01	3.33E-02	
Bi-214	0.997	2.14E-01	3.51E-02	
? Pb-214	0.511	2.64E-01	4.12E-02	
Ac-228	1.000	3.54E-01	5.74E-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 17-Dec-19-10014
L2-10214A-FQGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:57:40AM
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	9.34E-02	6.03E-02	6.03E-02
+	BE-7	477.60	* 10.44	2.94E-01	2.58E-01	2.58E-01
+	K-40	1460.82	* 10.66	5.34E+00	2.28E-01	2.28E-01
	Mn-54	834.85	99.98	3.11E-03	4.79E-02	4.79E-02
	Co-60	1173.23	99.85	-5.78E-03	4.41E-02	5.04E-02
		1332.49	99.98	-2.80E-03		4.41E-02
	Nb-94	702.65	99.81	1.53E-02	3.71E-02	4.38E-02
		871.09	99.89	-2.04E-03		3.71E-02
	Ag-108m	79.13	6.60	5.67E-01	4.02E-02	1.15E+00
		433.94	90.50	-2.62E-03		4.02E-02
		614.28	89.80	-2.55E-02		5.41E-02
		722.94	90.80	8.53E-03		4.78E-02
	Sb-125	176.31	6.84	-1.17E-01	1.10E-01	5.04E-01
		380.45	1.52	-9.53E-01		2.10E+00
		427.87	29.60	-7.01E-02		1.10E-01
		463.36	10.49	3.79E-02		3.23E-01
		600.60	17.65	2.22E-02		2.31E-01
		606.71	4.98	-2.17E-01		1.37E+00
		635.95	11.22	-3.14E-02		3.10E-01

Analysis Report for 17-Dec-19-10014
L2-10214A-FQGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.87E-02	1.10E-01	1.98E+00
Ba-133	79.61	2.65	7.38E-01	7.30E-02	2.68E+00
	81.00	32.90	-2.46E-01		1.69E-01
	276.40	7.16	-1.80E-01		4.33E-01
	302.85	18.34	7.45E-02		1.89E-01
	356.01	62.05	-4.36E-02		7.30E-02
	383.85	8.94	7.42E-02		3.44E-01
Cs-134	475.36	1.48	-1.77E+00	4.55E-02	2.72E+00
	563.25	8.34	-1.79E-01		3.97E-01
	569.33	15.37	-5.15E-02		2.13E-01
	604.72	97.62	-9.02E-03		6.29E-02
	795.86	85.46	1.21E-02		4.55E-02
	801.95	8.69	-2.00E-01		3.94E-01
	1038.61	0.99	2.90E-01		4.42E+00
	1167.97	1.79	-5.55E-01		2.58E+00
	1365.19	3.02	-6.52E-01		1.05E+00
+ Cs-137	661.66	* 85.10	7.34E-02	3.22E-02	3.22E-02
Eu-152	121.78	28.67	7.78E-03	1.14E-01	1.14E-01
	244.70	7.61	1.17E-01		4.77E-01
	295.94	0.45	4.37E+00		8.77E+00
	344.28	26.60	-7.24E-02		1.33E-01
	367.79	0.86	-2.61E-01		3.61E+00
	411.12	2.24	5.00E-01		1.54E+00
	443.96	2.83	-2.52E-01		1.12E+00
	488.68	0.42	1.76E+00		8.66E+00
	563.99	0.49	3.04E-01		7.18E+00
	586.26	0.46	-1.62E+00		1.23E+01
	678.62	0.47	8.66E-01		8.34E+00
	688.67	0.86	-2.62E+00		3.60E+00
	719.35	0.28	1.21E+01		1.63E+01
	778.90	12.96	-1.60E-01		3.12E-01
	810.45	0.32	-7.69E-01		1.25E+01
	867.37	4.26	4.33E-01		9.84E-01
	919.33	0.43	-2.82E+00		7.55E+00
	964.08	14.65	-3.21E-01		3.19E-01
	1085.87	10.24	-2.17E-01		5.18E-01
	1089.74	1.73	-3.07E-01		3.07E+00
	1112.07	13.69	-4.62E-01		2.86E-01
	1212.95	1.43	-1.46E+00		3.68E+00
	1249.94	0.19	8.40E+00		2.37E+01
	1299.14	1.63	3.17E-01		3.25E+00
	1408.01	21.07	-4.87E-02		1.89E-01
	1457.64	0.50	-2.48E+00		3.60E+01
	1528.10	0.28	-3.75E+00		1.37E+01
Eu-154	123.07	40.40	5.51E-03	8.11E-02	8.11E-02
	247.93	6.89	-1.85E-01		4.58E-01
	591.76	4.95	-1.43E-01		7.25E-01
	692.42	1.78	-2.76E-01		1.91E+00
	723.30	20.06	2.20E-02		2.20E-01
	756.80	4.52	-5.13E-02		7.99E-01
	873.18	12.08	-7.13E-02		2.92E-01

Analysis Report for 17-Dec-19-10014
L2-10214A-FQGS-002SS

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	8.11E-02	4.64E-01
	1004.76	18.01	-1.78E-01		2.32E-01
	1274.43	34.80	-3.84E-02		1.50E-01
	1596.48	1.80	1.82E-01		2.44E+00
Eu-155	45.30	1.31	3.97E+00	1.72E-01	1.22E+01
	60.01	1.22	-7.57E+00		1.14E+01
	86.55	30.70	2.25E-02		1.72E-01
	105.31	21.10	7.42E-02		1.84E-01
Ra-226	186.21	3.64	-2.40E-01	1.01E+00	1.01E+00
Pa-231	27.36	10.30	7.21E-01	1.10E+00	1.10E+00
	283.69	1.70	-6.61E-01		1.92E+00
	300.07	2.47	-1.50E+00		1.35E+00
	302.65	2.20	6.20E-01		1.57E+00
	330.06	1.40	6.18E-01		2.45E+00
U-235	143.76	10.96	-2.92E-02	6.48E-02	2.82E-01
	163.33	5.08	1.67E-01		6.87E-01
	185.71	57.20	-6.70E-03		6.48E-02
	202.11	1.08	-1.42E-01		3.33E+00
	205.31	5.01	-3.13E-01		7.05E-01
Am-241	59.54	35.90	-6.17E-02	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

Analysis Report for 17-Dec-19-10015
L2-10214A-FSGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10015
Sample Description : L2-10214A-FSGS-003SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.037E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:04:00PM
Acquisition Started : 12/17/2019 9:22:57AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.0 seconds

Dead Time : 0.11 %

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82226
Fill Height : 1037.17 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:38:03AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19^[86]

Analysis Report for 17-Dec-19-10015
L2-10214A-FSGS-003SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	238.54	950 -	970	954.24	7.31E+01	9.52	2.08E+01	0.99
m	2	241.60	950 -	970	966.50	2.39E+01	6.21	2.15E+01	0.99
	3	351.85	1400 -	1412	1407.13	5.94E+01	9.89	1.46E+01	0.37
	4	582.74	2325 -	2335	2330.16	1.60E+01	6.54	1.00E+01	0.60
	5	608.83	2429 -	2441	2434.47	4.93E+01	8.79	1.07E+01	1.50
	6	1460.13	5830 -	5849	5840.35	1.28E+02	11.31	0.00E+00	1.64

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	0.92	1460.82 *	10.66	3.74E+00	3.68E-01
Tl-208	0.96	583.19 *	85.00	3.06E-02	1.27E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.47E-01	2.25E-02
		300.09	3.30		
Bi-214	0.98	609.32 *	45.49	1.82E-01	3.42E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		

Analysis Report for 17-Dec-19-10015
L2-10214A-FSGS-003SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty		
Bi-214	0.98	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	2.91E-01	7.92E-02
				295.22	18.42		
351.93 *	35.60			1.89E-01	3.49E-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
K-40	0.926	3.74E+00	3.68E-01	
Tl-208	0.968	3.06E-02	1.27E-02	
X Bi-211	0.907			
Pb-212	0.999	1.47E-01	2.25E-02	
Bi-214	0.984	1.82E-01	3.42E-02	
Pb-214	0.509	2.05E-01	3.19E-02	

Analysis Report for 17-Dec-19-10015

L2-10214A-FSGS-003SS

- ? = 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 17-Dec-19-10015
L2-10214A-FSGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:38:03AM
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	5.04E-02	5.77E-02	5.77E-02
	BE-7	477.60	10.44	1.14E-01	3.99E-01	3.99E-01
+	K-40	1460.82	* 10.66	3.74E+00	8.40E-02	8.40E-02
	Mn-54	834.85	99.98	2.80E-02	4.87E-02	4.87E-02
	Co-60	1173.23	99.85	-2.25E-03	5.45E-02	7.27E-02
		1332.49	99.98	1.67E-02		5.45E-02
	Nb-94	702.65	99.81	2.15E-02	4.89E-02	5.17E-02
		871.09	99.89	-1.21E-02		4.89E-02
	Ag-108m	79.13	6.60	1.07E+00	4.31E-02	1.66E+00
		433.94	90.50	-2.67E-02		4.31E-02
		614.28	89.80	-2.16E-02		5.96E-02
		722.94	90.80	4.65E-02		5.70E-02
	Sb-125	176.31	6.84	3.16E-01	1.43E-01	5.50E-01
		380.45	1.52	1.26E+00		2.51E+00
		427.87	29.60	2.13E-02		1.43E-01
		463.36	10.49	8.14E-02		3.73E-01
		600.60	17.65	-4.95E-02		2.24E-01
		606.71	4.98	1.90E+00		1.50E+00
		635.95	11.22	-4.37E-01		2.90E-01

Analysis Report for 17-Dec-19-10015
L2-10214A-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-7.87E-01	1.43E-01	2.28E+00
Ba-133	79.61	2.65	-1.59E+00	7.14E-02	3.70E+00
	81.00	32.90	-4.59E-01		2.43E-01
	276.40	7.16	2.66E-01		5.23E-01
	302.85	18.34	8.39E-03		1.96E-01
	356.01	62.05	-4.78E-02		7.14E-02
	383.85	8.94	-2.00E-01		4.00E-01
Cs-134	475.36	1.48	6.63E-01	6.37E-02	2.56E+00
	563.25	8.34	-3.13E-02		4.43E-01
	569.33	15.37	4.16E-02		2.42E-01
	604.72	97.62	-3.11E-02		7.37E-02
	795.86	85.46	5.05E-02		6.37E-02
	801.95	8.69	1.05E-01		5.45E-01
	1038.61	0.99	-5.71E-01		5.45E+00
	1167.97	1.79	1.65E+00		3.75E+00
	1365.19	3.02	5.99E-02		1.69E+00
Cs-137	661.66	85.10	2.81E-02	6.79E-02	6.79E-02
Eu-152	121.78	28.67	7.32E-02	1.38E-01	1.51E-01
	244.70	7.61	-3.39E-01		5.42E-01
	295.94	0.45	1.71E+00		9.76E+00
	344.28	26.60	-4.69E-02		1.38E-01
	367.79	0.86	-2.20E-01		4.24E+00
	411.12	2.24	-1.79E+00		1.86E+00
	443.96	2.83	-3.03E-01		1.32E+00
	488.68	0.42	4.73E-01		8.14E+00
	563.99	0.49	1.43E+00		7.53E+00
	586.26	0.46	-1.82E+00		1.23E+01
	678.62	0.47	3.31E+00		9.35E+00
	688.67	0.86	-1.12E+00		5.63E+00
	719.35	0.28	-1.82E+00		1.41E+01
	778.90	12.96	-7.95E-02		3.74E-01
	810.45	0.32	8.66E+00		1.48E+01
	867.37	4.26	-4.04E-01		1.11E+00
	919.33	0.43	1.18E+00		1.02E+01
	964.08	14.65	2.16E-01		4.25E-01
	1085.87	10.24	-3.97E-01		3.60E-01
	1089.74	1.73	-2.27E+00		2.40E+00
	1112.07	13.69	4.47E-02		4.65E-01
	1212.95	1.43	7.25E-01		4.93E+00
	1249.94	0.19	6.23E+00		3.32E+01
	1299.14	1.63	1.93E+00		3.29E+00
	1408.01	21.07	2.29E-02		2.36E-01
	1457.64	0.50	8.10E+01		3.57E+01
	1528.10	0.28	9.15E+00		1.88E+01
Eu-154	123.07	40.40	-3.66E-02	1.04E-01	1.04E-01
	247.93	6.89	5.13E-01		5.53E-01
	591.76	4.95	1.16E-01		8.61E-01
	692.42	1.78	1.29E-01		2.83E+00
	723.30	20.06	1.66E-01		2.58E-01
	756.80	4.52	-2.67E-02		9.28E-01
	873.18	12.08	3.36E-02		4.25E-01

Analysis Report for 17-Dec-19-10015
L2-10214A-FSGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.15E-01	1.04E-01	4.72E-01
	1004.76	18.01	1.37E-01		2.84E-01
	1274.43	34.80	5.05E-02		1.92E-01
	1596.48	1.80	-4.18E-01		2.53E+00
Eu-155	45.30	1.31	-1.44E+01	2.46E-01	2.66E+01
	60.01	1.22	-1.74E+01		2.79E+01
	86.55	30.70	2.65E-03		2.46E-01
	105.31	21.10	5.95E-02		2.49E-01
Ra-226	186.21	3.64	8.13E-01	1.17E+00	1.17E+00
Pa-231	27.36	10.30	2.08E+00	1.50E+00	3.38E+00
	283.69	1.70	-7.33E-01		2.11E+00
	300.07	2.47	-8.52E-01		1.50E+00
	302.65	2.20	-2.68E-01		1.58E+00
	330.06	1.40	1.09E+00		3.03E+00
U-235	143.76	10.96	-6.71E-02	7.42E-02	4.01E-01
	163.33	5.08	2.90E-01		7.79E-01
	185.71	57.20	1.32E-02		7.42E-02
	202.11	1.08	4.80E-02		3.47E+00
	205.31	5.01	-4.73E-01		6.87E-01
Am-241	59.54	35.90	-8.14E-01	9.75E-01	9.75E-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

Analysis Report for 17-Dec-19-10016
L2-10214A-FSGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10016
Sample Description : L2-10214A-FSGS-004SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.471E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:06:00PM
Acquisition Started : 12/17/2019 9:23:04AM

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 : 11/4/2019
Efficiency Calibration Used Done On : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82227
Fill Height : 1471.49 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:38:20AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19 [93]

Analysis Report for 17-Dec-19-10016
L2-10214A-FSGS-004SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.90	948 -	961	955.17	8.50E+01	14.82	4.90E+01	0.79
2	352.24	1401 -	1413	1407.99	5.75E+01	10.46	1.95E+01	1.06
3	583.01	2324 -	2338	2330.18	3.67E+01	8.81	1.23E+01	1.27
4	609.46	2431 -	2442	2435.88	2.14E+01	7.92	1.56E+01	1.25
5	1460.25	5828 -	5849	5838.92	1.89E+02	14.43	5.30E+00	1.79

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	0.94	1460.82	*	10.66	4.28E+00
Tl-208	0.99	583.19	*	85.00	5.58E-02
Pb-212	0.99	115.18		0.60	
		238.63	*	43.60	1.36E-01
		300.09		3.30	
Bi-214	0.99	609.32	*	45.49	6.26E-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	

Analysis Report for 17-Dec-19-10016
L2-10214A-FSGS-004SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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			1.46E-01	2.90E-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
K-40	0.948	4.28E+00	3.77E-01	
Tl-208	0.995	5.58E-02	1.38E-02	
Pb-212	0.990	1.36E-01	2.62E-02	
Bi-214	0.999	6.26E-02	2.35E-02	
Pb-214	0.991	1.46E-01	2.90E-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 17-Dec-19-10016
L2-10214A-FSGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:38:20AM
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	5.06E-02	5.22E-02	5.22E-02
	BE-7	477.60	10.44	1.25E-01	3.57E-01	3.57E-01
+	K-40	1460.82	* 10.66	4.28E+00	4.06E-01	4.06E-01
	Mn-54	834.85	99.98	-2.53E-02	3.54E-02	3.54E-02
	Co-60	1173.23	99.85	2.65E-02	4.40E-02	5.37E-02
		1332.49	99.98	-1.44E-02		4.40E-02
	Nb-94	702.65	99.81	-1.03E-02	3.64E-02	3.95E-02
		871.09	99.89	1.83E-02		3.64E-02
	Ag-108m	79.13	6.60	1.11E+00	3.17E-02	1.03E+00
		433.94	90.50	-4.88E-02		3.17E-02
		614.28	89.80	-7.14E-04		5.06E-02
		722.94	90.80	-3.22E-02		4.50E-02
	Sb-125	176.31	6.84	9.00E-02	1.13E-01	4.08E-01
		380.45	1.52	-7.67E-01		1.78E+00
		427.87	29.60	-3.92E-02		1.13E-01
		463.36	10.49	9.17E-02		3.44E-01
		600.60	17.65	1.73E-01		2.11E-01
		606.71	4.98	7.21E-01		1.08E+00
		635.95	11.22	-1.25E-01		2.91E-01

Analysis Report for 17-Dec-19-10016
L2-10214A-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	2.44E-01	1.13E-01	1.85E+00
Ba-133	79.61	2.65	2.04E+00	6.24E-02	2.47E+00
	81.00	32.90	-1.66E-01		1.58E-01
	276.40	7.16	2.83E-01		4.83E-01
	302.85	18.34	2.61E-02		1.74E-01
	356.01	62.05	-6.53E-02		6.24E-02
	383.85	8.94	-4.56E-02		3.23E-01
Cs-134	475.36	1.48	-5.23E-01	4.74E-02	2.31E+00
	563.25	8.34	-8.88E-02		4.14E-01
	569.33	15.37	1.22E-01		1.97E-01
	604.72	97.62	-5.40E-02		4.86E-02
	795.86	85.46	4.11E-02		4.74E-02
	801.95	8.69	3.21E-01		4.78E-01
	1038.61	0.99	-1.67E+00		3.49E+00
	1167.97	1.79	1.63E+00		3.16E+00
	1365.19	3.02	6.10E-01		1.25E+00
Cs-137	661.66	85.10	1.72E-02	5.11E-02	5.11E-02
Eu-152	121.78	28.67	-5.81E-02	9.36E-02	9.36E-02
	244.70	7.61	1.83E-01		4.29E-01
	295.94	0.45	1.81E+00		8.13E+00
	344.28	26.60	-6.78E-02		1.03E-01
	367.79	0.86	4.45E-01		3.06E+00
	411.12	2.24	8.88E-01		1.38E+00
	443.96	2.83	-1.30E+00		1.07E+00
	488.68	0.42	-5.78E-01		7.17E+00
	563.99	0.49	-4.08E+00		6.26E+00
	586.26	0.46	-2.60E+00		1.17E+01
	678.62	0.47	-4.53E+00		6.88E+00
	688.67	0.86	2.81E-01		3.92E+00
	719.35	0.28	1.04E+01		1.41E+01
	778.90	12.96	-9.11E-03		2.53E-01
	810.45	0.32	-3.58E+00		1.14E+01
	867.37	4.26	-2.56E-01		7.74E-01
	919.33	0.43	1.55E+00		8.84E+00
	964.08	14.65	1.81E-01		4.40E-01
	1085.87	10.24	-8.66E-02		4.58E-01
	1089.74	1.73	6.25E-01		2.96E+00
	1112.07	13.69	-8.41E-02		2.14E-01
	1212.95	1.43	6.37E-01		3.85E+00
	1249.94	0.19	1.98E+01		2.96E+01
	1299.14	1.63	-4.69E-01		2.66E+00
	1408.01	21.07	-7.54E-02		1.63E-01
	1457.64	0.50	9.56E+01		3.39E+01
	1528.10	0.28	6.67E-01		8.59E+00
Eu-154	123.07	40.40	1.34E-03	6.92E-02	6.92E-02
	247.93	6.89	-9.78E-02		3.82E-01
	591.76	4.95	3.96E-02		6.42E-01
	692.42	1.78	8.38E-01		1.99E+00
	723.30	20.06	-1.84E-01		2.04E-01
	756.80	4.52	-3.17E-01		7.53E-01
	873.18	12.08	8.09E-02		3.19E-01

Analysis Report for 17-Dec-19-10016
L2-10214A-FSGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-4.47E-01	6.92E-02	3.46E-01
	1004.76	18.01	1.56E-01		2.23E-01
	1274.43	34.80	1.73E-02		1.14E-01
	1596.48	1.80	-1.44E-01		2.37E+00
Eu-155	45.30	1.31	6.41E+00	1.55E-01	9.58E+00
	60.01	1.22	3.15E+00		1.02E+01
	86.55	30.70	6.78E-02		1.55E-01
	105.31	21.10	-2.45E-02		1.58E-01
Ra-226	186.21	3.64	5.37E-01	8.43E-01	8.43E-01
Pa-231	27.36	10.30	5.68E-01	1.11E+00	1.11E+00
	283.69	1.70	3.07E-01		1.76E+00
	300.07	2.47	-7.84E-01		1.36E+00
	302.65	2.20	6.51E-01		1.45E+00
	330.06	1.40	2.01E+00		2.44E+00
U-235	143.76	10.96	1.30E-01	5.17E-02	2.51E-01
	163.33	5.08	2.47E-01		5.57E-01
	185.71	57.20	2.46E-02		5.17E-02
	202.11	1.08	-7.67E-01		2.39E+00
	205.31	5.01	-1.64E-01		5.46E-01
Am-241	59.54	35.90	2.19E-01	3.63E-01	3.63E-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

Analysis Report for 17-Dec-19-10017
L2-10214A-FSGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10017
Sample Description : L2-10214A-FSGS-005SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.704E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:08:00PM
Acquisition Started : 12/17/2019 9:23:12AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.2 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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82228
Fill Height : 1704.25 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:38:19AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19 [99]

Analysis Report for 17-Dec-19-10017
L2-10214A-FSGS-005SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.60	949 -	962	954.87	8.10E+01	15.13	5.20E+01	0.66
2	294.99	1176 -	1186	1180.17	3.12E+01	6.88	6.80E+00	0.62
3	351.98	1402 -	1415	1407.93	6.35E+01	9.64	1.05E+01	1.24
4	726.96	2901 -	2912	2906.92	1.49E+01	4.84	3.11E+00	0.48
5	911.09	3637 -	3649	3643.40	3.22E+01	6.69	4.78E+00	0.73
6	1460.73	5834 -	5854	5843.30	1.86E+02	14.46	6.87E+00	1.89

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	3.79E+00	3.37E-01
Bi-212	0.98	39.86	1.06		
		727.33 *	6.67	3.07E-01	1.01E-01
		785.37	1.10		
		1620.50	1.47		
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.25E-01	2.54E-02
		300.09	3.30		
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	1.28E-01	2.99E-02
		351.93 *	35.60	1.52E-01	2.60E-02 ^[100]

Analysis Report for 17-Dec-19-10017
L2-10214A-FSGS-005SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-214	0.99	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	1.99E-01	4.21E-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

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	0.999	3.79E+00	3.37E-01	
X K-40	0.875			
	0.986	3.07E-01	1.01E-01	
	1.000	1.25E-01	2.54E-02	
	0.997	1.41E-01	1.96E-02	
	0.999	1.99E-01	4.21E-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 17-Dec-19-10017
L2-10214A-FSGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:38:19AM
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	1.80E-02	4.35E-02	4.35E-02
BE-7	477.60	10.44	-2.74E-03	3.16E-01	3.16E-01
+ K-40	1460.82	* 10.66	3.79E+00	3.90E-01	3.90E-01
Mn-54	834.85	99.98	2.44E-02	4.25E-02	4.25E-02
Co-60	1173.23	99.85	1.81E-02	4.72E-02	5.54E-02
	1332.49	99.98	7.61E-03		4.72E-02
Nb-94	702.65	99.81	6.02E-03	3.22E-02	3.74E-02
	871.09	99.89	-7.56E-03		3.22E-02
Ag-108m	79.13	6.60	8.49E-01	3.34E-02	1.30E+00
	433.94	90.50	1.49E-02		3.34E-02
	614.28	89.80	-1.90E-04		5.32E-02
	722.94	90.80	-3.18E-02		4.46E-02
Sb-125	176.31	6.84	1.97E-02	9.27E-02	4.14E-01
	380.45	1.52	6.28E-01		2.03E+00
	427.87	29.60	-4.78E-02		9.27E-02
	463.36	10.49	1.34E-01		2.97E-01
	600.60	17.65	-3.63E-03		2.18E-01
	606.71	4.98	1.21E+00		1.06E+00
	635.95	11.22	1.65E-01		3.02E-01

Analysis Report for 17-Dec-19-10017
L2-10214A-FSGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-9.93E-01	9.27E-02	1.96E+00
Ba-133	79.61	2.65	1.57E+00	6.18E-02	3.08E+00
	81.00	32.90	-4.44E-01		2.02E-01
	276.40	7.16	-3.74E-02		4.40E-01
	302.85	18.34	6.23E-03		1.52E-01
	356.01	62.05	-4.14E-03		6.18E-02
	383.85	8.94	-3.32E-02		3.39E-01
Cs-134	475.36	1.48	7.33E-01	4.66E-02	2.29E+00
	563.25	8.34	2.82E-01		4.42E-01
	569.33	15.37	-2.57E-01		2.32E-01
	604.72	97.62	1.59E-02		5.12E-02
	795.86	85.46	2.43E-02		4.66E-02
	801.95	8.69	-8.97E-01		3.82E-01
	1038.61	0.99	2.64E+00		4.35E+00
	1167.97	1.79	-1.56E-01		2.85E+00
	1365.19	3.02	-2.06E-01		1.07E+00
Cs-137	661.66	85.10	-1.02E-02	4.93E-02	4.93E-02
Eu-152	121.78	28.67	-5.50E-02	1.09E-01	1.16E-01
	244.70	7.61	3.51E-03		4.28E-01
	295.94	0.45	-1.71E+00		7.19E+00
	344.28	26.60	-8.38E-02		1.09E-01
	367.79	0.86	-9.29E-01		3.10E+00
	411.12	2.24	-3.07E-01		1.47E+00
	443.96	2.83	7.75E-02		9.93E-01
	488.68	0.42	-1.70E+00		6.65E+00
	563.99	0.49	-1.64E+00		7.41E+00
	586.26	0.46	6.33E+00		1.03E+01
	678.62	0.47	-1.55E+00		6.47E+00
	688.67	0.86	1.66E+00		3.92E+00
	719.35	0.28	6.49E+00		1.34E+01
	778.90	12.96	-2.66E-01		2.87E-01
	810.45	0.32	5.17E+00		1.04E+01
	867.37	4.26	-8.72E-01		8.18E-01
	919.33	0.43	-1.11E+01		9.87E+00
	964.08	14.65	2.61E-01		3.48E-01
	1085.87	10.24	-6.69E-02		3.73E-01
	1089.74	1.73	-1.89E+00		2.40E+00
	1112.07	13.69	-5.80E-02		3.42E-01
	1212.95	1.43	4.69E-02		3.90E+00
	1249.94	0.19	3.50E+01		3.18E+01
	1299.14	1.63	7.32E-01		2.39E+00
	1408.01	21.07	5.33E-03		1.65E-01
	1457.64	0.50	8.09E+01		3.06E+01
	1528.10	0.28	3.98E+00		1.08E+01
Eu-154	123.07	40.40	-2.04E-02	8.03E-02	8.03E-02
	247.93	6.89	5.57E-02		4.50E-01
	591.76	4.95	4.88E-01		7.59E-01
	692.42	1.78	-8.96E-03		1.94E+00
	723.30	20.06	-1.22E-01		1.99E-01
	756.80	4.52	4.49E-01		7.75E-01
	873.18	12.08	-1.09E-01		2.74E-01

Analysis Report for 17-Dec-19-10017
L2-10214A-FSGS-005SS

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	8.03E-02	3.92E-01
	1004.76	18.01	2.77E-02		2.13E-01
	1274.43	34.80	2.97E-02		1.35E-01
	1596.48	1.80	-6.84E-01		2.33E+00
Eu-155	45.30	1.31	8.67E+00	1.98E-01	1.80E+01
	60.01	1.22	-1.40E+00		1.72E+01
	86.55	30.70	1.72E-01		1.98E-01
	105.31	21.10	1.23E-01		1.99E-01
Ra-226	186.21	3.64	5.72E-02	9.02E-01	9.02E-01
Pa-231	27.36	10.30	1.71E+00	1.20E+00	2.02E+00
	283.69	1.70	-7.30E-01		1.78E+00
	300.07	2.47	-5.38E-01		1.20E+00
	302.65	2.20	-9.09E-02		1.26E+00
	330.06	1.40	3.31E-01		2.36E+00
U-235	143.76	10.96	-1.05E-01	5.78E-02	2.78E-01
	163.33	5.08	-2.70E-01		5.73E-01
	185.71	57.20	2.67E-02		5.78E-02
	202.11	1.08	9.95E-01		2.87E+00
	205.31	5.01	3.34E-01		6.38E-01
Am-241	59.54	35.90	3.52E-02	6.07E-01	6.07E-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

Analysis Report for 17-Dec-19-10018
L2-10214A-FSGS-006SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10018
Sample Description : L2-10214A-FSGS-006SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.516E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:10:00PM
Acquisition Started : 12/17/2019 9:42:44AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.1 seconds

Dead Time : 0.12 %

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82230
Fill Height : 1515.76 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:57:47AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19 [105]

Analysis Report for 17-Dec-19-10018
L2-10214A-FSGS-006SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.58	947 -	960	954.42	7.93E+01	14.61	4.87E+01	1.15
2	294.95	1175 -	1186	1179.71	2.71E+01	9.75	2.59E+01	0.55
3	351.80	1400 -	1412	1406.95	6.52E+01	10.58	1.78E+01	1.09
4	583.11	2325 -	2336	2331.64	3.10E+01	6.78	6.00E+00	0.59
5	609.01	2429 -	2441	2435.21	3.85E+01	7.69	7.50E+00	0.75
6	1459.99	5830 -	5852	5839.80	1.72E+02	13.77	4.99E+00	0.96

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	4.30E+00	3.92E-01
Tl-208	0.99	583.19 *	85.00	5.18E-02	1.18E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.42E-01	2.86E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.24E-01	2.59E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		

Analysis Report for 17-Dec-19-10018
L2-10214A-FSGS-006SS

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			1.29E-01	4.76E-02
351.93 *	35.60			1.83E-01	3.31E-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
K-40	0.896	4.30E+00	3.92E-01	
Tl-208	0.999	5.18E-02	1.18E-02	
X Bi-211	0.917			
Pb-212	1.000	1.42E-01	2.86E-02	
Bi-214	0.994	1.24E-01	2.59E-02	
Pb-214	0.995	1.65E-01	2.72E-02	

Analysis Report for 17-Dec-19-10018

L2-10214A-FSGS-006SS

- ? = 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 17-Dec-19-10018
L2-10214A-FSGS-006SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:57:47AM
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	7.31E-02	5.41E-02	5.41E-02
	BE-7	477.60	10.44	2.37E-01	4.25E-01	4.25E-01
+	K-40	1460.82	* 10.66	4.30E+00	4.28E-01	4.28E-01
	Mn-54	834.85	99.98	-9.31E-03	4.42E-02	4.42E-02
	Co-60	1173.23	99.85	2.48E-02	5.01E-02	6.03E-02
		1332.49	99.98	3.23E-02		5.01E-02
	Nb-94	702.65	99.81	1.21E-02	3.89E-02	4.92E-02
		871.09	99.89	-2.62E-02		3.89E-02
	Ag-108m	79.13	6.60	1.89E+00	3.73E-02	1.92E+00
		433.94	90.50	-1.76E-02		3.73E-02
		614.28	89.80	-9.13E-03		4.78E-02
		722.94	90.80	-2.41E-02		4.69E-02
	Sb-125	176.31	6.84	1.22E-01	1.13E-01	5.37E-01
		380.45	1.52	-4.65E-01		2.29E+00
		427.87	29.60	7.01E-02		1.13E-01
		463.36	10.49	-1.24E-01		3.57E-01
		600.60	17.65	1.53E-01		2.50E-01
		606.71	4.98	1.54E+00		1.21E+00
		635.95	11.22	1.88E-01		2.80E-01

Analysis Report for 17-Dec-19-10018
L2-10214A-FSGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.28E+00	1.13E-01	2.51E+00
Ba-133	79.61	2.65	2.61E+00	7.34E-02	4.58E+00
	81.00	32.90	-1.10E-01		3.15E-01
	276.40	7.16	4.65E-01		5.13E-01
	302.85	18.34	1.43E-01		1.99E-01
	356.01	62.05	-3.99E-02		7.34E-02
	383.85	8.94	-2.97E-03		4.00E-01
Cs-134	475.36	1.48	1.15E+00	5.62E-02	2.90E+00
	563.25	8.34	5.13E-03		4.55E-01
	569.33	15.37	5.01E-02		2.40E-01
	604.72	97.62	-3.14E-02		6.25E-02
	795.86	85.46	2.30E-02		5.62E-02
	801.95	8.69	-3.35E-01		4.61E-01
	1038.61	0.99	1.86E+00		4.43E+00
	1167.97	1.79	-1.46E+00		3.16E+00
	1365.19	3.02	1.39E-01		1.38E+00
Cs-137	661.66	85.10	1.73E-02	5.23E-02	5.23E-02
Eu-152	121.78	28.67	3.08E-02	1.27E-01	1.43E-01
	244.70	7.61	1.71E-01		5.06E-01
	295.94	0.45	3.68E+00		9.16E+00
	344.28	26.60	-4.83E-02		1.27E-01
	367.79	0.86	1.08E+00		3.79E+00
	411.12	2.24	-1.05E+00		1.50E+00
	443.96	2.83	-2.57E-01		1.12E+00
	488.68	0.42	2.02E+00		9.11E+00
	563.99	0.49	-2.06E+00		7.46E+00
	586.26	0.46	-9.89E+00		1.16E+01
	678.62	0.47	3.26E+00		8.98E+00
	688.67	0.86	-6.85E-01		5.07E+00
	719.35	0.28	1.42E+00		1.55E+01
	778.90	12.96	-1.06E-01		3.32E-01
	810.45	0.32	2.38E+00		1.29E+01
	867.37	4.26	-7.60E-01		1.04E+00
	919.33	0.43	-7.27E+00		8.51E+00
	964.08	14.65	1.51E-01		3.80E-01
	1085.87	10.24	-4.36E-01		5.69E-01
	1089.74	1.73	4.28E-01		3.61E+00
	1112.07	13.69	-1.97E-01		3.64E-01
	1212.95	1.43	-1.70E+00		4.47E+00
	1249.94	0.19	-4.24E+00		2.70E+01
	1299.14	1.63	1.34E+00		3.40E+00
	1408.01	21.07	-8.61E-03		1.67E-01
	1457.64	0.50	9.50E+01		3.59E+01
	1528.10	0.28	2.94E+00		1.09E+01
Eu-154	123.07	40.40	-8.63E-03	9.76E-02	9.76E-02
	247.93	6.89	-2.69E-01		5.01E-01
	591.76	4.95	2.50E-01		7.65E-01
	692.42	1.78	1.08E+00		2.50E+00
	723.30	20.06	-1.97E-01		2.12E-01
	756.80	4.52	3.57E-02		9.14E-01
	873.18	12.08	-1.52E-01		3.02E-01

Analysis Report for 17-Dec-19-10018
L2-10214A-FSGS-006SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	5.38E-02	9.76E-02	4.07E-01
	1004.76	18.01	-2.81E-02		2.23E-01
	1274.43	34.80	-1.60E-02		1.53E-01
	1596.48	1.80	-3.15E+00		2.16E+00
Eu-155	45.30	1.31	-1.39E+01	2.42E-01	2.57E+01
	60.01	1.22	1.39E+01		2.87E+01
	86.55	30.70	-9.21E-03		2.45E-01
	105.31	21.10	6.02E-02		2.42E-01
Ra-226	186.21	3.64	5.08E-01	1.14E+00	1.14E+00
Pa-231	27.36	10.30	2.11E+00	1.37E+00	3.40E+00
	283.69	1.70	4.44E-01		2.15E+00
	300.07	2.47	-5.48E-01		1.37E+00
	302.65	2.20	2.91E-01		1.60E+00
	330.06	1.40	-2.43E-01		2.62E+00
	U-235	143.76	10.96		-1.44E-01
U-235	163.33	5.08	8.59E-02	7.11E-02	7.26E-01
	185.71	57.20	2.00E-02		7.11E-02
	202.11	1.08	6.70E-01		3.16E+00
	205.31	5.01	-1.24E-01		6.62E-01
Am-241	59.54	35.90	3.35E-01	1.04E+00	1.04E+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

Analysis Report for 17-Dec-19-10019
L2-10214A-FSGS-007SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10019
Sample Description : L2-10214A-FSGS-007SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.568E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:12:00PM
Acquisition Started : 12/17/2019 9:42:52AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P11314
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.2 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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82231
Fill Height : 1567.87 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:58:09AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19

Analysis Report for 17-Dec-19-10019
L2-10214A-FSGS-007SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.77	949 -	961	954.65	7.62E+01	13.37	3.78E+01	0.81
2	609.14	2428 -	2441	2434.58	5.22E+01	7.57	1.80E+00	0.98
3	910.69	3634 -	3645	3640.23	2.54E+01	5.45	1.61E+00	1.59
4	1460.11	5826 -	5850	5838.39	1.73E+02	13.15	0.00E+00	1.70

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	0.92	1460.82 *	10.66	3.85E+00	3.37E-01
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.20E-01	2.33E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.50E-01	2.36E-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		

[113]

Analysis Report for 17-Dec-19-10019
L2-10214A-FSGS-007SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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		
		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			1.70E-01	3.71E-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

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.923	3.85E+00	3.37E-01	
Pb-212	0.997	1.20E-01	2.33E-02	
Bi-214	0.998	1.50E-01	2.36E-02	
Ac-228	0.987	1.70E-01	3.71E-02	

Analysis Report for 17-Dec-19-10019

L2-10214A-FSGS-007SS

- ? = 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 17-Dec-19-10019
L2-10214A-FSGS-007SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:58:09AM
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	5.54E-02	5.01E-02	5.01E-02
BE-7	477.60	10.44	-2.23E-02	2.93E-01	2.93E-01
+ K-40	1460.82	* 10.66	3.85E+00	6.41E-02	6.41E-02
Mn-54	834.85	99.98	-3.19E-03	3.38E-02	3.38E-02
Co-60	1173.23	99.85	2.55E-03	4.11E-02	4.11E-02
	1332.49	99.98	1.20E-02		4.16E-02
Nb-94	702.65	99.81	-3.40E-04	2.75E-02	3.28E-02
	871.09	99.89	-3.76E-03		2.75E-02
Ag-108m	79.13	6.60	5.59E-01	3.43E-02	1.06E+00
	433.94	90.50	2.22E-02		3.43E-02
	614.28	89.80	-3.46E-02		4.53E-02
	722.94	90.80	4.26E-03		4.35E-02
Sb-125	176.31	6.84	8.15E-02	8.97E-02	3.75E-01
	380.45	1.52	-2.79E-01		2.02E+00
	427.87	29.60	6.57E-02		8.97E-02
	463.36	10.49	-9.44E-02		2.83E-01
	600.60	17.65	-2.10E-02		2.11E-01
	606.71	4.98	8.83E-01		1.12E+00
	635.95	11.22	2.20E-01		3.40E-01

Analysis Report for 17-Dec-19-10019
L2-10214A-FSGS-007SS

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	8.97E-02	2.03E+00
Ba-133	79.61	2.65	1.69E+00	5.18E-02	2.57E+00
	81.00	32.90	-1.95E-01		1.64E-01
	276.40	7.16	3.04E-01		4.28E-01
	302.85	18.34	2.79E-02		1.65E-01
	356.01	62.05	-6.32E-02		5.18E-02
	383.85	8.94	1.41E-01		3.45E-01
Cs-134	475.36	1.48	7.10E-01	4.27E-02	2.08E+00
	563.25	8.34	2.46E-02		4.47E-01
	569.33	15.37	9.74E-02		2.26E-01
	604.72	97.62	-4.34E-03		5.14E-02
	795.86	85.46	-2.90E-02		4.27E-02
	801.95	8.69	3.09E-01		4.12E-01
	1038.61	0.99	2.09E+00		3.57E+00
	1167.97	1.79	-2.30E+00		2.05E+00
	1365.19	3.02	-2.53E-01		1.09E+00
Cs-137	661.66	85.10	4.62E-03	4.30E-02	4.30E-02
Eu-152	121.78	28.67	-3.13E-02	9.94E-02	9.94E-02
	244.70	7.61	1.81E-02		4.21E-01
	295.94	0.45	5.01E+00		8.08E+00
	344.28	26.60	-6.65E-03		1.06E-01
	367.79	0.86	4.58E-01		3.11E+00
	411.12	2.24	-7.64E-01		1.08E+00
	443.96	2.83	2.94E-01		1.07E+00
	488.68	0.42	1.41E+00		6.93E+00
	563.99	0.49	-7.88E+00		6.80E+00
	586.26	0.46	1.11E+01		1.12E+01
	678.62	0.47	1.58E+00		6.41E+00
	688.67	0.86	2.34E+00		3.85E+00
	719.35	0.28	5.13E+00		1.16E+01
	778.90	12.96	-8.62E-02		2.06E-01
	810.45	0.32	4.97E+00		1.06E+01
	867.37	4.26	-2.03E-02		7.88E-01
	919.33	0.43	-4.98E+00		8.69E+00
	964.08	14.65	-1.18E-01		3.28E-01
	1085.87	10.24	-6.50E-01		4.50E-01
	1089.74	1.73	9.25E-01		3.27E+00
	1112.07	13.69	-3.38E-01		3.34E-01
	1212.95	1.43	2.22E-01		3.99E+00
	1249.94	0.19	-1.29E+01		2.27E+01
	1299.14	1.63	1.34E+00		2.42E+00
	1408.01	21.07	-1.49E-02		2.06E-01
	1457.64	0.50	7.52E+01		3.14E+01
	1528.10	0.28	8.72E+00		1.57E+01
Eu-154	123.07	40.40	-1.92E-02	7.02E-02	7.02E-02
	247.93	6.89	4.59E-02		3.84E-01
	591.76	4.95	2.61E-01		8.01E-01
	692.42	1.78	1.08E+00		2.00E+00
	723.30	20.06	-5.79E-03		2.01E-01
	756.80	4.52	-7.39E-01		7.99E-01
	873.18	12.08	3.42E-02		2.39E-01

Analysis Report for 17-Dec-19-10019
L2-10214A-FSGS-007SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.28E-01	7.02E-02	3.40E-01
	1004.76	18.01	-9.17E-02		1.84E-01
	1274.43	34.80	-8.96E-02		1.33E-01
	1596.48	1.80	1.13E+00		2.33E+00
Eu-155	45.30	1.31	-5.08E-01	1.50E-01	8.81E+00
	60.01	1.22	-2.29E-01		1.05E+01
	86.55	30.70	1.09E-01		1.54E-01
	105.31	21.10	-2.47E-02		1.50E-01
Ra-226	186.21	3.64	8.27E-01	8.21E-01	8.21E-01
Pa-231	27.36	10.30	9.56E-01	1.17E+00	1.17E+00
	283.69	1.70	-4.34E-01		1.42E+00
	300.07	2.47	-2.59E+00		1.17E+00
	302.65	2.20	8.33E-01		1.40E+00
	330.06	1.40	-5.15E-01		2.14E+00
	U-235	143.76	10.96		2.48E-02
U-235	163.33	5.08	-1.32E-01	5.17E-02	5.23E-01
	185.71	57.20	4.77E-02		5.17E-02
	202.11	1.08	4.24E-01		2.46E+00
	205.31	5.01	-2.75E-01		5.13E-01
Am-241	59.54	35.90	-1.01E-01	3.62E-01	3.62E-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

Analysis Report for 17-Dec-19-10020
L2-10214A-FSGS-008SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10020
Sample Description : L2-10214A-FSGS-008SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.496E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:14:00PM
Acquisition Started : 12/17/2019 9:43:00AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.2 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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82232
Fill Height : 1496.46 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:58:06AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 [119]
12-17-19

Analysis Report for 17-Dec-19-10020
L2-10214A-FSGS-008SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	185.83	739 -	748	744.05	2.14E+01	9.74	3.26E+01	0.91
2	238.67	950 -	961	955.14	8.06E+01	14.02	4.54E+01	0.86
3	351.70	1401 -	1414	1406.79	5.81E+01	10.12	1.59E+01	0.60
4	583.44	2328 -	2339	2333.07	3.04E+01	7.20	8.58E+00	0.83
5	609.29	2431 -	2444	2436.44	4.42E+01	8.08	7.81E+00	1.11
6	910.72	3636 -	3648	3641.90	2.60E+01	6.27	4.96E+00	0.77
7	1460.70	5832 -	5853	5843.16	1.74E+02	13.60	2.80E+00	2.14

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	3.67E+00	3.28E-01
Tl-208	0.99	583.19 *	85.00	4.38E-02	1.07E-02
Bi-211	0.93	351.07 *	13.02	3.88E-01	7.45E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.27E-01	2.43E-02
		300.09	3.30		
Bi-214	1.00	609.32 *	45.49	1.22E-01	2.35E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		

[120]

Analysis Report for 17-Dec-19-10020
L2-10214A-FSGS-008SS

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		
		351.93 *	35.60	1.42E-01	2.72E-02
		785.96	1.06		
Ra-226	0.97	186.21 *	3.64	3.61E-01	1.67E-01
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	1.65E-01	4.05E-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			2.30E-02	1.06E-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 17-Dec-19-10020
L2-10214A-FSGS-008SS

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.998	3.67E+00	3.28E-01	
Tl-208	0.990	4.38E-02	1.07E-02	
? Bi-211	0.939	3.88E-01	7.45E-02	
Pb-212	1.000	1.27E-01	2.43E-02	
Bi-214	1.000	1.22E-01	2.35E-02	
? Pb-214	0.995	1.42E-01	2.72E-02	
? Ra-226	0.977	3.61E-01	1.67E-01	
Ac-228	0.988	1.65E-01	4.05E-02	
? U-235	0.998	2.30E-02	1.06E-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 17-Dec-19-10020
L2-10214A-FSGS-008SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:58:06AM
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	5.66E-02	5.15E-02	5.15E-02
	BE-7	477.60	10.44	2.36E-01	3.36E-01	3.36E-01
+	K-40	1460.82	* 10.66	3.67E+00	2.94E-01	2.94E-01
	Mn-54	834.85	99.98	7.53E-03	2.91E-02	2.91E-02
	Co-60	1173.23	99.85	-3.32E-02	3.94E-02	4.15E-02
		1332.49	99.98	-2.08E-02		3.94E-02
	Nb-94	702.65	99.81	-1.37E-02	3.58E-02	3.58E-02
		871.09	99.89	8.50E-03		3.78E-02
	Ag-108m	79.13	6.60	4.22E-01	3.60E-02	1.31E+00
		433.94	90.50	2.60E-02		3.60E-02
		614.28	89.80	-1.27E-02		5.85E-02
		722.94	90.80	2.66E-02		4.58E-02
	Sb-125	176.31	6.84	3.91E-01	1.12E-01	4.33E-01
		380.45	1.52	8.85E-01		2.19E+00
		427.87	29.60	-1.43E-02		1.12E-01
		463.36	10.49	7.47E-02		3.21E-01
		600.60	17.65	1.54E-01		2.00E-01
		606.71	4.98	1.06E+00		1.08E+00
		635.95	11.22	5.29E-02		2.87E-01

Analysis Report for 17-Dec-19-10020
L2-10214A-FSGS-008SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	6.51E-01	1.12E-01	2.05E+00
Ba-133	79.61	2.65	1.97E+00	5.92E-02	3.18E+00
	81.00	32.90	-4.23E-01		2.01E-01
	276.40	7.16	4.98E-02		4.38E-01
	302.85	18.34	-1.05E-02		1.75E-01
	356.01	62.05	-2.60E-02		5.92E-02
	383.85	8.94	6.99E-05		3.32E-01
Cs-134	475.36	1.48	1.04E+00	4.27E-02	2.34E+00
	563.25	8.34	-1.10E-01		3.71E-01
	569.33	15.37	-4.93E-02		2.03E-01
	604.72	97.62	-4.74E-02		5.06E-02
	795.86	85.46	-1.30E-02		4.27E-02
	801.95	8.69	-9.54E-02		4.03E-01
	1038.61	0.99	1.83E+00		3.98E+00
	1167.97	1.79	-6.99E-01		2.67E+00
	1365.19	3.02	7.79E-01		1.33E+00
Cs-137	661.66	85.10	7.39E-03	4.68E-02	4.68E-02
Eu-152	121.78	28.67	4.31E-02	1.08E-01	1.29E-01
	244.70	7.61	2.00E-01		4.54E-01
	295.94	0.45	3.11E+00		8.36E+00
	344.28	26.60	-3.13E-02		1.08E-01
	367.79	0.86	-3.06E-01		3.21E+00
	411.12	2.24	-4.17E-02		1.34E+00
	443.96	2.83	6.90E-02		1.05E+00
	488.68	0.42	4.45E+00		8.79E+00
	563.99	0.49	-4.28E+00		6.30E+00
	586.26	0.46	8.72E+00		1.07E+01
	678.62	0.47	2.08E+00		7.55E+00
	688.67	0.86	2.37E+00		3.95E+00
	719.35	0.28	7.42E+00		1.37E+01
	778.90	12.96	-8.55E-02		2.52E-01
	810.45	0.32	3.86E-01		1.20E+01
	867.37	4.26	-9.92E-01		9.25E-01
	919.33	0.43	-6.34E+00		9.38E+00
	964.08	14.65	3.43E-01		3.86E-01
	1085.87	10.24	-3.79E-02		3.62E-01
	1089.74	1.73	-1.44E+00		2.15E+00
	1112.07	13.69	-2.72E-01		3.46E-01
	1212.95	1.43	3.57E+00		4.15E+00
	1249.94	0.19	7.71E+00		3.06E+01
	1299.14	1.63	1.82E-01		2.72E+00
	1408.01	21.07	-3.93E-02		1.61E-01
	1457.64	0.50	8.11E+01		3.01E+01
	1528.10	0.28	-1.35E+01		9.21E+00
Eu-154	123.07	40.40	5.59E-02	8.91E-02	8.91E-02
	247.93	6.89	1.00E-01		4.20E-01
	591.76	4.95	-6.86E-02		7.04E-01
	692.42	1.78	-4.30E-01		1.99E+00
	723.30	20.06	1.73E-01		2.08E-01
	756.80	4.52	-3.88E-01		8.14E-01
	873.18	12.08	1.02E-01		3.21E-01

Analysis Report for 17-Dec-19-10020
L2-10214A-FSGS-008SS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29	10.48	3.82E-01	8.91E-02	4.29E-01
		1004.76	18.01	6.06E-02		2.36E-01
		1274.43	34.80	-1.26E-02		1.36E-01
		1596.48	1.80	-2.48E+00		1.95E+00
	Eu-155	45.30	1.31	-4.76E+00	1.79E-01	1.58E+01
		60.01	1.22	-2.18E+01		1.80E+01
		86.55	30.70	3.27E-03		1.79E-01
		105.31	21.10	-3.47E-02		1.86E-01
+	Ra-226	186.21	* 3.64	3.61E-01	5.39E-01	5.39E-01
	Pa-231	27.36	10.30	6.29E-01	1.41E+00	1.89E+00
		283.69	1.70	-1.72E-01		1.78E+00
		300.07	2.47	-1.93E+00		1.41E+00
		302.65	2.20	-8.75E-02		1.47E+00
		330.06	1.40	1.12E+00		2.24E+00
+	U-235	143.76	10.96	1.48E-01	3.43E-02	2.97E-01
		163.33	5.08	-2.54E-02		5.98E-01
		185.71	* 57.20	2.30E-02		3.43E-02
		202.11	1.08	-6.85E-01		2.78E+00
		205.31	5.01	1.31E-01		5.86E-01
	Am-241	59.54	35.90	-3.28E-01	6.70E-01	6.70E-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

Analysis Report for 17-Dec-19-10021
L2-10214A-FSGS-009SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10021
Sample Description : L2-10214A-FSGS-009SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.588E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:16:00PM
Acquisition Started : 12/17/2019 10:08:21AM

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82233
Fill Height : 1587.81 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 10:23:24AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1530 12/17/19

Analysis Report for 17-Dec-19-10021
L2-10214A-FSGS-009SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.66	473 -	481	477.49	9.24E+01	16.16	7.76E+01	1.07
2	351.93	700 -	708	703.81	5.18E+01	9.87	2.12E+01	1.09
3	583.17	1161 -	1169	1165.94	2.70E+01	8.22	1.90E+01	0.84
4	609.09	1215 -	1223	1217.75	5.57E+01	8.17	5.32E+00	1.51
5	1460.29	2913 -	2927	2920.64	1.77E+02	14.11	7.51E+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	0.95	1460.82	*	10.66	3.30E+00
Tl-208	1.00	583.19	*	85.00	3.46E-02
Bi-211	0.88	351.07	*	13.02	3.08E-01
Pb-212	1.00	115.18		0.60	
		238.63	*	43.60	1.29E-01
		300.09		3.30	
Bi-214	0.99	609.32	*	45.49	1.37E-01
		768.36		4.89	
		806.18		1.26	
		934.06		3.11	
		1120.29		14.92	
		1155.21		1.63	

[127]

Analysis Report for 17-Dec-19-10021
L2-10214A-FSGS-009SS

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	1.00	241.99	7.25
295.22	18.42				
351.93 *	35.60			1.13E-01	2.33E-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
K-40	0.956	3.30E+00	2.99E-01	
Tl-208	1.000	3.46E-02	1.07E-02	
? Bi-211	0.888	3.08E-01	6.38E-02	
Pb-212	1.000	1.29E-01	2.48E-02	
Bi-214	0.996	1.37E-01	2.17E-02	
? Pb-214	1.000	1.13E-01	2.33E-02	

Analysis Report for 17-Dec-19-10021

L2-10214A-FSGS-009SS

- ? = 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 17-Dec-19-10021
L2-10214A-FSGS-009SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 10:23:24AM
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	4.89E-02	4.50E-02	4.50E-02
	BE-7	477.60	10.44	1.72E-01	3.03E-01	3.03E-01
+	K-40	1460.82	* 10.66	3.30E+00	3.48E-01	3.48E-01
	Mn-54	834.85	99.98	-1.19E-02	3.12E-02	3.12E-02
	Co-60	1173.23	99.85	1.74E-02	3.98E-02	4.25E-02
		1332.49	99.98	1.10E-02		3.98E-02
	Nb-94	702.65	99.81	-5.40E-03	3.48E-02	3.48E-02
		871.09	99.89	8.03E-03		3.58E-02
	Ag-108m	79.13	6.60	8.82E-02	2.79E-02	9.16E-01
		433.94	90.50	-9.75E-03		2.79E-02
		614.28	89.80	-1.19E-02		3.91E-02
		722.94	90.80	-8.49E-03		3.83E-02
	Sb-125	176.31	6.84	-1.22E-02	9.35E-02	4.51E-01
		380.45	1.52	5.37E-01		1.85E+00
		427.87	29.60	4.08E-02		9.35E-02
		463.36	10.49	1.35E-01		3.18E-01
		600.60	17.65	4.80E-02		1.80E-01
		606.71	4.98	-1.28E+00		9.95E-01
		635.95	11.22	2.05E-02		2.00E-01

Analysis Report for 17-Dec-19-10021
L2-10214A-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.93E-01	9.35E-02	1.66E+00
Ba-133	79.61	2.65	-5.02E-01	5.56E-02	2.11E+00
	81.00	32.90	-9.64E-02		1.51E-01
	276.40	7.16	5.92E-03		3.89E-01
	302.85	18.34	-5.61E-03		1.54E-01
	356.01	62.05	-1.16E-02		5.56E-02
	383.85	8.94	-2.30E-01		2.99E-01
Cs-134	475.36	1.48	-2.89E-01	3.79E-02	1.96E+00
	563.25	8.34	-3.90E-02		3.55E-01
	569.33	15.37	-2.80E-02		1.80E-01
	604.72	97.62	-8.54E-02		4.64E-02
	795.86	85.46	1.56E-03		3.79E-02
	801.95	8.69	-9.27E-02		3.49E-01
	1038.61	0.99	1.76E-01		3.62E+00
	1167.97	1.79	5.92E-01		1.98E+00
	1365.19	3.02	2.55E-01		9.75E-01
Cs-137	661.66	85.10	3.24E-02	4.61E-02	4.61E-02
Eu-152	121.78	28.67	-3.82E-02	9.71E-02	9.71E-02
	244.70	7.61	-6.98E-02		4.07E-01
	295.94	0.45	3.51E+00		7.89E+00
	344.28	26.60	-1.43E-02		1.07E-01
	367.79	0.86	1.05E+00		3.44E+00
	411.12	2.24	3.56E-01		1.38E+00
	443.96	2.83	2.05E-01		1.04E+00
	488.68	0.42	1.95E+00		6.91E+00
	563.99	0.49	3.33E-01		6.12E+00
	586.26	0.46	-4.16E+00		9.57E+00
	678.62	0.47	-3.13E-01		7.07E+00
	688.67	0.86	-2.06E+00		3.65E+00
	719.35	0.28	-3.44E-01		1.22E+01
	778.90	12.96	-2.69E-02		2.57E-01
	810.45	0.32	-2.46E-01		1.02E+01
	867.37	4.26	1.19E-01		8.04E-01
	919.33	0.43	1.87E+00		7.95E+00
	964.08	14.65	-8.18E-02		2.86E-01
	1085.87	10.24	-1.65E-01		3.21E-01
	1089.74	1.73	-3.04E-01		2.19E+00
	1112.07	13.69	-1.40E-01		3.18E-01
	1212.95	1.43	2.02E+00		3.46E+00
	1249.94	0.19	4.62E+00		2.39E+01
	1299.14	1.63	-1.08E+00		2.79E+00
	1408.01	21.07	4.24E-02		1.91E-01
	1457.64	0.50	-4.43E-01		2.71E+01
	1528.10	0.28	-1.82E-01		1.06E+01
Eu-154	123.07	40.40	-3.05E-02	6.89E-02	6.89E-02
	247.93	6.89	3.43E-01		4.55E-01
	591.76	4.95	-3.01E-01		5.51E-01
	692.42	1.78	2.81E-01		1.77E+00
	723.30	20.06	-3.71E-02		1.76E-01
	756.80	4.52	1.14E-01		6.12E-01
	873.18	12.08	1.87E-01		3.20E-01

Analysis Report for 17-Dec-19-10021
L2-10214A-FSGS-009SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-4.63E-02	6.89E-02	3.58E-01
	1004.76	18.01	-1.85E-02		2.23E-01
	1274.43	34.80	1.67E-02		1.17E-01
	1596.48	1.80	-7.96E-01		2.30E+00
Eu-155	45.30	1.31	3.51E+00	1.54E-01	1.01E+01
	60.01	1.22	-3.73E-01		1.07E+01
	86.55	30.70	8.03E-02		1.54E-01
	105.31	21.10	1.39E-01		1.69E-01
Ra-226	186.21	3.64	-4.07E-01	7.85E-01	7.85E-01
Pa-231	27.36	10.30	9.22E-01	1.13E+00	1.13E+00
	283.69	1.70	-1.47E-01		1.52E+00
	300.07	2.47	-5.20E-01		1.21E+00
	302.65	2.20	-4.67E-02		1.28E+00
	330.06	1.40	-1.21E+00		1.86E+00
U-235	143.76	10.96	1.07E-01	5.16E-02	2.51E-01
	163.33	5.08	1.06E-01		5.83E-01
	185.71	57.20	-7.52E-03		5.16E-02
	202.11	1.08	-2.07E+00		2.57E+00
	205.31	5.01	-1.04E-02		5.65E-01
Am-241	59.54	35.90	-3.01E-02	3.69E-01	3.69E-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

Analysis Report for 17-Dec-19-10022
L2-10214A-FSGS-010SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10022
Sample Description : L2-10214A-FSGS-010SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.430E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:18:00PM
Acquisition Started : 12/17/2019 10:08:27AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.1 seconds

Dead Time : 0.12 %

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82234
Fill Height : 1429.55 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 10:23:31AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19 [133]

Analysis Report for 17-Dec-19-10022
L2-10214A-FSGS-010SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.14	305 -	313	309.28	2.53E+01	10.73	4.17E+01	0.50
2	185.82	739 -	750	743.58	3.16E+01	11.96	4.44E+01	0.73
3	238.57	949 -	959	954.39	6.04E+01	12.71	4.26E+01	1.11
4	295.22	1174 -	1187	1180.78	4.93E+01	9.64	1.57E+01	1.17
5	351.69	1399 -	1414	1406.51	8.19E+01	11.17	1.41E+01	0.90
6	582.84	2326 -	2336	2330.56	3.31E+01	7.20	7.88E+00	0.31
7	609.10	2428 -	2443	2435.58	5.80E+01	8.37	4.00E+00	1.38
8	910.58	3634 -	3648	3641.30	3.32E+01	6.18	1.76E+00	1.27
9	1459.84	5830 -	5849	5839.21	1.79E+02	13.66	2.36E+00	1.61

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	0.85	1460.82 *	10.66	4.55E+00	4.00E-01
Tl-208	0.98	583.19 *	85.00	5.63E-02	1.27E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.09E-01	2.47E-02
		300.09	3.30		
Pb212-XR	1.00	74.82	10.28		
		77.11 *	17.10	3.12E-01	1.36E-01
		87.35	3.97		

[134]

Analysis Report for 17-Dec-19-10022

L2-10214A-FSGS-010SS

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	1.90E-01	2.96E-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	2.38E-01	5.04E-02
		351.93 *	35.60	2.33E-01	3.68E-02
		785.96	1.06		
Pb214-XR	1.00	74.82	5.80		
		77.11 *	9.70	5.49E-01	2.41E-01
		87.35	2.24		
		89.78	0.82		
Ra-226	0.97	186.21 *	3.64	6.13E-01	2.37E-01
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	2.52E-01	4.82E-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	3.90E-02	1.51E-02
		202.11	1.08		
		205.31	5.01		

Analysis Report for 17-Dec-19-10022
L2-10214A-FSGS-010SS

* = 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	0.858	4.55E+00	4.00E-01	
	Tl-208	0.980	5.63E-02	1.27E-02	
X	Bi-211	0.939			
	Pb-212	1.000	1.09E-01	2.47E-02	
?	Pb212-XR	1.000	3.12E-01	1.36E-01	
	Bi-214	0.997	1.90E-01	2.96E-02	
	Pb-214	0.995	2.35E-01	2.97E-02	
?	Pb214-XR	1.000	5.49E-01	2.41E-01	
?	Ra-226	0.976	6.13E-01	2.37E-01	
	Ac-228	0.981	2.52E-01	4.82E-02	
?	U-235	0.999	3.90E-02	1.51E-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 17-Dec-19-10022
L2-10214A-FSGS-010SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 10:23:31AM
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	7.66E-02	5.92E-02	5.92E-02
	BE-7	477.60	10.44	1.10E-01	4.22E-01	4.22E-01
+	K-40	1460.82	* 10.66	4.55E+00	3.17E-01	3.17E-01
	Mn-54	834.85	99.98	3.01E-02	4.69E-02	4.69E-02
	Co-60	1173.23	99.85	3.77E-02	5.10E-02	5.90E-02
		1332.49	99.98	6.33E-04		5.10E-02
	Nb-94	702.65	99.81	-2.13E-02	4.19E-02	4.25E-02
		871.09	99.89	-6.82E-04		4.19E-02
	Ag-108m	79.13	6.60	-6.18E-01	4.51E-02	1.53E+00
		433.94	90.50	3.04E-02		4.51E-02
		614.28	89.80	-1.11E-02		5.28E-02
		722.94	90.80	3.51E-02		5.21E-02
	Sb-125	176.31	6.84	3.45E-01	1.28E-01	5.73E-01
		380.45	1.52	-9.92E-01		2.35E+00
		427.87	29.60	-3.07E-02		1.28E-01
		463.36	10.49	2.62E-01		4.16E-01
		600.60	17.65	9.02E-03		2.24E-01
		606.71	4.98	1.77E+00		1.36E+00
		635.95	11.22	-2.47E-01		3.10E-01

Analysis Report for 17-Dec-19-10022
L2-10214A-FSGS-010SS

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	1.28E-01	2.39E+00
Ba-133	79.61	2.65	-1.73E+00	6.43E-02	3.64E+00
	81.00	32.90	-1.77E-01		2.37E-01
	276.40	7.16	1.09E-01		5.29E-01
	302.85	18.34	-3.51E-02		1.89E-01
	356.01	62.05	-2.40E-02		6.43E-02
	383.85	8.94	9.71E-02		4.10E-01
Cs-134	475.36	1.48	8.49E-01	4.48E-02	2.97E+00
	563.25	8.34	8.82E-02		4.12E-01
	569.33	15.37	-4.39E-02		2.39E-01
	604.72	97.62	-3.67E-03		6.53E-02
	795.86	85.46	9.93E-03		4.48E-02
	801.95	8.69	-4.21E-02		4.92E-01
	1038.61	0.99	5.44E-01		5.15E+00
	1167.97	1.79	-2.10E-01		2.86E+00
	1365.19	3.02	3.53E-01		1.54E+00
Cs-137	661.66	85.10	2.07E-02	4.97E-02	4.97E-02
Eu-152	121.78	28.67	2.06E-02	1.06E-01	1.50E-01
	244.70	7.61	2.22E-01		5.43E-01
	295.94	0.45	4.84E+00		9.69E+00
	344.28	26.60	1.04E-02		1.06E-01
	367.79	0.86	3.46E+00		4.21E+00
	411.12	2.24	7.47E-01		1.77E+00
	443.96	2.83	4.78E-01		1.27E+00
	488.68	0.42	-3.37E+00		7.72E+00
	563.99	0.49	9.27E-01		7.14E+00
	586.26	0.46	-4.73E+00		1.27E+01
	678.62	0.47	-7.47E+00		7.69E+00
	688.67	0.86	1.71E+00		4.88E+00
	719.35	0.28	-1.10E+01		1.52E+01
	778.90	12.96	1.05E-01		3.15E-01
	810.45	0.32	-1.95E+01		1.21E+01
	867.37	4.26	3.80E-02		1.06E+00
	919.33	0.43	-1.97E+00		7.96E+00
	964.08	14.65	2.89E-01		3.93E-01
	1085.87	10.24	-2.64E-02		5.47E-01
	1089.74	1.73	-2.15E+00		2.90E+00
	1112.07	13.69	-1.29E-01		3.51E-01
	1212.95	1.43	-1.79E+00		4.14E+00
	1249.94	0.19	1.53E+01		2.90E+01
	1299.14	1.63	-1.82E+00		2.98E+00
	1408.01	21.07	-2.19E-02		1.56E-01
	1457.64	0.50	1.01E+02		3.69E+01
	1528.10	0.28	-4.67E+00		1.24E+01
Eu-154	123.07	40.40	-5.18E-02	1.02E-01	1.02E-01
	247.93	6.89	3.22E-01		5.08E-01
	591.76	4.95	2.69E-01		7.92E-01
	692.42	1.78	-3.21E+00		2.17E+00
	723.30	20.06	1.48E-01		2.36E-01
	756.80	4.52	2.53E-01		9.49E-01
	873.18	12.08	-2.06E-01		3.38E-01

Analysis Report for 17-Dec-19-10022
L2-10214A-FSGS-010SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29		10.48	1.14E-01	1.02E-01	3.88E-01
		1004.76		18.01	1.28E-01		2.19E-01
		1274.43		34.80	-1.40E-01		1.27E-01
		1596.48		1.80	6.48E-01		2.02E+00
	Eu-155	45.30		1.31	-2.15E+00	2.28E-01	2.97E+01
		60.01		1.22	-1.07E+01		2.81E+01
		86.55		30.70	-6.53E-02		2.28E-01
		105.31		21.10	5.43E-02		2.62E-01
+	Ra-226	186.21	*	3.64	6.13E-01	7.50E-01	7.50E-01
	Pa-231	27.36		10.30	2.02E+00	1.44E+00	3.20E+00
		283.69		1.70	2.44E-01		2.04E+00
		300.07		2.47	1.64E-01		1.44E+00
		302.65		2.20	-2.63E-01		1.61E+00
		330.06		1.40	-4.97E-01		2.54E+00
+	U-235	143.76		10.96	1.03E-01	4.77E-02	3.65E-01
		163.33		5.08	1.97E-01		7.14E-01
		185.71	*	57.20	3.90E-02		4.77E-02
		202.11		1.08	-1.19E-01		3.32E+00
		205.31		5.01	-2.50E-01		7.20E-01
	Am-241	59.54		35.90	-5.66E-01	9.75E-01	9.75E-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

Analysis Report for 17-Dec-19-10023
L2-10214A-FSGS-011SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10023
Sample Description : L2-10214A-FSGS-011SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.319E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:20:00PM
Acquisition Started : 12/17/2019 10:08:33AM

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 : 11/4/2019
Efficiency Calibration Used Done On : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82235
Fill Height : 1318.54 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 10:23:57AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19

Analysis Report for 17-Dec-19-10023
L2-10214A-FSGS-011SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.66	949 -	962	954.24	7.24E+01	14.09	4.36E+01	0.92
2	352.07	1400 -	1414	1407.28	5.62E+01	9.93	1.48E+01	1.33
3	1460.09	5827 -	5849	5838.31	1.49E+02	12.66	2.88E+00	1.64

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	0.91	1460.82 *	10.66	3.51E+00	3.35E-01
Bi-211	0.85	351.07 *	13.02	4.01E-01	7.80E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.19E-01	2.50E-02
		300.09	3.30		
Pb-214	0.99	241.99	7.25		
		295.22	18.42		
		351.93 *	35.60	1.47E-01	2.85E-02
		785.96	1.06		

Analysis Report for 17-Dec-19-10023
L2-10214A-FSGS-011SS

* = 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	0.918	3.51E+00	3.35E-01	
? Bi-211	0.853	4.01E-01	7.80E-02	
Pb-212	1.000	1.19E-01	2.50E-02	
? Pb-214	0.998	1.47E-01	2.85E-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 17-Dec-19-10023
L2-10214A-FSGS-011SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 10:23:57AM
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	5.35E-02	4.80E-02	4.80E-02
	BE-7	477.60	10.44	2.63E-02	3.41E-01	3.41E-01
+	K-40	1460.82	* 10.66	3.51E+00	3.36E-01	3.36E-01
	Mn-54	834.85	99.98	4.44E-02	4.67E-02	4.67E-02
	Co-60	1173.23	99.85	-3.13E-02	4.04E-02	4.04E-02
		1332.49	99.98	1.21E-02		4.04E-02
	Nb-94	702.65	99.81	9.62E-03	3.03E-02	3.26E-02
		871.09	99.89	-2.31E-02		3.03E-02
	Ag-108m	79.13	6.60	2.81E-01	3.15E-02	9.65E-01
		433.94	90.50	-2.90E-02		3.15E-02
		614.28	89.80	-1.09E-01		3.98E-02
		722.94	90.80	1.59E-02		4.65E-02
	Sb-125	176.31	6.84	9.09E-02	1.02E-01	3.66E-01
		380.45	1.52	-6.59E-01		2.03E+00
		427.87	29.60	-1.04E-02		1.02E-01
		463.36	10.49	1.25E-01		3.06E-01
		600.60	17.65	1.85E-03		2.03E-01
		606.71	4.98	1.03E+00		9.85E-01
		635.95	11.22	3.79E-02		2.93E-01

Analysis Report for 17-Dec-19-10023
L2-10214A-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	2.93E-03	1.02E-01	1.71E+00
Ba-133	79.61	2.65	2.37E-01	6.05E-02	2.30E+00
	81.00	32.90	-1.08E-01		1.51E-01
	276.40	7.16	6.20E-02		3.91E-01
	302.85	18.34	-1.00E-02		1.49E-01
	356.01	62.05	-4.32E-03		6.05E-02
	383.85	8.94	9.67E-02		3.77E-01
Cs-134	475.36	1.48	3.35E-01	3.90E-02	2.41E+00
	563.25	8.34	-5.12E-01		4.82E-01
	569.33	15.37	4.25E-02		2.33E-01
	604.72	97.62	1.15E-02		4.76E-02
	795.86	85.46	-1.83E-02		3.90E-02
	801.95	8.69	-4.89E-02		3.85E-01
	1038.61	0.99	-1.34E-01		2.93E+00
	1167.97	1.79	1.20E-01		2.49E+00
	1365.19	3.02	8.75E-02		1.23E+00
Cs-137	661.66	85.10	1.10E-02	4.68E-02	4.68E-02
Eu-152	121.78	28.67	-1.05E-01	8.67E-02	8.67E-02
	244.70	7.61	2.22E-01		4.45E-01
	295.94	0.45	2.22E+00		7.94E+00
	344.28	26.60	-3.55E-02		1.21E-01
	367.79	0.86	-1.99E-01		3.15E+00
	411.12	2.24	-3.01E-01		1.38E+00
	443.96	2.83	-4.42E-01		9.24E-01
	488.68	0.42	2.94E+00		7.92E+00
	563.99	0.49	-1.19E+01		7.50E+00
	586.26	0.46	-5.77E+00		9.44E+00
	678.62	0.47	-3.33E+00		7.11E+00
	688.67	0.86	-2.87E+00		3.84E+00
	719.35	0.28	-5.46E+00		1.22E+01
	778.90	12.96	-7.53E-02		2.17E-01
	810.45	0.32	-8.56E+00		9.39E+00
	867.37	4.26	4.11E-01		7.41E-01
	919.33	0.43	5.54E+00		8.60E+00
	964.08	14.65	-2.03E-02		3.46E-01
	1085.87	10.24	-2.09E-01		4.02E-01
	1089.74	1.73	2.13E+00		2.75E+00
	1112.07	13.69	6.59E-02		2.73E-01
	1212.95	1.43	-5.78E-01		3.31E+00
	1249.94	0.19	6.23E-01		2.89E+01
	1299.14	1.63	1.31E+00		3.12E+00
	1408.01	21.07	-5.50E-02		1.91E-01
	1457.64	0.50	7.78E+01		3.13E+01
	1528.10	0.28	5.54E+00		1.35E+01
Eu-154	123.07	40.40	3.44E-02	6.42E-02	6.42E-02
	247.93	6.89	-2.16E-01		4.03E-01
	591.76	4.95	5.30E-01		7.57E-01
	692.42	1.78	-3.80E-01		1.81E+00
	723.30	20.06	8.07E-02		2.14E-01
	756.80	4.52	6.33E-01		9.13E-01
	873.18	12.08	-2.41E-01		2.94E-01

Analysis Report for 17-Dec-19-10023
L2-10214A-FSGS-011SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-7.39E-02	6.42E-02	4.06E-01
	1004.76	18.01	4.04E-02		2.31E-01
	1274.43	34.80	-8.86E-02		1.48E-01
	1596.48	1.80	5.99E-01		1.87E+00
Eu-155	45.30	1.31	-4.88E-02	1.47E-01	8.80E+00
	60.01	1.22	5.40E+00		1.07E+01
	86.55	30.70	7.50E-02		1.48E-01
Ra-226	105.31	21.10	-3.84E-02		1.47E-01
Ra-226	186.21	3.64	2.94E-01	7.55E-01	7.55E-01
Pa-231	27.36	10.30	5.44E-01	1.12E+00	1.12E+00
	283.69	1.70	-2.66E-01		1.66E+00
	300.07	2.47	-1.04E+00		1.20E+00
	302.65	2.20	2.46E-01		1.27E+00
	330.06	1.40	4.77E-02		2.45E+00
U-235	143.76	10.96	1.44E-01	4.77E-02	2.69E-01
	163.33	5.08	2.58E-01		5.57E-01
	185.71	57.20	1.29E-02		4.77E-02
	202.11	1.08	-1.48E+00		2.43E+00
U-235	205.31	5.01	1.08E-01		5.48E-01
Am-241	59.54	35.90	-3.52E-02	3.60E-01	3.60E-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

Analysis Report for 17-Dec-19-10024
L2-10214A-FSGS-012SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10024
Sample Description : L2-10214A-FSGS-012SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.707E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:22:00PM
Acquisition Started : 12/17/2019 10:08:41AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.2 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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82236
Fill Height : 1706.74 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 10:23:47AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19

Analysis Report for 17-Dec-19-10024
L2-10214A-FSGS-012SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.68	949 -	962	955.18	8.41E+01	14.34	4.39E+01	1.12
2	295.45	1177 -	1187	1182.01	2.98E+01	8.27	1.62E+01	0.26
3	338.12	1346 -	1357	1352.55	2.72E+01	8.47	1.78E+01	0.85
4	351.91	1400 -	1414	1407.65	5.13E+01	10.25	1.88E+01	0.99
5	596.02	2378 -	2388	2383.38	1.31E+01	5.46	6.94E+00	0.44
6	609.23	2430 -	2442	2436.19	3.38E+01	6.50	3.25E+00	1.03
7	1460.53	5833 -	5854	5842.51	1.87E+02	14.71	7.92E+00	1.87

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	3.81E+00
Pb-212	1.00	115.18		0.60	
		238.63	*	43.60	1.30E-01
		300.09		3.30	
Bi-214	0.99	609.32	*	45.49	9.08E-02
		768.36		4.89	
		806.18		1.26	
		934.06		3.11	
		1120.29		14.92	
		1155.21		1.63	

[147]

Analysis Report for 17-Dec-19-10024
L2-10214A-FSGS-012SS

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			1.22E-01	3.52E-02
351.93 *	35.60			1.22E-01	2.64E-02
Ac-228	0.99	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	2.00E-01	6.42E-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				

* = 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 17-Dec-19-10024
L2-10214A-FSGS-012SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.987	3.81E+00	3.42E-01	
X	Bi-211	0.892			
	Pb-212	1.000	1.30E-01	2.44E-02	
	Bi-214	0.999	9.08E-02	1.83E-02	
	Pb-214	0.998	1.22E-01	2.11E-02	
	Ac-228	0.999	2.00E-01	6.42E-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 17-Dec-19-10024
L2-10214A-FSGS-012SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 10:23:47AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
5	596.02	1.45139E-02	41.77		

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	2.91E-02	4.55E-02	4.55E-02
	BE-7	477.60	10.44	1.18E-01	3.98E-01	3.98E-01
+	K-40	1460.82	* 10.66	3.81E+00	4.31E-01	4.31E-01
	Mn-54	834.85	99.98	1.26E-02	3.58E-02	3.58E-02
	Co-60	1173.23	99.85	5.05E-02	5.04E-02	5.20E-02
		1332.49	99.98	4.26E-02		5.04E-02
	Nb-94	702.65	99.81	4.51E-03	3.55E-02	3.55E-02
		871.09	99.89	-1.58E-02		3.67E-02
	Ag-108m	79.13	6.60	8.87E-02	3.34E-02	1.28E+00
		433.94	90.50	-7.29E-03		3.34E-02
		614.28	89.80	-1.67E-02		5.31E-02
		722.94	90.80	9.79E-03		4.39E-02
	Sb-125	176.31	6.84	6.66E-02	1.08E-01	4.12E-01
		380.45	1.52	6.32E-01		1.99E+00
		427.87	29.60	1.70E-03		1.08E-01
		463.36	10.49	1.76E-01		3.49E-01
		600.60	17.65	4.54E-02		2.38E-01
		606.71	4.98	8.34E-01		9.19E-01

Analysis Report for 17-Dec-19-10024
L2-10214A-FSGS-012SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	
Sb-125	635.95	11.22	1.32E-01	1.08E-01	3.22E-01	
	671.44	1.79	4.87E-01		2.09E+00	
Ba-133	79.61	2.65	6.07E-01	6.51E-02	3.05E+00	
	81.00	32.90	-8.05E-02		2.17E-01	
	276.40	7.16	1.14E-01		4.13E-01	
	302.85	18.34	7.99E-02		1.69E-01	
	356.01	62.05	-1.68E-02		6.51E-02	
	383.85	8.94	3.75E-02		3.35E-01	
	475.36	1.48	4.62E-01		4.15E-02	2.66E+00
Cs-134	563.25	8.34	2.50E-02	4.15E-02	3.68E-01	
	569.33	15.37	-4.99E-02		2.05E-01	
	604.72	97.62	-1.26E-02		4.46E-02	
	795.86	85.46	4.62E-03		4.15E-02	
	801.95	8.69	-4.21E-02		3.91E-01	
	1038.61	0.99	-2.87E+00		4.26E+00	
	1167.97	1.79	1.52E+00		2.64E+00	
	1365.19	3.02	2.86E-01		1.07E+00	
	661.66	85.10	-7.59E-04		3.85E-02	3.85E-02
	Cs-137					
Eu-152	121.78	28.67	-2.91E-02	1.16E-01	1.16E-01	
	244.70	7.61	-9.62E-02		4.10E-01	
	295.94	0.45	8.93E+00		8.19E+00	
	344.28	26.60	2.09E-02		1.16E-01	
	367.79	0.86	-8.42E-02		3.05E+00	
	411.12	2.24	-4.22E-01		1.25E+00	
	443.96	2.83	-8.52E-03		1.08E+00	
	488.68	0.42	-7.30E+00		6.65E+00	
	563.99	0.49	-1.59E+00		6.14E+00	
	586.26	0.46	2.75E+00		9.10E+00	
	678.62	0.47	-4.17E-01		6.92E+00	
	688.67	0.86	1.70E+00		3.41E+00	
	719.35	0.28	6.19E+00		1.34E+01	
	778.90	12.96	-5.09E-02		2.92E-01	
	810.45	0.32	-1.53E+00		1.14E+01	
	867.37	4.26	-7.44E-01		8.59E-01	
	919.33	0.43	-2.26E+01		7.79E+00	
	964.08	14.65	1.29E-01		3.78E-01	
	1085.87	10.24	-1.83E-01		3.73E-01	
	1089.74	1.73	-2.45E-01		2.40E+00	
	1112.07	13.69	-3.98E-01		2.83E-01	
	1212.95	1.43	1.07E+00		3.84E+00	
	1249.94	0.19	5.70E+00		2.61E+01	
1299.14	1.63	-2.76E-01	2.39E+00			
1408.01	21.07	1.00E-01	1.81E-01			
1457.64	0.50	8.66E+01	3.05E+01			
1528.10	0.28	2.39E+00	8.90E+00			
Eu-154	123.07	40.40	-5.92E-02	8.03E-02	8.03E-02	
	247.93	6.89	2.64E-02		4.01E-01	
	591.76	4.95	-2.84E-01		7.68E-01	
	692.42	1.78	-5.62E-01		1.61E+00	
	723.30	20.06	1.26E-03		1.90E-01	
	756.80	4.52	6.99E-01		8.95E-01	

Analysis Report for 17-Dec-19-10024
L2-10214A-FSGS-012SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	873.18	12.08	-1.58E-01	8.03E-02	3.11E-01
	996.29	10.48	2.90E-01		3.74E-01
	1004.76	18.01	1.17E-01		2.24E-01
	1274.43	34.80	3.00E-02		1.14E-01
	1596.48	1.80	0.00E+00		3.71E-01
Eu-155	45.30	1.31	-1.18E+00	1.74E-01	1.71E+01
	60.01	1.22	2.17E+00		2.03E+01
	86.55	30.70	-9.32E-03		1.74E-01
	105.31	21.10	-4.33E-02		1.79E-01
Ra-226	186.21	3.64	3.65E-01	9.17E-01	9.17E-01
Pa-231	27.36	10.30	1.49E+00	1.41E+00	1.97E+00
	283.69	1.70	-7.26E-01		1.76E+00
	300.07	2.47	6.79E-01		1.43E+00
	302.65	2.20	7.04E-01		1.41E+00
	330.06	1.40	-6.63E-01		2.21E+00
U-235	143.76	10.96	-4.43E-03	5.83E-02	2.94E-01
	163.33	5.08	-4.10E-01		5.29E-01
	185.71	57.20	4.00E-02		5.83E-02
	202.11	1.08	-9.07E-01		2.90E+00
	205.31	5.01	6.48E-01		5.97E-01
Am-241	59.54	35.90	-3.21E-01	6.95E-01	6.95E-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

Analysis Report for 17-Dec-19-10025
L2-10214A-FSGS-013SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10025
Sample Description : L2-10214A-FSGS-013SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.586E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:24:00PM
Acquisition Started : 12/17/2019 10:27:21AM

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82237
Fill Height : 1586.49 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 10:42:23AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1530 12/17/19

Analysis Report for 17-Dec-19-10025
L2-10214A-FSGS-013SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.45	474 -	481	477.09	8.04E+01	15.42	7.76E+01	0.94
2	338.22	673 -	679	676.40	2.13E+01	8.51	2.67E+01	1.09
3	351.91	701 -	708	703.77	5.88E+01	9.88	1.92E+01	1.08
4	583.16	1161 -	1171	1165.92	3.88E+01	9.25	1.92E+01	1.11
5	609.15	1212 -	1221	1217.87	6.02E+01	9.90	1.68E+01	1.10
6	1460.35	2915 -	2926	2920.76	1.65E+02	13.86	1.06E+01	1.94

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	3.08E+00	2.90E-01
Tl-208	1.00	583.19 *	85.00	4.96E-02	1.22E-02
Bi-211	0.89	351.07 *	13.02	3.50E-01	6.52E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.12E-01	2.33E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.48E-01	2.59E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

Analysis Report for 17-Dec-19-10025
L2-10214A-FSGS-013SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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			1.28E-01	2.38E-02
Ac-228	1.00	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	1.43E-01	5.81E-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				

* = 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 17-Dec-19-10025
L2-10214A-FSGS-013SS

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.965	3.08E+00	2.90E-01	
Tl-208	1.000	4.96E-02	1.22E-02	
? Bi-211	0.892	3.50E-01	6.52E-02	
Pb-212	0.995	1.12E-01	2.33E-02	
Bi-214	0.998	1.48E-01	2.59E-02	
? Pb-214	1.000	1.28E-01	2.38E-02	
Ac-228	1.000	1.43E-01	5.81E-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 17-Dec-19-10025
L2-10214A-FSGS-013SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 10:42:23AM
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	4.84E-02	4.82E-02	4.82E-02
	BE-7	477.60	10.44	2.89E-02	2.69E-01	2.69E-01
+	K-40	1460.82	* 10.66	3.08E+00	3.79E-01	3.79E-01
	Mn-54	834.85	99.98	1.48E-02	3.70E-02	3.70E-02
	Co-60	1173.23	99.85	2.11E-02	3.62E-02	4.43E-02
		1332.49	99.98	-1.00E-02		3.62E-02
	Nb-94	702.65	99.81	-7.07E-03	3.18E-02	3.18E-02
		871.09	99.89	9.54E-03		3.51E-02
	Ag-108m	79.13	6.60	-8.77E-02	3.20E-02	9.44E-01
		433.94	90.50	-2.27E-03		3.20E-02
		614.28	89.80	-6.26E-02		4.52E-02
		722.94	90.80	1.32E-02		4.02E-02
	Sb-125	176.31	6.84	-1.95E-01	9.47E-02	4.38E-01
		380.45	1.52	4.59E-01		1.91E+00
		427.87	29.60	1.67E-02		9.47E-02
		463.36	10.49	-4.94E-02		2.60E-01
		600.60	17.65	-1.34E-03		1.75E-01
		606.71	4.98	1.31E+00		1.07E+00
		635.95	11.22	1.14E-01		2.60E-01

Analysis Report for 17-Dec-19-10025
L2-10214A-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.54E-01	9.47E-02	1.72E+00
Ba-133	79.61	2.65	-3.38E-01	5.59E-02	2.25E+00
	81.00	32.90	-1.36E-01		1.54E-01
	276.40	7.16	-9.90E-02		3.69E-01
	302.85	18.34	-3.82E-02		1.49E-01
	356.01	62.05	-2.52E-02		5.59E-02
	383.85	8.94	1.13E-01		3.42E-01
Cs-134	475.36	1.48	4.82E-01	3.34E-02	1.88E+00
	563.25	8.34	2.06E-01		3.99E-01
	569.33	15.37	2.39E-02		2.12E-01
	604.72	97.62	-1.37E-02		4.94E-02
	795.86	85.46	-1.36E-02		3.34E-02
	801.95	8.69	-4.24E-02		3.49E-01
	1038.61	0.99	-1.46E+00		3.12E+00
	1167.97	1.79	2.45E-01		2.37E+00
	1365.19	3.02	-3.40E-01		1.03E+00
Cs-137	661.66	85.10	-1.46E-02	3.92E-02	3.92E-02
Eu-152	121.78	28.67	-3.54E-03	9.66E-02	9.66E-02
	244.70	7.61	-2.85E-01		3.78E-01
	295.94	0.45	5.09E+00		7.21E+00
	344.28	26.60	-6.89E-03		1.13E-01
	367.79	0.86	1.10E-01		3.04E+00
	411.12	2.24	1.11E-01		1.27E+00
	443.96	2.83	-2.63E-01		9.06E-01
	488.68	0.42	5.33E-01		7.10E+00
	563.99	0.49	2.85E+00		6.77E+00
	586.26	0.46	-1.69E-02		1.00E+01
	678.62	0.47	-2.73E+00		5.13E+00
	688.67	0.86	5.97E-01		3.65E+00
	719.35	0.28	1.51E+00		9.86E+00
	778.90	12.96	-1.44E-01		2.41E-01
	810.45	0.32	-9.54E-02		1.06E+01
	867.37	4.26	-1.00E-02		7.86E-01
	919.33	0.43	-1.12E+00		8.33E+00
	964.08	14.65	1.78E-02		2.82E-01
	1085.87	10.24	6.17E-02		3.41E-01
	1089.74	1.73	1.51E+00		2.24E+00
	1112.07	13.69	-2.64E-01		2.51E-01
	1212.95	1.43	-1.13E+00		3.23E+00
	1249.94	0.19	-8.52E+00		2.29E+01
	1299.14	1.63	1.62E+00		2.79E+00
	1408.01	21.07	-5.98E-02		1.58E-01
	1457.64	0.50	6.73E+01		2.67E+01
	1528.10	0.28	4.37E+00		1.06E+01
Eu-154	123.07	40.40	-2.22E-02	6.47E-02	6.47E-02
	247.93	6.89	8.69E-02		4.09E-01
	591.76	4.95	-2.89E-01		6.17E-01
	692.42	1.78	6.86E-01		1.81E+00
	723.30	20.06	1.28E-01		1.90E-01
	756.80	4.52	-3.32E-01		6.46E-01
	873.18	12.08	-2.02E-02		2.85E-01

Analysis Report for 17-Dec-19-10025
L2-10214A-FSGS-013SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-9.10E-03	6.47E-02	3.50E-01
	1004.76	18.01	1.39E-01		2.14E-01
	1274.43	34.80	2.85E-02		1.20E-01
	1596.48	1.80	3.21E-01		2.04E+00
Eu-155	45.30	1.31	-1.90E+00	1.55E-01	9.72E+00
	60.01	1.22	-5.84E+00		9.88E+00
	86.55	30.70	4.76E-02		1.55E-01
	105.31	21.10	5.08E-02		1.71E-01
Ra-226	186.21	3.64	-2.82E-03	8.65E-01	8.65E-01
Pa-231	27.36	10.30	3.03E-01	9.61E-01	9.61E-01
	283.69	1.70	-1.65E-01		1.54E+00
	300.07	2.47	-7.09E-01		1.13E+00
	302.65	2.20	-3.18E-01		1.24E+00
	330.06	1.40	4.98E-01		2.15E+00
U-235	143.76	10.96	1.01E-01	5.42E-02	2.56E-01
	163.33	5.08	-1.70E-01		5.81E-01
	185.71	57.20	-1.09E-04		5.42E-02
	202.11	1.08	-5.34E-02		2.76E+00
	205.31	5.01	1.54E-01		6.15E-01
Am-241	59.54	35.90	-1.32E-01	3.56E-01	3.56E-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

Analysis Report for 17-Dec-19-10026
L2-10214A-FSGS-014SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10026
Sample Description : L2-10214A-FSGS-014SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.822E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:26:00PM
Acquisition Started : 12/17/2019 10:27:27AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.1 seconds

Dead Time : 0.12 %

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82238
Fill Height : 1821.77 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 10:42:31AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 [160]
12-17-19

Analysis Report for 17-Dec-19-10026
L2-10214A-FSGS-014SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.57	947 -	961	954.38	7.73E+01	16.51	6.77E+01	0.70
2	351.76	1400 -	1413	1406.79	4.93E+01	10.30	2.06E+01	0.73
3	582.79	2325 -	2337	2330.39	4.36E+01	6.86	1.39E+00	1.24
4	609.14	2430 -	2440	2435.74	2.57E+01	8.03	1.63E+01	0.47
5	910.77	3637 -	3647	3642.03	2.80E+01	5.29	0.00E+00	1.47
6	1460.07	5830 -	5849	5840.11	1.54E+02	12.41	0.00E+00	1.19

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	0.91	1460.82 *	10.66	3.67E+00	3.36E-01
Tl-208	0.97	583.19 *	85.00	7.02E-02	1.18E-02
Bi-211	0.92	351.07 *	13.02	3.66E-01	8.20E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.35E-01	3.07E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	7.96E-02	2.53E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

[161]

Analysis Report for 17-Dec-19-10026
L2-10214A-FSGS-014SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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			1.34E-01	2.99E-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	2.00E-01	3.89E-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 17-Dec-19-10026
L2-10214A-FSGS-014SS

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.913	3.67E+00	3.36E-01	
Tl-208	0.976	7.02E-02	1.18E-02	
? Bi-211	0.926	3.66E-01	8.20E-02	
Pb-212	0.999	1.35E-01	3.07E-02	
Bi-214	0.998	7.96E-02	2.53E-02	
? Pb-214	0.997	1.34E-01	2.99E-02	
Ac-228	0.991	2.00E-01	3.89E-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 17-Dec-19-10026
L2-10214A-FSGS-014SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 10:42:31AM
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	4.74E-02	5.14E-02	5.14E-02
	BE-7	477.60	10.44	6.62E-02	3.47E-01	3.47E-01
+	K-40	1460.82	* 10.66	3.67E+00	6.85E-02	6.85E-02
	Mn-54	834.85	99.98	-4.43E-02	4.24E-02	4.24E-02
	Co-60	1173.23	99.85	1.54E-02	4.41E-02	4.41E-02
		1332.49	99.98	1.78E-03		4.94E-02
	Nb-94	702.65	99.81	1.02E-02	3.86E-02	3.86E-02
		871.09	99.89	7.83E-04		3.95E-02
	Ag-108m	79.13	6.60	4.62E-01	4.15E-02	1.69E+00
		433.94	90.50	-3.42E-03		4.15E-02
		614.28	89.80	-4.95E-02		4.80E-02
		722.94	90.80	4.24E-02		5.08E-02
	Sb-125	176.31	6.84	6.90E-04	1.23E-01	4.81E-01
		380.45	1.52	3.37E-01		2.19E+00
		427.87	29.60	1.50E-02		1.23E-01
		463.36	10.49	3.60E-02		3.44E-01
		600.60	17.65	6.53E-02		1.84E-01
		606.71	4.98	1.73E+00		1.17E+00
		635.95	11.22	1.56E-01		3.83E-01

Analysis Report for 17-Dec-19-10026
L2-10214A-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.09E+00	1.23E-01	1.70E+00
Ba-133	79.61	2.65	4.58E-01	5.73E-02	4.06E+00
	81.00	32.90	-1.65E-01		2.84E-01
	276.40	7.16	3.35E-02		4.93E-01
	302.85	18.34	7.27E-02		1.98E-01
	356.01	62.05	-3.91E-03		5.73E-02
	383.85	8.94	-1.07E-01		3.99E-01
Cs-134	475.36	1.48	7.74E-01	5.30E-02	2.39E+00
	563.25	8.34	1.38E-02		4.54E-01
	569.33	15.37	-1.24E-01		2.48E-01
	604.72	97.62	-3.38E-02		5.48E-02
	795.86	85.46	-8.49E-03		5.30E-02
	801.95	8.69	-1.41E-01		4.42E-01
	1038.61	0.99	-7.70E-01		4.73E+00
	1167.97	1.79	2.13E-01		2.53E+00
	1365.19	3.02	-9.32E-01		1.25E+00
Cs-137	661.66	85.10	2.85E-02	4.79E-02	4.79E-02
Eu-152	121.78	28.67	-3.83E-02	1.16E-01	1.49E-01
	244.70	7.61	-7.81E-02		5.18E-01
	295.94	0.45	2.76E+00		9.42E+00
	344.28	26.60	4.30E-02		1.16E-01
	367.79	0.86	-9.44E-01		4.14E+00
	411.12	2.24	9.65E-01		1.55E+00
	443.96	2.83	-1.27E+00		9.77E-01
	488.68	0.42	3.11E+00		9.26E+00
	563.99	0.49	2.86E+00		7.83E+00
	586.26	0.46	-1.10E+00		1.18E+01
	678.62	0.47	4.37E+00		8.15E+00
	688.67	0.86	-5.99E+00		4.14E+00
	719.35	0.28	-8.71E+00		1.37E+01
	778.90	12.96	-1.88E-01		2.83E-01
	810.45	0.32	-7.84E+00		9.98E+00
	867.37	4.26	5.35E-02		9.73E-01
	919.33	0.43	3.89E+00		8.76E+00
	964.08	14.65	1.71E-01		3.70E-01
	1085.87	10.24	-5.98E-02		4.47E-01
	1089.74	1.73	7.51E-01		2.79E+00
	1112.07	13.69	-1.01E-01		3.98E-01
	1212.95	1.43	2.09E+00		3.97E+00
	1249.94	0.19	9.38E+00		2.93E+01
	1299.14	1.63	5.68E-01		2.80E+00
	1408.01	21.07	9.38E-02		1.93E-01
	1457.64	0.50	7.87E+01		3.17E+01
	1528.10	0.28	2.80E+00		1.04E+01
Eu-154	123.07	40.40	-1.04E-02	1.05E-01	1.05E-01
	247.93	6.89	1.77E-01		5.37E-01
	591.76	4.95	7.32E-02		6.95E-01
	692.42	1.78	1.56E+00		2.24E+00
	723.30	20.06	6.70E-02		2.26E-01
	756.80	4.52	6.17E-01		9.15E-01
	873.18	12.08	3.94E-02		3.27E-01

Analysis Report for 17-Dec-19-10026
L2-10214A-FSGS-014SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.62E-01	1.05E-01	3.90E-01
	1004.76	18.01	3.09E-02		2.66E-01
	1274.43	34.80	2.81E-02		1.50E-01
	1596.48	1.80	9.08E-01		2.21E+00
Eu-155	45.30	1.31	1.03E+00	2.46E-01	2.43E+01
	60.01	1.22	1.20E+01		2.97E+01
	86.55	30.70	2.24E-02		2.56E-01
	105.31	21.10	5.42E-03		2.46E-01
Ra-226	186.21	3.64	9.72E-02	1.01E+00	1.01E+00
Pa-231	27.36	10.30	2.11E+00	1.44E+00	2.88E+00
	283.69	1.70	-1.15E+00		1.94E+00
	300.07	2.47	-1.48E+00		1.44E+00
	302.65	2.20	1.24E-01		1.63E+00
	330.06	1.40	7.13E-01		2.76E+00
U-235	143.76	10.96	1.18E-01	6.42E-02	3.57E-01
	163.33	5.08	-3.06E-01		6.63E-01
	185.71	57.20	-8.81E-03		6.42E-02
	202.11	1.08	-2.32E-01		3.40E+00
	205.31	5.01	-4.76E-01		6.78E-01
Am-241	59.54	35.90	8.25E-01	1.07E+00	1.07E+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

Analysis Report for 17-Dec-19-10027
L2-10214A-FSGS-015SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10027
Sample Description : L2-10214A-FSGS-015SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.174E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:28:00PM
Acquisition Started : 12/17/2019 10:27:35AM

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 : 11/4/2019
Efficiency Calibration Used Done On : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82239
Fill Height : 1173.90 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 10:42:47AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12/17/19

Analysis Report for 17-Dec-19-10027
L2-10214A-FSGS-015SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.75	949 -	961	954.57	1.18E+02	15.79	4.84E+01	0.88
2	351.97	1400 -	1414	1406.88	8.59E+01	12.22	2.21E+01	0.85
3	583.12	2324 -	2336	2330.61	3.19E+01	8.17	1.31E+01	1.03
4	609.43	2430 -	2442	2435.78	4.66E+01	8.11	7.36E+00	0.44
5	910.65	3635 -	3645	3640.07	1.74E+01	6.39	9.56E+00	0.60
6	1460.24	5829 -	5848	5838.92	2.15E+02	15.25	5.00E+00	1.89

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	0.94	1460.82 *	10.66	5.31E+00	4.42E-01
Tl-208	0.99	583.19 *	85.00	5.21E-02	1.37E-02
Bi-211	0.88	351.07 *	13.02	6.37E-01	1.04E-01
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.00E-01	3.13E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.47E-01	2.70E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

[168]

Analysis Report for 17-Dec-19-10027
L2-10214A-FSGS-015SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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			2.33E-01	3.81E-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	1.28E-01	4.72E-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

INTERFERENCE CORRECTED REPORT

Analysis Report for 17-Dec-19-10027
L2-10214A-FSGS-015SS

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.948	5.31E+00	4.42E-01	
Tl-208	0.999	5.21E-02	1.37E-02	
? Bi-211	0.880	6.37E-01	1.04E-01	
Pb-212	0.998	2.00E-01	3.13E-02	
Bi-214	0.999	1.47E-01	2.70E-02	
? Pb-214	1.000	2.33E-01	3.81E-02	
Ac-228	0.985	1.28E-01	4.72E-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 17-Dec-19-10027
L2-10214A-FSGS-015SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 10:42:47AM
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	6.16E-02	5.65E-02	5.65E-02
	BE-7	477.60	10.44	2.92E-03	3.65E-01	3.65E-01
+	K-40	1460.82	* 10.66	5.31E+00	4.22E-01	4.22E-01
	Mn-54	834.85	99.98	2.27E-02	5.04E-02	5.04E-02
	Co-60	1173.23	99.85	1.14E-02	4.61E-02	5.72E-02
		1332.49	99.98	-2.96E-02		4.61E-02
	Nb-94	702.65	99.81	2.51E-02	3.94E-02	3.94E-02
		871.09	99.89	4.27E-03		4.16E-02
	Ag-108m	79.13	6.60	8.11E-01	4.18E-02	1.11E+00
		433.94	90.50	2.29E-02		4.18E-02
		614.28	89.80	-1.99E-02		5.57E-02
		722.94	90.80	4.24E-02		5.10E-02
	Sb-125	176.31	6.84	-1.71E-01	1.25E-01	4.04E-01
		380.45	1.52	1.37E+00		2.37E+00
		427.87	29.60	4.26E-02		1.25E-01
		463.36	10.49	9.85E-02		3.52E-01
		600.60	17.65	-2.21E-02		2.16E-01
		606.71	4.98	1.17E+00		1.22E+00
		635.95	11.22	-3.29E-01		3.20E-01

Analysis Report for 17-Dec-19-10027
L2-10214A-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.12E+00	1.25E-01	2.04E+00
Ba-133	79.61	2.65	2.37E+00	7.23E-02	2.69E+00
	81.00	32.90	-4.24E-01		1.55E-01
	276.40	7.16	-2.24E-01		4.44E-01
	302.85	18.34	2.04E-01		2.02E-01
	356.01	62.05	-1.33E-02		7.23E-02
	383.85	8.94	9.50E-02		4.04E-01
Cs-134	475.36	1.48	2.44E-01	5.12E-02	2.64E+00
	563.25	8.34	-8.41E-01		4.88E-01
	569.33	15.37	2.63E-01		2.74E-01
	604.72	97.62	-3.65E-02		5.12E-02
	795.86	85.46	3.38E-02		5.61E-02
	801.95	8.69	-7.17E-02		5.06E-01
	1038.61	0.99	2.41E+00		4.87E+00
	1167.97	1.79	6.51E-01		3.18E+00
	1365.19	3.02	4.76E-01		1.67E+00
Cs-137	661.66	85.10	3.22E-02	5.35E-02	5.35E-02
Eu-152	121.78	28.67	7.68E-03	1.00E-01	1.00E-01
	244.70	7.61	-1.46E-01		4.89E-01
	295.94	0.45	6.45E+00		1.03E+01
	344.28	26.60	-9.55E-02		1.29E-01
	367.79	0.86	-2.37E+00		4.10E+00
	411.12	2.24	-8.16E-01		1.45E+00
	443.96	2.83	6.37E-01		1.37E+00
	488.68	0.42	-1.36E+00		9.12E+00
	563.99	0.49	-8.75E+00		8.06E+00
	586.26	0.46	-2.47E+00		1.26E+01
	678.62	0.47	4.15E+00		7.41E+00
	688.67	0.86	9.69E-02		3.90E+00
	719.35	0.28	-4.20E+00		1.55E+01
	778.90	12.96	-1.26E-02		2.73E-01
	810.45	0.32	-1.06E-01		1.26E+01
	867.37	4.26	8.16E-01		1.02E+00
	919.33	0.43	2.56E+00		1.01E+01
	964.08	14.65	-3.70E-02		3.80E-01
	1085.87	10.24	1.97E-01		4.48E-01
	1089.74	1.73	5.26E-01		2.73E+00
	1112.07	13.69	6.74E-02		3.50E-01
	1212.95	1.43	1.59E+00		4.56E+00
	1249.94	0.19	1.53E+01		3.68E+01
	1299.14	1.63	-7.55E-01		3.09E+00
	1408.01	21.07	-6.36E-02		2.53E-01
	1457.64	0.50	1.11E+02		3.92E+01
	1528.10	0.28	4.84E+00		1.32E+01
Eu-154	123.07	40.40	-6.26E-03	7.05E-02	7.05E-02
	247.93	6.89	1.42E-01		4.81E-01
	591.76	4.95	-6.12E-01		8.01E-01
	692.42	1.78	1.08E+00		2.24E+00
	723.30	20.06	1.51E-01		2.31E-01
	756.80	4.52	2.08E-01		9.16E-01
	873.18	12.08	-4.59E-01		3.36E-01

Analysis Report for 17-Dec-19-10027
L2-10214A-FSGS-015SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.18E-01	7.05E-02	5.26E-01
	1004.76	18.01	3.04E-01		3.13E-01
	1274.43	34.80	7.75E-02		1.80E-01
	1596.48	1.80	-8.31E-01		2.45E+00
Eu-155	45.30	1.31	-3.52E+00	1.81E-01	9.81E+00
	60.01	1.22	8.84E+00		1.28E+01
	86.55	30.70	1.09E-01		1.81E-01
	105.31	21.10	1.67E-01		1.88E-01
Ra-226	186.21	3.64	2.72E-01	8.93E-01	8.93E-01
Pa-231	27.36	10.30	4.97E-01	1.11E+00	1.11E+00
	283.69	1.70	1.14E+00		1.87E+00
	300.07	2.47	-4.70E+00		1.34E+00
	302.65	2.20	1.82E+00		1.68E+00
	330.06	1.40	6.27E-01		2.56E+00
U-235	143.76	10.96	8.56E-04	5.86E-02	2.85E-01
	163.33	5.08	1.56E-01		5.79E-01
	185.71	57.20	4.90E-02		5.86E-02
	202.11	1.08	-9.30E-02		2.72E+00
	205.31	5.01	-4.17E-01		5.42E-01
Am-241	59.54	35.90	3.16E-01	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

Analysis Report for 17-Dec-19-10028
L2-10214A-FSGS-016SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10028
Sample Description : L2-10214A-FSGS-016SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.116E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:30:00PM
Acquisition Started : 12/17/2019 10:27:44AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.2 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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82240
Fill Height : 1115.95 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 10:42:49AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12/17/19

Analysis Report for 17-Dec-19-10028
L2-10214A-FSGS-016SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.66	948 -	960	955.11	9.16E+01	13.09	3.04E+01	1.36
2	295.46	1174 -	1187	1182.07	4.73E+01	11.36	2.97E+01	0.83
3	338.17	1348 -	1357	1352.71	2.32E+01	7.30	1.28E+01	0.43
4	351.75	1401 -	1415	1407.01	9.05E+01	11.43	1.35E+01	1.26
5	582.98	2326 -	2338	2331.23	4.45E+01	9.09	1.45E+01	1.08
6	609.22	2429 -	2443	2436.16	6.05E+01	9.07	7.50E+00	1.27
7	661.70	2639 -	2653	2645.97	4.80E+01	9.55	1.50E+01	0.43
8	911.48	3638 -	3653	3644.98	4.39E+01	8.41	9.08E+00	0.67
9	1460.69	5832 -	5854	5843.12	2.06E+02	14.77	3.03E+00	1.14

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	4.82E+00	4.04E-01
Cs-137	1.00	661.66 *	85.10	8.22E-02	1.71E-02
Tl-208	0.99	583.19 *	85.00	7.00E-02	1.49E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.55E-01	2.55E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.83E-01	2.96E-02
		768.36	4.89		

[175]

Analysis Report for 17-Dec-19-10028
L2-10214A-FSGS-016SS

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			2.14E-01	5.42E-02
351.93 *	35.60			2.40E-01	3.59E-02
Ac-228	0.99	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	1.89E-01	6.14E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	3.08E-01	6.05E-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 17-Dec-19-10028
L2-10214A-FSGS-016SS

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.997	4.82E+00	4.04E-01	
Cs-137	1.000	8.22E-02	1.71E-02	
Tl-208	0.993	7.00E-02	1.49E-02	
X Bi-211	0.928			
Pb-212	1.000	1.55E-01	2.55E-02	
Bi-214	0.999	1.83E-01	2.96E-02	
Pb-214	0.994	2.32E-01	2.99E-02	
Ac-228	0.996	2.50E-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 17-Dec-19-10028
L2-10214A-FSGS-016SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 10:42:48AM
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	6.29E-02	5.49E-02	5.49E-02
	BE-7	477.60	10.44	1.01E-01	3.30E-01	3.30E-01
+	K-40	1460.82	* 10.66	4.82E+00	3.46E-01	3.46E-01
	Mn-54	834.85	99.98	-1.55E-02	4.58E-02	4.58E-02
	Co-60	1173.23	99.85	-5.35E-02	4.21E-02	6.24E-02
		1332.49	99.98	-1.42E-02		4.21E-02
	Nb-94	702.65	99.81	3.00E-02	4.50E-02	4.50E-02
		871.09	99.89	1.74E-02		5.26E-02
	Ag-108m	79.13	6.60	3.12E-01	3.97E-02	1.48E+00
		433.94	90.50	-6.42E-03		3.97E-02
		614.28	89.80	-3.35E-02		6.90E-02
		722.94	90.80	2.30E-02		5.39E-02
	Sb-125	176.31	6.84	3.32E-01	1.20E-01	4.79E-01
		380.45	1.52	6.30E-01		2.33E+00
		427.87	29.60	5.28E-02		1.20E-01
		463.36	10.49	2.98E-01		3.90E-01
		600.60	17.65	-6.81E-02		2.26E-01
		606.71	4.98	1.36E+00		1.31E+00
		635.95	11.22	9.74E-02		4.01E-01

Analysis Report for 17-Dec-19-10028
L2-10214A-FSGS-016SS

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	1.20E-01	2.32E+00
Ba-133	79.61	2.65	-3.11E-01	7.19E-02	3.48E+00
	81.00	32.90	-2.31E-01		2.45E-01
	276.40	7.16	-4.42E-02		4.69E-01
	302.85	18.34	2.08E-01		2.12E-01
	356.01	62.05	-4.91E-02		7.19E-02
	383.85	8.94	-1.55E-01		3.86E-01
Cs-134	475.36	1.48	4.26E-01	5.37E-02	2.08E+00
	563.25	8.34	-1.18E-02		4.57E-01
	569.33	15.37	4.13E-02		2.68E-01
	604.72	97.62	-2.95E-02		6.36E-02
	795.86	85.46	8.38E-03		5.37E-02
	801.95	8.69	-1.41E-01		5.31E-01
	1038.61	0.99	1.90E+00		6.24E+00
	1167.97	1.79	-2.65E-01		3.63E+00
	1365.19	3.02	8.66E-01		1.48E+00
+ Cs-137	661.66	* 85.10	8.22E-02	4.31E-02	4.31E-02
Eu-152	121.78	28.67	-5.85E-02	1.20E-01	1.23E-01
	244.70	7.61	3.51E-01		4.62E-01
	295.94	0.45	5.48E+00		1.03E+01
	344.28	26.60	-8.18E-02		1.20E-01
	367.79	0.86	2.24E+00		4.09E+00
	411.12	2.24	5.58E-01		1.69E+00
	443.96	2.83	6.34E-01		1.32E+00
	488.68	0.42	-5.51E-01		9.80E+00
	563.99	0.49	1.19E+00		7.77E+00
	586.26	0.46	1.76E+01		1.39E+01
	678.62	0.47	1.72E+00		8.73E+00
	688.67	0.86	1.07E+00		5.00E+00
	719.35	0.28	5.26E+00		1.54E+01
	778.90	12.96	-8.39E-02		3.49E-01
	810.45	0.32	3.18E+00		1.26E+01
	867.37	4.26	-3.61E-01		1.30E+00
	919.33	0.43	-7.60E+00		1.16E+01
	964.08	14.65	2.05E-01		4.50E-01
	1085.87	10.24	8.43E-02		4.50E-01
	1089.74	1.73	1.52E+00		3.05E+00
	1112.07	13.69	-3.66E-02		4.05E-01
	1212.95	1.43	-2.02E+00		4.47E+00
	1249.94	0.19	1.04E+00		2.81E+01
	1299.14	1.63	9.51E-01		3.50E+00
	1408.01	21.07	-7.20E-02		1.90E-01
	1457.64	0.50	1.02E+02		3.64E+01
	1528.10	0.28	-8.59E-02		1.51E+01
Eu-154	123.07	40.40	7.89E-02	9.26E-02	9.26E-02
	247.93	6.89	-2.29E-03		4.43E-01
	591.76	4.95	-1.68E-01		8.64E-01
	692.42	1.78	2.55E-01		2.31E+00
	723.30	20.06	2.43E-01		2.47E-01
	756.80	4.52	1.64E-01		9.13E-01
	873.18	12.08	2.51E-01		4.04E-01

Analysis Report for 17-Dec-19-10028
L2-10214A-FSGS-016SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.11E-01	9.26E-02	5.65E-01
	1004.76	18.01	-3.54E-02		2.98E-01
	1274.43	34.80	-3.38E-02		1.43E-01
	1596.48	1.80	1.93E+00		3.00E+00
Eu-155	45.30	1.31	-6.00E+00	2.10E-01	1.87E+01
	60.01	1.22	9.53E-01		1.99E+01
	86.55	30.70	-1.63E-01		2.10E-01
	105.31	21.10	1.09E-01		2.22E-01
Ra-226	186.21	3.64	8.54E-01	9.88E-01	9.88E-01
Pa-231	27.36	10.30	1.56E+00	1.69E+00	2.12E+00
	283.69	1.70	-5.27E-01		1.90E+00
	300.07	2.47	3.66E-01		1.69E+00
	302.65	2.20	6.07E-01		1.73E+00
	330.06	1.40	7.29E-01		2.48E+00
U-235	143.76	10.96	-8.31E-02	6.23E-02	3.17E-01
	163.33	5.08	2.75E-01		6.61E-01
	185.71	57.20	3.80E-02		6.23E-02
	202.11	1.08	2.43E-01		3.16E+00
	205.31	5.01	8.02E-02		7.07E-01
Am-241	59.54	35.90	-2.75E-01	6.98E-01	6.98E-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

Analysis Report for 17-Dec-19-10029
L2-10214A-FSGS-017SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10029
Sample Description : L2-10214A-FSGS-017SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.148E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:32:00PM
Acquisition Started : 12/17/2019 10:51:29AM

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82241
Fill Height : 1148.05 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 11:06:31AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1530 12-17-19 [181]

Analysis Report for 17-Dec-19-10029
L2-10214A-FSGS-017SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	76.75	152 -	157	154.09	5.39E+01	14.29	8.31E+01	0.84
2	238.64	473 -	481	477.46	1.31E+02	18.26	9.46E+01	1.13
3	295.01	586 -	594	590.07	4.79E+01	12.71	5.31E+01	1.29
4	351.99	699 -	708	703.93	9.57E+01	13.98	4.33E+01	1.04
5	583.17	1160 -	1169	1165.95	6.08E+01	10.33	2.02E+01	1.01
6	609.08	1212 -	1223	1217.74	8.00E+01	10.84	1.50E+01	1.68
7	661.36	1317 -	1328	1322.25	3.63E+01	9.69	2.27E+01	1.44
8	910.95	1815 -	1826	1821.35	4.18E+01	9.23	1.72E+01	1.77
9	1460.36	2913 -	2927	2920.77	2.93E+02	17.94	9.62E+00	1.48

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	6.10E+00	4.57E-01
Cs-137	0.98	661.66 *	85.10	5.55E-02	1.52E-02
Tl-208	1.00	583.19 *	85.00	8.55E-02	1.54E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.98E-01	3.18E-02
		300.09	3.30		
Pb212-XR	0.98	74.82	10.28		
		77.11 *	17.10	3.74E-01	1.06E-01 ^[182]

Analysis Report for 17-Dec-19-10029

L2-10214A-FSGS-017SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.98	87.35	3.97		
		89.78	1.46		
Bi-214	0.99	609.32 *	45.49	2.16E-01	3.21E-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	1.93E-01	5.35E-02
		351.93 *	35.60	2.27E-01	3.78E-02
		785.96	1.06		
Pb214-XR	0.98	74.82	5.80		
		77.11 *	9.70	6.59E-01	1.90E-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	2.61E-01	5.87E-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 17-Dec-19-10029
L2-10214A-FSGS-017SS

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
	0.966	6.10E+00	4.57E-01	
	0.986	5.55E-02	1.52E-02	
	1.000	8.55E-02	1.54E-02	
X	0.873			
	1.000	1.98E-01	3.18E-02	
?	0.989	3.74E-01	1.06E-01	
	0.996	2.16E-01	3.21E-02	
	0.997	2.16E-01	3.09E-02	
?	0.989	6.59E-01	1.90E-01	
	0.997	2.61E-01	5.87E-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 17-Dec-19-10029
L2-10214A-FSGS-017SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 11:06:31AM
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	5.38E-02	5.43E-02	5.43E-02
	BE-7	477.60	10.44	8.20E-02	3.12E-01	3.12E-01
+	K-40	1460.82	* 10.66	6.10E+00	4.36E-01	4.36E-01
	Mn-54	834.85	99.98	-3.91E-03	3.70E-02	3.70E-02
	Co-60	1173.23	99.85	-1.18E-02	4.69E-02	4.93E-02
		1332.49	99.98	-9.43E-03		4.69E-02
	Nb-94	702.65	99.81	1.95E-02	4.04E-02	4.24E-02
		871.09	99.89	6.03E-03		4.04E-02
	Ag-108m	79.13	6.60	-5.58E-01	3.93E-02	1.08E+00
		433.94	90.50	1.69E-02		3.93E-02
		614.28	89.80	-1.27E-02		5.11E-02
		722.94	90.80	3.26E-03		4.49E-02
	Sb-125	176.31	6.84	-4.45E-01	1.17E-01	4.92E-01
		380.45	1.52	-6.49E-01		1.93E+00
		427.87	29.60	6.54E-03		1.17E-01
		463.36	10.49	-2.43E-03		3.27E-01
		600.60	17.65	1.13E-01		2.24E-01
		606.71	4.98	7.85E-02		1.31E+00
		635.95	11.22	1.55E-01		3.57E-01

Analysis Report for 17-Dec-19-10029
L2-10214A-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-3.22E-01	1.17E-01	2.07E+00
Ba-133	79.61	2.65	-1.90E+00	7.80E-02	2.41E+00
	81.00	32.90	-2.74E-01		1.65E-01
	276.40	7.16	4.21E-02		4.71E-01
	302.85	18.34	1.96E-02		1.93E-01
	356.01	62.05	-2.19E-02		7.80E-02
	383.85	8.94	5.14E-02		3.37E-01
Cs-134	475.36	1.48	-1.48E-01	5.02E-02	2.11E+00
	563.25	8.34	-1.30E-02		4.26E-01
	569.33	15.37	8.50E-02		2.63E-01
	604.72	97.62	1.41E-02		6.13E-02
	795.86	85.46	-5.59E-03		5.02E-02
	801.95	8.69	-3.28E-02		4.73E-01
	1038.61	0.99	7.10E-02		4.32E+00
	1167.97	1.79	1.01E-01		2.63E+00
	1365.19	3.02	-3.82E-01		1.50E+00
+ Cs-137	661.66	* 85.10	5.55E-02	4.37E-02	4.37E-02
Eu-152	121.78	28.67	-2.13E-02	1.15E-01	1.15E-01
	244.70	7.61	-2.98E-01		4.32E-01
	295.94	0.45	7.11E+00		9.43E+00
	344.28	26.60	-6.50E-02		1.22E-01
	367.79	0.86	-3.28E-01		3.82E+00
	411.12	2.24	-2.80E-01		1.43E+00
	443.96	2.83	9.70E-01		1.31E+00
	488.68	0.42	6.32E+00		8.37E+00
	563.99	0.49	5.12E-01		7.34E+00
	586.26	0.46	-1.31E+01		1.29E+01
	678.62	0.47	1.05E+00		7.53E+00
	688.67	0.86	-1.63E+00		3.70E+00
	719.35	0.28	-4.85E+00		1.17E+01
	778.90	12.96	-2.26E-01		2.72E-01
	810.45	0.32	-4.90E+00		1.18E+01
	867.37	4.26	-5.27E-01		9.08E-01
	919.33	0.43	-2.08E+00		1.12E+01
	964.08	14.65	7.55E-02		4.00E-01
	1085.87	10.24	2.00E-01		5.86E-01
	1089.74	1.73	1.45E+00		3.48E+00
	1112.07	13.69	-2.57E-02		3.73E-01
	1212.95	1.43	-2.95E+00		3.24E+00
	1249.94	0.19	-3.36E+00		2.44E+01
	1299.14	1.63	-2.58E+00		2.26E+00
	1408.01	21.07	-2.29E-01		1.39E-01
	1457.64	0.50	-1.95E+00		3.84E+01
	1528.10	0.28	-5.40E+00		1.27E+01
Eu-154	123.07	40.40	3.36E-02	8.49E-02	8.49E-02
	247.93	6.89	-1.47E-01		4.33E-01
	591.76	4.95	1.16E-01		7.91E-01
	692.42	1.78	-9.52E-01		1.99E+00
	723.30	20.06	8.94E-02		2.15E-01
	756.80	4.52	4.78E-01		8.45E-01
	873.18	12.08	2.66E-02		3.22E-01

Analysis Report for 17-Dec-19-10029
L2-10214A-FSGS-017SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	2.02E-01	8.49E-02	4.61E-01
	1004.76	18.01	-2.39E-02		2.74E-01
	1274.43	34.80	2.18E-02		1.52E-01
	1596.48	1.80	1.44E+00		2.91E+00
Eu-155	45.30	1.31	1.40E+00	1.73E-01	1.11E+01
	60.01	1.22	-1.16E-01		1.27E+01
	86.55	30.70	3.73E-02		1.73E-01
	105.31	21.10	3.98E-02		1.80E-01
Ra-226	186.21	3.64	3.04E-01	9.79E-01	9.79E-01
Pa-231	27.36	10.30	6.26E-01	1.19E+00	1.19E+00
	283.69	1.70	5.68E-02		1.74E+00
	300.07	2.47	-1.19E+00		1.39E+00
	302.65	2.20	1.63E-01		1.61E+00
	330.06	1.40	1.78E+00		2.80E+00
U-235	143.76	10.96	8.13E-02	6.30E-02	2.93E-01
	163.33	5.08	8.17E-02		6.91E-01
	185.71	57.20	2.37E-02		6.30E-02
	202.11	1.08	2.16E-01		3.28E+00
	205.31	5.01	-1.07E-01		7.23E-01
Am-241	59.54	35.90	-1.85E-01	4.22E-01	4.22E-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

Analysis Report for 17-Dec-19-10006
L2-10214A-FIGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10006
Sample Description : L2-10214A-FIGS-001SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.272E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:34:00PM
Acquisition Started : 12/17/2019 8:43:28AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.5 seconds

Dead Time : 0.17 %

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

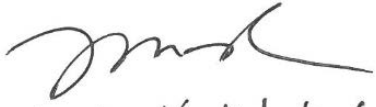
Energy Calibration Used Done On : 11/4/2019
Efficiency Calibration Used Done On : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82218
Fill Height : 1271.88 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 8:58:31AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19 [188]

Analysis Report for 17-Dec-19-10006
L2-10214A-FIGS-001SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	76.99	306 -	315	308.68	5.23E+01	14.42	6.87E+01	0.38
	2	185.89	736 -	751	743.83	4.46E+01	19.27	1.08E+02	0.78
M	3	238.52	949 -	973	954.19	1.75E+02	14.41	4.68E+01	0.86
m	4	242.02	949 -	973	968.15	4.37E+01	8.66	5.57E+01	0.87
	5	295.08	1173 -	1187	1180.23	9.85E+01	14.58	3.95E+01	1.26
	6	351.76	1400 -	1413	1406.77	1.79E+02	17.03	4.04E+01	1.18
	7	582.89	2324 -	2337	2330.79	6.88E+01	10.41	1.42E+01	1.43
	8	609.02	2428 -	2442	2435.27	1.14E+02	12.74	1.68E+01	1.13
	9	661.49	2637 -	2652	2645.05	4.94E+01	11.46	2.66E+01	1.28
	10	910.78	3634 -	3648	3642.08	3.51E+01	7.76	7.88E+00	1.16
	11	968.40	3867 -	3878	3872.59	2.26E+01	6.98	1.04E+01	0.88
	12	1237.10	4942 -	4953	4947.67	1.90E+01	5.15	3.00E+00	1.22
	13	1459.94	5829 -	5850	5839.58	2.36E+02	15.69	2.65E+00	1.62
	14	1763.42	7048 -	7061	7054.69	2.70E+01	5.20	0.00E+00	0.25

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	0.88	1460.82	*	10.66	6.28E+00
Cs-137	0.99	661.66	*	85.10	9.50E-02
Tl-208	0.98	583.19	*	85.00	1.21E-01
					4.98E-01
					2.27E-02
					1.97E-02 ^[189]

Analysis Report for 17-Dec-19-10006

L2-10214A-FIGS-001SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	3.27E-01	3.77E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	6.61E-01	1.94E-01
		87.35	3.97		
Bi-214	0.99	89.78	1.46		
		609.32 *	45.49	3.87E-01	4.91E-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	4.95E-01	1.06E-01
		295.22 *	18.42	4.92E-01	8.27E-02
		351.93 *	35.60	5.25E-01	6.53E-02
Pb214-XR	0.99	785.96	1.06		
		74.82	5.80		
		77.11 *	9.70	1.17E+00	3.47E-01
87.35	2.24				
89.78	0.82				
Ra-226	0.98	186.21 *	3.64	8.89E-01	3.91E-01
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	2.77E-01	6.25E-02
		964.77	4.99		
		968.97 *	15.80	3.04E-01	9.48E-02
		1588.20	3.22		
		U-235	0.99	143.76	10.96
163.33	5.08				
185.71 *	57.20			5.66E-02	2.49E-02
202.11	1.08				
205.31	5.01				

Analysis Report for 17-Dec-19-10006
L2-10214A-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
	K-40	0.882	6.28E+00	4.98E-01	
	Cs-137	0.995	9.50E-02	2.27E-02	
	Tl-208	0.986	1.21E-01	1.97E-02	
X	Bi-211	0.927			
	Pb-212	0.998	3.27E-01	3.77E-02	
?	Pb212-XR	0.999	6.61E-01	1.94E-01	
	Bi-214	0.994	3.87E-01	4.91E-02	
	Pb-214	0.996	5.09E-01	4.61E-02	
?	Pb214-XR	0.999	1.17E+00	3.47E-01	
?	Ra-226	0.983	8.89E-01	3.91E-01	
	Ac-228	0.982	2.85E-01	5.22E-02	
?	U-235	0.997	5.66E-02	2.49E-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 17-Dec-19-10006
L2-10214A-FIGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 8:58:31AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
12	1237.10	2.11111E-02	27.13		
14	1763.42	3.00000E-02	19.25		

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	8.28E-02	6.71E-02	6.71E-02
	BE-7	477.60	10.44	1.32E-01	4.23E-01	4.23E-01
+	K-40	1460.82	* 10.66	6.28E+00	3.57E-01	3.57E-01
	Mn-54	834.85	99.98	4.45E-03	5.51E-02	5.51E-02
	Co-60	1173.23	99.85	-2.58E-02	5.49E-02	6.74E-02
		1332.49	99.98	2.04E-02		5.49E-02
	Nb-94	702.65	99.81	2.42E-02	5.67E-02	5.67E-02
		871.09	99.89	4.24E-03		5.75E-02
	Ag-108m	79.13	6.60	-5.28E-01	5.42E-02	2.08E+00
		433.94	90.50	1.33E-02		5.42E-02
		614.28	89.80	-5.26E-02		7.13E-02
		722.94	90.80	-4.69E-02		6.57E-02
	Sb-125	176.31	6.84	-1.42E-01	1.67E-01	6.51E-01
		380.45	1.52	-2.71E-01		2.69E+00
		427.87	29.60	4.17E-02		1.67E-01
		463.36	10.49	2.59E-01		4.94E-01
		600.60	17.65	-1.02E-01		2.94E-01

[192]

Analysis Report for 17-Dec-19-10006

L2-10214A-FIGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)		
Sb-125	606.71	4.98	3.65E+00	1.67E-01	1.97E+00		
	635.95	11.22	4.01E-01		4.60E-01		
	671.44	1.79	-8.71E-01		2.43E+00		
Ba-133	79.61	2.65	-1.99E+00	1.01E-01	4.86E+00		
	81.00	32.90	-4.43E-01		3.26E-01		
	276.40	7.16	1.80E-01		6.32E-01		
	302.85	18.34	1.00E-01		2.46E-01		
	356.01	62.05	-1.74E-02		1.01E-01		
	383.85	8.94	-1.28E-01		4.80E-01		
	475.36	1.48	9.76E-03		7.37E-02	3.08E+00	
Cs-134	563.25	8.34	7.15E-02	7.37E-02	5.34E-01		
	569.33	15.37	1.15E-01		3.18E-01		
	604.72	97.62	8.82E-03		9.45E-02		
	795.86	85.46	5.89E-02		7.37E-02		
	801.95	8.69	5.03E-01		6.53E-01		
	1038.61	0.99	-1.79E+00		6.16E+00		
	1167.97	1.79	1.31E+00		3.81E+00		
	1365.19	3.02	6.15E-01		1.74E+00		
	+ Cs-137	661.66	*		85.10	6.45E-02	6.45E-02
	Eu-152	121.78	28.67		1.69E-01	1.76E-01	1.89E-01
244.70		7.61	6.26E-04	7.04E-01			
295.94		0.45	1.60E+01	1.36E+01			
344.28		26.60	-5.37E-02	1.76E-01			
367.79		0.86	4.84E+00	5.36E+00			
411.12		2.24	-7.07E-01	2.21E+00			
443.96		2.83	9.93E-01	1.78E+00			
488.68		0.42	3.99E+00	9.84E+00			
563.99		0.49	4.57E+00	9.19E+00			
586.26		0.46	-3.13E+00	1.75E+01			
678.62		0.47	1.94E+00	8.38E+00			
688.67		0.86	3.24E+00	5.35E+00			
719.35		0.28	-3.80E+00	1.84E+01			
778.90		12.96	3.53E-03	4.17E-01			
810.45		0.32	-2.72E+00	1.45E+01			
867.37		4.26	4.25E-01	1.28E+00			
919.33		0.43	-1.50E+01	1.29E+01			
964.08		14.65	-1.30E-01	5.61E-01			
1085.87		10.24	-3.45E-01	4.95E-01			
1089.74		1.73	-5.92E-01	3.09E+00			
1112.07		13.69	-1.54E+00	4.66E-01			
1212.95		1.43	3.88E+00	5.49E+00			
1249.94		0.19	4.43E+00	3.39E+01			
1299.14	1.63	3.59E-01	3.42E+00				
1408.01	21.07	-6.16E-02	2.72E-01				
1457.64	0.50	1.35E+02	4.38E+01				
1528.10	0.28	3.12E+00	1.16E+01				
Eu-154	123.07	40.40	-3.07E-02	1.26E-01	1.26E-01		
	247.93	6.89	-3.66E-01		6.34E-01		
	591.76	4.95	-7.28E-01		1.06E+00		
	692.42	1.78	8.37E-01		2.93E+00		
	723.30	20.06	-1.58E-01		2.94E-01		

Analysis Report for 17-Dec-19-10006
L2-10214A-FIGS-001SS

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	756.80		4.52	-1.94E-01	1.26E-01	1.22E+00
		873.18		12.08	3.88E-01		5.11E-01
		996.29		10.48	-1.54E-01		6.30E-01
		1004.76		18.01	-7.37E-02		3.19E-01
		1274.43		34.80	-8.39E-02		2.08E-01
		1596.48		1.80	1.52E+00		2.92E+00
	Eu-155	45.30		1.31	-3.08E+01	3.10E-01	2.98E+01
		60.01		1.22	4.68E+00		3.46E+01
		86.55		30.70	-1.34E-01		3.10E-01
		105.31		21.10	1.67E-02		3.11E-01
+	Ra-226	186.21	*	3.64	8.89E-01	1.28E+00	1.28E+00
	Pa-231	27.36		10.30	4.00E+00	1.80E+00	4.10E+00
		283.69		1.70	9.38E-01		2.46E+00
		300.07		2.47	2.19E-02		1.80E+00
		302.65		2.20	1.48E+00		2.08E+00
		330.06		1.40	5.63E-01		3.36E+00
+	U-235	143.76		10.96	-2.82E-02	8.14E-02	4.44E-01
		163.33		5.08	4.06E-01		9.25E-01
		185.71	*	57.20	5.66E-02		8.14E-02
		202.11		1.08	7.66E-02		4.03E+00
		205.31		5.01	-4.25E-01		8.43E-01
	Am-241	59.54		35.90	5.44E-01	1.24E+00	1.24E+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

Analysis Report for 17-Dec-19-10007
L2-10214A-QIGS-001SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10007
Sample Description : L2-10214A-QIGS-001SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.148E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:34:00PM
Acquisition Started : 12/17/2019 9:03:12AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.6 seconds

Dead Time : 0.17 %

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82221
Fill Height : 1148.38 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:18:16AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 [195]
12-17-19

Analysis Report for 17-Dec-19-10007

L2-10214A-QIGS-001SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.10	305 -	315	309.11	3.80E+01	15.25	8.00E+01	0.35
2	238.59	947 -	960	954.44	1.66E+02	20.00	8.38E+01	0.89
3	294.98	1175 -	1185	1179.82	8.92E+01	12.86	3.18E+01	1.27
4	338.00	1346 -	1358	1351.77	4.72E+01	11.32	3.08E+01	0.99
5	351.77	1399 -	1414	1406.83	1.83E+02	17.75	4.40E+01	1.13
6	582.66	2324 -	2340	2329.86	8.15E+01	11.27	1.45E+01	1.14
7	608.85	2427 -	2444	2434.58	1.51E+02	14.54	1.72E+01	1.27
8	661.36	2638 -	2651	2644.56	5.73E+01	10.02	1.57E+01	0.41
9	968.08	3866 -	3877	3871.30	1.78E+01	7.00	1.22E+01	0.37
10	1119.39	4470 -	4482	4476.64	1.81E+01	7.45	1.39E+01	1.15
11	1460.01	5829 -	5850	5839.88	2.17E+02	15.72	8.15E+00	1.84

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	0.90	1460.82 *	10.66	6.02E+00	5.08E-01
Cs-137	0.98	661.66 *	85.10	1.14E-01	2.11E-02
Tl-208	0.95	583.19 *	85.00	1.49E-01	2.25E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	3.21E-01	4.65E-02
		300.09	3.30		

[196]

Analysis Report for 17-Dec-19-10007

L2-10214A-QIGS-001SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	1.00	74.82	10.28		
		77.11 *	17.10	4.87E-01	2.02E-01
		87.35	3.97		
		89.78	1.46		
Bi-214	0.96	609.32 *	45.49	5.32E-01	6.04E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29 *	14.92	2.97E-01	1.23E-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	4.61E-01	7.60E-02
		351.93 *	35.60	5.57E-01	7.01E-02
Pb214-XR	1.00	785.96	1.06		
		74.82	5.80		
		77.11 *	9.70	8.59E-01	3.58E-01
Ac-228	0.55	87.35	2.24		
		89.78	0.82		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	4.41E-01	1.12E-01
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20	25.80		
964.77	4.99				
968.97 *	15.80	2.50E-01	9.87E-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 17-Dec-19-10007
L2-10214A-QIGS-001SS

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
	0.901	6.02E+00	5.08E-01	
	0.986	1.14E-01	2.11E-02	
	0.957	1.49E-01	2.25E-02	
X	0.924			
	1.000	3.21E-01	4.65E-02	
?	1.000	4.87E-01	2.02E-01	
	0.969	4.86E-01	5.42E-02	
	0.995	5.13E-01	5.15E-02	
?	1.000	8.59E-01	3.58E-01	
	0.550	3.34E-01	7.39E-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 17-Dec-19-10007
L2-10214A-QIGS-001SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:18:16AM
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-01	7.07E-02	7.07E-02
	BE-7	477.60	10.44	1.09E-01	4.54E-01	4.54E-01
+	K-40	1460.82	* 10.66	6.02E+00	5.99E-01	5.99E-01
	Mn-54	834.85	99.98	3.34E-02	6.00E-02	6.00E-02
	Co-60	1173.23	99.85	1.15E-02	5.91E-02	7.15E-02
		1332.49	99.98	-4.72E-02		5.91E-02
	Nb-94	702.65	99.81	1.50E-02	5.62E-02	5.76E-02
		871.09	99.89	-2.39E-03		5.62E-02
	Ag-108m	79.13	6.60	-5.31E-03	5.58E-02	2.01E+00
		433.94	90.50	-1.74E-03		5.58E-02
		614.28	89.80	-4.06E-03		7.47E-02
		722.94	90.80	7.62E-02		7.12E-02
	Sb-125	176.31	6.84	7.74E-01	1.77E-01	7.23E-01
		380.45	1.52	1.28E+00		3.19E+00
		427.87	29.60	7.36E-04		1.77E-01
		463.36	10.49	-1.22E-01		5.16E-01
		600.60	17.65	9.41E-02		3.25E-01
		606.71	4.98	4.72E+00		2.20E+00
		635.95	11.22	9.46E-02		4.61E-01

Analysis Report for 17-Dec-19-10007

L2-10214A-QIGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-5.82E-01	1.77E-01	2.88E+00
Ba-133	79.61	2.65	-4.27E-01	1.05E-01	4.76E+00
	81.00	32.90	-1.84E-01		3.25E-01
	276.40	7.16	7.07E-02		6.38E-01
	302.85	18.34	1.70E-01		2.75E-01
	356.01	62.05	-3.16E-02		1.05E-01
	383.85	8.94	2.68E-02		5.34E-01
Cs-134	475.36	1.48	-5.04E-01	7.42E-02	3.23E+00
	563.25	8.34	-1.55E-01		6.19E-01
	569.33	15.37	-1.48E-01		3.15E-01
	604.72	97.62	-1.72E-02		1.08E-01
	795.86	85.46	3.13E-03		7.42E-02
	801.95	8.69	3.23E-01		6.42E-01
	1038.61	0.99	5.22E-01		7.05E+00
	1167.97	1.79	1.50E+00		4.04E+00
	1365.19	3.02	5.80E-01		1.81E+00
+ Cs-137	661.66	* 85.10	1.14E-01	5.02E-02	5.02E-02
Eu-152	121.78	28.67	-3.27E-02	1.57E-01	1.93E-01
	244.70	7.61	4.14E-01		7.55E-01
	295.94	0.45	1.35E+01		1.41E+01
	344.28	26.60	-1.32E-01		1.57E-01
	367.79	0.86	9.15E-01		5.24E+00
	411.12	2.24	8.05E-01		2.38E+00
	443.96	2.83	-1.95E+00		1.86E+00
	488.68	0.42	7.36E-01		1.16E+01
	563.99	0.49	4.94E+00		1.06E+01
	586.26	0.46	-4.30E+00		1.83E+01
	678.62	0.47	-4.44E+00		1.05E+01
	688.67	0.86	-4.58E+00		6.44E+00
	719.35	0.28	9.56E-02		1.79E+01
	778.90	12.96	-6.28E-02		4.40E-01
	810.45	0.32	5.20E+00		1.51E+01
	867.37	4.26	1.20E-01		1.29E+00
	919.33	0.43	-5.64E+00		1.27E+01
	964.08	14.65	1.69E-01		5.70E-01
	1085.87	10.24	8.61E-02		5.82E-01
	1089.74	1.73	-1.33E+00		3.30E+00
	1112.07	13.69	7.33E-02		4.43E-01
	1212.95	1.43	-1.58E+00		5.12E+00
	1249.94	0.19	-1.85E+01		3.75E+01
	1299.14	1.63	2.15E+00		4.05E+00
	1408.01	21.07	-3.73E-02		3.17E-01
	1457.64	0.50	1.32E+02		4.48E+01
	1528.10	0.28	-1.09E+01		1.59E+01
Eu-154	123.07	40.40	2.10E-03	1.38E-01	1.38E-01
	247.93	6.89	-1.84E-01		6.53E-01
	591.76	4.95	5.59E-01		1.15E+00
	692.42	1.78	2.54E+00		3.50E+00
	723.30	20.06	3.40E-01		3.25E-01
	756.80	4.52	5.16E-01		1.26E+00
	873.18	12.08	-5.52E-01		4.58E-01

Analysis Report for 17-Dec-19-10007

L2-10214A-QIGS-001SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.20E-01	1.38E-01	5.79E-01
	1004.76	18.01	8.20E-02		3.62E-01
	1274.43	34.80	-3.51E-02		1.83E-01
	1596.48	1.80	1.59E+00		3.05E+00
Eu-155	45.30	1.31	3.91E+00	2.89E-01	3.65E+01
	60.01	1.22	-2.46E+01		3.47E+01
	86.55	30.70	-2.13E-01		3.38E-01
	105.31	21.10	-1.51E-01		2.89E-01
Ra-226	186.21	3.64	-6.68E-01	1.39E+00	1.39E+00
Pa-231	27.36	10.30	2.65E+00	2.00E+00	4.01E+00
	283.69	1.70	1.30E+00		2.78E+00
	300.07	2.47	-2.81E+00		2.00E+00
	302.65	2.20	1.53E+00		2.28E+00
	330.06	1.40	2.78E+00		3.66E+00
U-235	143.76	10.96	-1.88E-01	9.06E-02	4.83E-01
	163.33	5.08	-7.00E-01		9.00E-01
	185.71	57.20	9.42E-03		9.06E-02
	202.11	1.08	-1.95E+00		4.54E+00
	205.31	5.01	-1.18E+00		9.24E-01
Am-241	59.54	35.90	-5.04E-01	1.27E+00	1.27E+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

Analysis Report for 17-Dec-19-10008
L2-10214A-FIGS-002SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10008
Sample Description : L2-10214A-FIGS-002SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.090E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:36:00PM
Acquisition Started : 12/17/2019 8:43:35AM

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 : 11/4/2019
Efficiency Calibration Used Done On : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82219
Fill Height : 1089.69 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 8:58:54AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 [202] 12-17-19

Analysis Report for 17-Dec-19-10008
L2-10214A-FIGS-002SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	75.15	295 -	314	301.13	4.62E+01	9.69	8.93E+01	0.81
m	2	77.30	295 -	314	309.75	7.78E+01	11.50	9.19E+01	0.81
	3	87.35	344 -	353	349.88	3.74E+01	13.37	6.26E+01	0.77
	4	186.17	739 -	752	744.54	7.34E+01	15.19	5.66E+01	0.64
M	5	238.81	947 -	974	954.81	2.05E+02	38.79	6.35E+01	1.00
m	6	241.97	947 -	974	967.42	6.78E+01	14.59	5.46E+01	1.01
	7	295.19	1174 -	1188	1180.05	1.20E+02	15.14	3.80E+01	0.93
	8	351.96	1399 -	1414	1406.86	1.93E+02	17.17	3.39E+01	1.17
	9	583.03	2322 -	2340	2330.22	7.85E+01	11.12	1.35E+01	1.10
	10	609.11	2428 -	2442	2434.49	1.23E+02	13.47	2.05E+01	0.64
	11	661.52	2637 -	2652	2643.98	6.42E+01	10.40	1.48E+01	0.86
	12	1460.20	5827 -	5849	5838.74	2.28E+02	15.83	5.75E+00	2.05

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	0.94	1460.82 *	10.66	5.83E+00	4.77E-01
Cs-137	0.99	661.66 *	85.10	1.18E-01	2.04E-02
Tl-208	0.99	583.19 *	85.00	1.32E-01	2.04E-02
Pb-212	0.99	115.18 *	0.60		
		238.63 *	43.60	3.58E-01	7.37E-02 ^[203]

Analysis Report for 17-Dec-19-10008

L2-10214A-FIGS-002SS

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	0.99	300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	6.20E-01	1.45E-01
		77.11	*	17.10	5.80E-01	1.04E-01
		87.35	*	3.97	9.20E-01	3.42E-01
		89.78		1.46		
Bi-214	0.99	609.32	*	45.49	3.98E-01	4.99E-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	7.18E-01	1.65E-01
		295.22	*	18.42	5.67E-01	8.47E-02
		351.93	*	35.60	5.40E-01	6.45E-02
		785.96		1.06		
Ra-226	1.00	186.21	*	3.64	1.34E+00	2.98E-01
U-235	0.97	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	8.55E-02	1.90E-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

INTERFERENCE CORRECTED REPORT

Analysis Report for 17-Dec-19-10008

L2-10214A-FIGS-002SS

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.940	5.83E+00	4.77E-01	
X	Cd-109	0.929			
	Cs-137	0.997	1.18E-01	2.04E-02	
X	Eu-155	0.943			
	Tl-208	0.996	1.32E-01	2.04E-02	
X	Bi-211	0.880			
	Pb-212	0.996	3.58E-01	7.37E-02	
	Pb212-XR	0.991	6.12E-01	8.21E-02	
	Bi-214	0.997	3.98E-01	4.99E-02	
	Pb-214	1.000	5.64E-01	4.90E-02	
X	Pb214-XR	0.991			
?	Ra-226	1.000	1.34E+00	2.98E-01	
?	U-235	0.977	8.55E-02	1.90E-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 17-Dec-19-10008
L2-10214A-FIGS-002SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 8:58:54AM
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	9.38E-02	6.47E-02	6.47E-02
	BE-7	477.60	10.44	1.57E-01	4.70E-01	4.70E-01
+	K-40	1460.82	* 10.66	5.83E+00	4.83E-01	4.83E-01
	Mn-54	834.85	99.98	8.15E-03	5.29E-02	5.29E-02
	Co-60	1173.23	99.85	-9.37E-04	5.90E-02	6.03E-02
		1332.49	99.98	1.45E-02		5.90E-02
	Nb-94	702.65	99.81	-1.27E-02	4.51E-02	5.50E-02
		871.09	99.89	7.74E-03		4.51E-02
	Ag-108m	79.13	6.60	-9.39E-01	4.58E-02	1.45E+00
		433.94	90.50	4.06E-03		4.58E-02
		614.28	89.80	-2.59E-02		7.26E-02
		722.94	90.80	1.50E-02		6.50E-02
	Sb-125	176.31	6.84	2.36E-01	1.58E-01	5.50E-01
		380.45	1.52	1.63E+00		3.03E+00
		427.87	29.60	9.45E-02		1.58E-01
		463.36	10.49	1.43E-01		4.68E-01
		600.60	17.65	-6.73E-02		2.72E-01
		606.71	4.98	3.62E+00		1.92E+00
		635.95	11.22	-1.09E-01		3.15E-01

Analysis Report for 17-Dec-19-10008

L2-10214A-FIGS-002SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-2.64E-01	1.58E-01	2.54E+00
Ba-133	79.61	2.65	-1.95E+00	9.31E-02	3.56E+00
	81.00	32.90	-2.32E-01		2.30E-01
	276.40	7.16	-1.87E-01		5.52E-01
	302.85	18.34	-4.64E-02		2.00E-01
	356.01	62.05	-3.63E-02		9.31E-02
	383.85	8.94	-1.19E-02		5.07E-01
Cs-134	475.36	1.48	-2.71E+00	6.84E-02	3.12E+00
	563.25	8.34	-9.43E-01		5.44E-01
	569.33	15.37	-5.39E-02		2.28E-01
	604.72	97.62	-2.48E-02		8.71E-02
	795.86	85.46	-1.78E-02		6.84E-02
	801.95	8.69	3.73E-01		6.36E-01
	1038.61	0.99	2.56E+00		4.91E+00
	1167.97	1.79	-2.85E+00		3.48E+00
	1365.19	3.02	1.37E+00		1.89E+00
+ Cs-137	661.66	* 85.10	1.18E-01	4.67E-02	4.67E-02
Eu-152	121.78	28.67	-3.28E-02	1.30E-01	1.30E-01
	244.70	7.61	-1.04E-01		6.36E-01
	295.94	0.45	2.06E+01		1.36E+01
	344.28	26.60	3.74E-02		1.55E-01
	367.79	0.86	2.13E+00		4.59E+00
	411.12	2.24	-3.74E-02		1.95E+00
	443.96	2.83	8.87E-01		1.55E+00
	488.68	0.42	-4.93E-01		9.76E+00
	563.99	0.49	-1.26E+01		8.55E+00
	586.26	0.46	-7.62E-01		1.60E+01
	678.62	0.47	1.76E+00		9.07E+00
	688.67	0.86	-9.38E-02		4.46E+00
	719.35	0.28	3.89E+00		1.88E+01
	778.90	12.96	-2.16E-01		3.29E-01
	810.45	0.32	1.86E+00		1.51E+01
	867.37	4.26	6.18E-01		1.13E+00
	919.33	0.43	6.64E+00		1.21E+01
	964.08	14.65	1.05E-01		5.78E-01
	1085.87	10.24	-9.78E-02		5.36E-01
	1089.74	1.73	4.65E-01		2.90E+00
	1112.07	13.69	-2.13E-01		4.33E-01
	1212.95	1.43	-6.26E-01		5.08E+00
	1249.94	0.19	1.87E+01		3.45E+01
	1299.14	1.63	1.79E+00		4.05E+00
	1408.01	21.07	-4.83E-02		2.62E-01
	1457.64	0.50	1.25E+02		4.18E+01
	1528.10	0.28	-4.01E+00		1.46E+01
Eu-154	123.07	40.40	-4.94E-02	9.35E-02	9.35E-02
	247.93	6.89	-4.07E-01		5.12E-01
	591.76	4.95	-3.30E-02		8.66E-01
	692.42	1.78	-7.51E-01		2.26E+00
	723.30	20.06	8.40E-03		2.91E-01
	756.80	4.52	9.98E-02		1.07E+00
	873.18	12.08	-2.47E-01		3.65E-01

Analysis Report for 17-Dec-19-10008

L2-10214A-FIGS-002SS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29	10.48	-1.10E-01	9.35E-02	4.73E-01
		1004.76	18.01	-2.31E-01		2.77E-01
		1274.43	34.80	-9.54E-02		1.93E-01
		1596.48	1.80	-4.07E-02		2.53E+00
	Eu-155	45.30	1.31	9.49E+00	1.37E-01	1.36E+01
		60.01	1.22	-5.96E+00		1.38E+01
		86.55	* 30.70	1.19E-01		1.37E-01
		105.31	21.10	9.00E-02		2.07E-01
+	Ra-226	186.21	* 3.64	1.34E+00	8.31E-01	8.31E-01
	Pa-231	27.36	10.30	1.39E+00	1.46E+00	1.46E+00
		283.69	1.70	1.18E+00		2.35E+00
		300.07	2.47	3.27E-01		1.56E+00
		302.65	2.20	-9.26E-01		1.63E+00
		330.06	1.40	2.44E+00		3.39E+00
+	U-235	143.76	10.96	1.10E-02	5.29E-02	3.46E-01
		163.33	5.08	-2.43E-01		7.43E-01
		185.71	* 57.20	8.55E-02		5.29E-02
		202.11	1.08	-6.92E-01		3.31E+00
		205.31	5.01	-7.98E-01		7.13E-01
	Am-241	59.54	35.90	-1.31E-01	4.71E-01	4.71E-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

Analysis Report for 17-Dec-19-10009
L2-10214A-FIGS-003SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10009
Sample Description : L2-10214A-FIGS-003SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.420E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 2:30:00PM
Acquisition Started : 12/17/2019 8:43:45AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 352
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 - 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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82220
Fill Height : 1420.34 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 8:58:51AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 [209] 12-17-19

Analysis Report for 17-Dec-19-10009

L2-10214A-FIGS-003SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.95	295 -	316	301.12	9.16E+01	33.89	1.61E+02	0.89
m	2	77.04	295 -	316	309.46	1.28E+02	42.97	2.00E+02	0.89
	3	186.06	736 -	752	744.95	1.47E+02	27.97	2.03E+02	1.09
M	4	238.67	948 -	975	955.13	3.71E+02	48.85	1.39E+02	1.03
m	5	241.96	948 -	975	968.30	1.61E+02	23.78	1.18E+02	1.04
M	6	266.24	1062 -	1087	1065.31	1.98E+01	12.45	2.53E+01	0.45
m	7	270.45	1062 -	1087	1082.11	5.68E+01	14.23	9.44E+01	0.45
	8	295.23	1173 -	1188	1181.15	3.18E+02	25.71	1.14E+02	1.12
	9	338.21	1348 -	1361	1352.89	8.51E+01	15.77	5.89E+01	0.91
	10	351.91	1397 -	1417	1407.65	6.36E+02	28.59	4.99E+01	1.26
	11	510.55	2036 -	2047	2041.69	4.35E+01	12.04	4.05E+01	0.60
	12	583.21	2324 -	2340	2332.15	1.44E+02	14.91	2.52E+01	1.17
	13	609.27	2426 -	2447	2436.35	4.43E+02	25.62	5.72E+01	1.47
	14	727.09	2901 -	2914	2907.47	2.13E+01	9.88	2.77E+01	0.73
	15	768.81	3067 -	3080	3074.29	2.86E+01	10.16	2.54E+01	1.23
	16	794.47	3171 -	3182	3176.92	1.48E+01	6.88	1.22E+01	0.27
	17	911.25	3635 -	3654	3644.04	1.10E+02	13.80	2.27E+01	1.25
	18	969.02	3867 -	3884	3875.15	5.24E+01	12.03	2.76E+01	0.57
	19	1120.19	4470 -	4489	4480.04	1.19E+02	12.43	1.01E+01	0.83
	20	1238.15	4946 -	4959	4952.14	2.97E+01	9.27	2.03E+01	0.54
	21	1460.82	5831 -	5854	5843.67	2.97E+02	18.90	1.50E+01	1.38
	22	1509.24	6031 -	6044	6037.56	1.83E+01	5.66	4.73E+00	0.29
	23	1764.25	7049 -	7068	7059.07	8.64E+01	10.64	7.57E+00	0.62

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

Analysis Report for 17-Dec-19-10009

L2-10214A-FIGS-003SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.96	511.00 *	100.00	4.99E-02	1.42E-02
K-40	1.00	1460.82 *	10.66	6.35E+00	4.89E-01
Tl-208	1.00	583.19 *	85.00	2.09E-01	2.51E-02
Bi-212	0.99	39.86	1.06		
		727.33 *	6.67	4.56E-01	2.14E-01
		785.37	1.10		
		1620.50	1.47		
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	5.89E-01	9.10E-02
		300.09	3.30		
Pb212-XR	0.99	74.82 *	10.28	1.59E+00	6.11E-01
		77.11 *	17.10	1.21E+00	4.24E-01
		87.35	3.97		
		89.78	1.46		
Bi-214	0.99	609.32 *	45.49	1.24E+00	1.03E-01
		768.36 *	4.89	8.67E-01	3.12E-01
		806.18	1.26		
		934.06	3.11		
		1120.29 *	14.92	1.52E+00	1.70E-01
		1155.21	1.63		
		1238.12 *	5.83	1.03E+00	3.25E-01
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21 *	2.13	2.00E+00	6.27E-01
		1661.27	1.05		
		1729.59	2.88		
		1764.49 *	15.30	1.49E+00	1.92E-01
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99 *	7.25	1.55E+00	2.60E-01
		295.22 *	18.42	1.34E+00	1.53E-01
		351.93 *	35.60	1.57E+00	1.44E-01
		785.96	1.06		
Rn-219	0.94	271.23 *	10.80	3.89E-01	1.05E-01
		401.81	6.60		
Ra-226	0.99	186.21 *	3.64	2.50E+00	5.16E-01
Ac-228	0.99	129.07	2.42		
		209.25	3.89		
		270.24 *	3.46	1.21E+00	3.20E-01
		328.00	2.95		
		338.32 *	11.27	6.46E-01	1.31E-01
		409.46	1.92		
		463.00	4.40		
		794.95 *	4.25	5.28E-01	2.48E-01
		911.20 *	25.80	7.11E-01	9.40E-02
		964.77	4.99		
		968.97 *	15.80	5.75E-01	1.34E-01
		1588.20	3.22		

[211]

Analysis Report for 17-Dec-19-10009
L2-10214A-FIGS-003SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
U-235	0.98	143.76	10.96		
		163.33	5.08		
		185.71 *	57.20	1.59E-01	3.29E-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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
An Pk	0.968	4.99E-02	1.42E-02	
K-40	1.000	6.35E+00	4.89E-01	
Tl-208	1.000	2.09E-01	2.51E-02	
X Bi-211	0.892			
Bi-212	0.994	4.56E-01	2.14E-01	
Pb-212	1.000	5.89E-01	9.10E-02	
Pb212-XR	0.999	1.33E+00	3.48E-01	
Bi-214	0.997	1.31E+00	7.51E-02	
Pb-214	1.000	1.48E+00	9.73E-02	
X Pb214-XR	0.999			
Rn-219	0.941	1.80E-01	1.04E-01	
? Ra-226	0.996	2.50E+00	5.16E-01	
Ac-228	0.997	6.52E-01	6.38E-02	
? U-235	0.987	1.59E-01	3.29E-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 17-Dec-19-10009
L2-10214A-FIGS-003SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 8:58:51AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
M 6	266.24	2.20287E-02	62.78		

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	4.99E-02	4.25E-02	4.25E-02
	BE-7	477.60	10.44	1.08E-01	5.65E-01	5.65E-01
+	K-40	1460.82	* 10.66	6.35E+00	6.25E-01	6.25E-01
	Mn-54	834.85	99.98	3.08E-02	6.48E-02	6.48E-02
	Co-60	1173.23	99.85	-3.31E-02	5.82E-02	6.81E-02
		1332.49	99.98	-3.57E-02		5.82E-02
	Nb-94	702.65	99.81	1.61E-02	5.54E-02	6.38E-02
		871.09	99.89	9.55E-03		5.54E-02
	Ag-108m	79.13	6.60	6.29E-02	5.74E-02	2.42E+00
		433.94	90.50	-5.18E-02		5.74E-02
		614.28	89.80	-3.20E-02		1.52E-01
		722.94	90.80	1.63E-02		7.56E-02
	Sb-125	176.31	6.84	-4.82E-01	1.86E-01	8.27E-01
		380.45	1.52	-5.63E-01		3.46E+00
		427.87	29.60	-4.39E-02		1.86E-01
		463.36	10.49	1.88E-01		5.35E-01
		600.60	17.65	-1.34E-01		3.20E-01
		606.71	4.98	1.25E+01		2.94E+00

Analysis Report for 17-Dec-19-10009

L2-10214A-FIGS-003SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	
Sb-125	635.95	11.22	8.13E-03	1.86E-01	4.99E-01	
	671.44	1.79	-3.42E+00		3.09E+00	
Ba-133	79.61	2.65	-8.13E-01	1.67E-01	5.83E+00	
	81.00	32.90	-1.58E-01		3.96E-01	
	276.40	7.16	4.66E-01		8.24E-01	
	302.85	18.34	2.40E-02		3.27E-01	
	356.01	62.05	4.63E-03		1.67E-01	
	383.85	8.94	-2.83E-01		6.13E-01	
	475.36	1.48	-1.01E+00		7.81E-02	3.85E+00
Cs-134	563.25	8.34	1.03E-01	7.81E-02	6.84E-01	
	569.33	15.37	7.55E-02		3.37E-01	
	604.72	97.62	5.39E-03		1.37E-01	
	795.86	85.46	2.70E-02		7.81E-02	
	801.95	8.69	-1.04E-01		6.99E-01	
	1038.61	0.99	-2.94E+00		5.57E+00	
	1167.97	1.79	-2.08E+00		3.50E+00	
	1365.19	3.02	-1.95E+00		1.86E+00	
	661.66	85.10	8.33E-02		7.53E-02	7.53E-02
	Cs-137					
Eu-152	121.78	28.67	-1.24E-02	1.96E-01	2.32E-01	
	244.70	7.61	-1.24E-01		9.44E-01	
	295.94	0.45	4.23E+01		2.02E+01	
	344.28	26.60	-4.66E-02		1.96E-01	
	367.79	0.86	1.26E-01		5.95E+00	
	411.12	2.24	9.64E-01		2.60E+00	
	443.96	2.83	-1.01E+00		1.97E+00	
	488.68	0.42	1.79E+00		1.26E+01	
	563.99	0.49	-4.65E+00		1.10E+01	
	586.26	0.46	-3.24E+00		1.94E+01	
	678.62	0.47	-1.30E+00		1.19E+01	
	688.67	0.86	9.72E-01		5.97E+00	
	719.35	0.28	4.91E-01		2.16E+01	
	778.90	12.96	-7.01E-01		4.77E-01	
	810.45	0.32	3.36E+00		1.83E+01	
	867.37	4.26	-1.84E+00		1.36E+00	
	919.33	0.43	-8.62E+00		1.66E+01	
	964.08	14.65	-5.90E-02		6.61E-01	
	1085.87	10.24	4.98E-01		6.58E-01	
	1089.74	1.73	-5.00E-01		3.87E+00	
	1112.07	13.69	-2.94E-01		4.70E-01	
	1212.95	1.43	4.20E+00		5.17E+00	
	1249.94	0.19	9.17E+00		3.75E+01	
1299.14	1.63	-2.06E+00	4.08E+00			
1408.01	21.07	9.92E-02	3.80E-01			
1457.64	0.50	1.43E+02	4.05E+01			
1528.10	0.28	-8.86E-01	1.89E+01			
Eu-154	123.07	40.40	-6.22E-02	1.64E-01	1.64E-01	
	247.93	6.89	-1.08E-01		7.94E-01	
	591.76	4.95	3.22E-01		1.04E+00	
	692.42	1.78	2.69E+00		3.12E+00	
	723.30	20.06	6.80E-02		3.51E-01	
	756.80	4.52	-5.45E-01		1.29E+00	

Analysis Report for 17-Dec-19-10009

L2-10214A-FIGS-003SS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	873.18	12.08	-1.11E-01	1.64E-01	4.73E-01
		996.29	10.48	2.99E-01		6.02E-01
		1004.76	18.01	1.44E-02		3.62E-01
		1274.43	34.80	6.01E-02		2.15E-01
		1596.48	1.80	-3.20E+00		3.58E+00
	Eu-155	45.30	1.31	-1.81E+01	3.50E-01	3.07E+01
		60.01	1.22	-8.35E+00		3.32E+01
		86.55	30.70	-1.28E-01		3.81E-01
		105.31	21.10	-1.65E-01		3.50E-01
+	Ra-226	186.21	* 3.64	2.50E+00	1.50E+00	1.50E+00
	Pa-231	27.36	10.30	5.80E+00	2.71E+00	3.98E+00
		283.69	1.70	9.88E-01		3.24E+00
		300.07	2.47	-1.28E+00		2.77E+00
		302.65	2.20	-5.34E-01		2.71E+00
		330.06	1.40	1.12E-01		3.95E+00
+	U-235	143.76	10.96	2.17E-02	9.56E-02	5.53E-01
		163.33	5.08	2.44E-01		1.17E+00
		185.71	* 57.20	1.59E-01		9.56E-02
		202.11	1.08	1.25E+00		5.51E+00
		205.31	5.01	-1.31E+00		1.14E+00
	Am-241	59.54	35.90	-8.47E-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

Analysis Report for 17-Dec-19-10010
L2-10214A-FIGS-004SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10010
Sample Description : L2-10214A-FIGS-004SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.355E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 2:32:00PM
Acquisition Started : 12/17/2019 9:03:18AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 324
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 900.8 seconds

Dead Time : 0.09 %

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82222
Fill Height : 1354.76 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:18:21AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1530 [216]
12-17-19

Analysis Report for 17-Dec-19-10010
L2-10214A-FIGS-004SS

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	77.18	151 -	158	154.96	2.93E+02	37.99	5.59E+02	0.98
	2	186.02	368 -	376	372.35	3.04E+02	32.80	3.62E+02	1.24
	3	209.11	414 -	422	418.47	8.74E+01	27.77	3.21E+02	1.22
M	4	238.63	473 -	488	477.45	7.35E+02	67.13	2.65E+02	1.14
m	5	241.90	473 -	488	483.98	3.56E+02	35.93	2.27E+02	1.14
	6	269.76	536 -	544	539.63	1.17E+02	22.42	1.80E+02	1.08
M	7	295.13	585 -	603	590.33	6.42E+02	27.68	1.61E+02	1.11
m	8	300.04	585 -	603	600.13	7.02E+01	11.74	1.52E+02	1.12
	9	338.26	671 -	681	676.49	1.45E+02	23.39	1.69E+02	1.31
	10	351.82	698 -	708	703.59	1.13E+03	38.79	1.57E+02	1.37
	11	510.60	1015 -	1026	1020.88	1.28E+02	18.58	8.59E+01	2.16
	12	583.09	1160 -	1171	1165.79	2.47E+02	20.92	7.64E+01	1.13
	13	609.15	1212 -	1223	1217.88	8.75E+02	32.90	8.32E+01	1.41
	14	727.18	1448 -	1459	1453.86	7.49E+01	13.89	4.71E+01	1.91
	15	768.35	1530 -	1540	1536.17	4.26E+01	14.84	7.44E+01	0.86
	16	910.87	1816 -	1827	1821.20	2.21E+02	17.26	3.04E+01	1.53
	17	933.83	1863 -	1871	1867.12	2.70E+01	9.04	2.50E+01	1.13
	18	968.85	1932 -	1943	1937.16	8.97E+01	14.81	5.03E+01	1.13
	19	1120.09	2232 -	2246	2239.73	2.07E+02	17.56	3.55E+01	1.51
	20	1377.50	2748 -	2759	2754.90	2.96E+01	9.65	2.54E+01	1.00
	21	1407.14	2809 -	2820	2814.23	3.54E+01	8.66	1.56E+01	0.97
	22	1460.33	2913 -	2928	2920.72	4.26E+02	22.79	3.15E+01	1.79
	23	1729.20	3453 -	3465	3459.15	3.35E+01	7.12	6.50E+00	1.59
	24	1763.79	3522 -	3536	3528.44	1.51E+02	12.88	5.36E+00	2.73

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

[217]

Analysis Report for 17-Dec-19-10010
L2-10214A-FIGS-004SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	0.97	511.00 *	100.00	1.34E-01	2.15E-02
K-40	0.96	1460.82 *	10.66	8.30E+00	5.72E-01
Tl-208	0.99	583.19 *	85.00	3.28E-01	3.41E-02
Bi-212	0.99	39.86	1.06		
		727.33 *	6.67	1.47E+00	2.86E-01
		785.37	1.10		
		1620.50	1.47		
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.06E+00	1.29E-01
		300.09 *	3.30	1.52E+00	2.82E-01
Pb212-XR	0.52	74.82	10.28		
		77.11 *	17.10	1.94E+00	3.20E-01
		87.35	3.97		
		89.78	1.46		
Bi-214	0.90	609.32 *	45.49	2.24E+00	1.59E-01
		768.36 *	4.89	1.18E+00	4.17E-01
		806.18	1.26		
		934.06 *	3.11	1.34E+00	4.52E-01
		1120.29 *	14.92	2.40E+00	2.26E-01
		1155.21	1.63		
		1238.12	5.83		
		1280.98	1.43		
		1377.67 *	3.99	1.48E+00	4.86E-01
		1385.31	0.79		
		1401.52	1.33		
		1407.99 *	2.39	2.99E+00	7.41E-01
		1509.21	2.13		
		1661.27	1.05		
		1729.59 *	2.88	2.75E+00	5.95E-01
		1764.49 *	15.30	2.36E+00	2.23E-01
		1847.43	2.03		
		2118.51	1.16		
Pb-214	0.99	241.99 *	7.25	3.10E+00	3.99E-01
		295.22 *	18.42	2.47E+00	2.24E-01
		351.93 *	35.60	2.55E+00	2.22E-01
		785.96	1.06		
Pb214-XR	0.53	74.82	5.80		
		77.11 *	9.70	3.41E+00	5.86E-01
		87.35	2.24		
		89.78	0.82		
Ra-226	0.99	186.21 *	3.64	4.63E+00	6.24E-01
Ac-228	0.99	129.07	2.42		
		209.25 *	3.89	1.32E+00	4.32E-01
		270.24 *	3.46	2.26E+00	4.72E-01
		328.00	2.95		
		338.32 *	11.27	1.00E+00	1.81E-01
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	1.30E+00	1.16E-01
		964.77	4.99		

Analysis Report for 17-Dec-19-10010
L2-10214A-FIGS-004SS

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Ac-228	0.99	968.97 *	15.80	8.97E-01	1.53E-01
		1588.20	3.22		
U-235	0.98	143.76	10.96		
		163.33	5.08		
		185.71 *	57.20	2.95E-01	3.98E-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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
An Pk	0.974	1.34E-01	2.15E-02	
K-40	0.963	8.30E+00	5.72E-01	
Tl-208	0.999	3.28E-01	3.41E-02	
X Bi-211	0.914			
Bi-212	0.998	1.47E+00	2.86E-01	
Pb-212	1.000	1.14E+00	1.17E-01	
? Pb212-XR	0.529	1.94E+00	3.20E-01	
Bi-214	0.907	2.19E+00	1.01E-01	
Pb-214	0.998	2.59E+00	1.47E-01	
? Pb214-XR	0.531	3.41E+00	5.86E-01	
? Ra-226	0.994	4.63E+00	6.24E-01	
Ac-228	0.992	1.16E+00	7.99E-02	
X Pa-231	1.000			
? U-235	0.989	2.95E-01	3.98E-02	

Analysis Report for 17-Dec-19-10010

L2-10214A-FIGS-004SS

- ? = 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 17-Dec-19-10010
L2-10214A-FIGS-004SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:18:21AM
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	1.34E-01	5.53E-02	5.53E-02
	BE-7	477.60	10.44	5.89E-01	6.14E-01	6.14E-01
+	K-40	1460.82	* 10.66	8.30E+00	6.97E-01	6.97E-01
	Mn-54	834.85	99.98	-1.80E-02	6.41E-02	6.41E-02
	Co-60	1173.23	99.85	3.98E-02	7.59E-02	7.90E-02
		1332.49	99.98	1.46E-03		7.59E-02
	Nb-94	702.65	99.81	-1.87E-02	6.27E-02	6.27E-02
		871.09	99.89	-1.20E-02		6.67E-02
	Ag-108m	79.13	6.60	-1.06E+00	6.03E-02	2.26E+00
		433.94	90.50	-1.04E-02		6.03E-02
		614.28	89.80	-1.29E-01		1.19E-01
		722.94	90.80	3.47E-03		8.85E-02
	Sb-125	176.31	6.84	-5.47E-03	1.90E-01	9.28E-01
		380.45	1.52	4.33E-01		3.79E+00
		427.87	29.60	-9.75E-04		1.90E-01
		463.36	10.49	7.44E-01		6.40E-01
		600.60	17.65	-2.06E-01		3.55E-01
		606.71	4.98	-3.16E-01		3.63E+00
		635.95	11.22	-1.31E-01		5.16E-01

Analysis Report for 17-Dec-19-10010

L2-10214A-FIGS-004SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-3.79E+00	1.90E-01	3.25E+00
Ba-133	79.61	2.65	-3.48E+00	1.78E-01	5.21E+00
	81.00	32.90	-6.95E-01		3.27E-01
	276.40	7.16	3.92E-02		8.05E-01
	302.85	18.34	-1.23E-01		3.42E-01
	356.01	62.05	-3.23E-01		1.78E-01
	383.85	8.94	-2.45E-01		6.33E-01
Cs-134	475.36	1.48	1.98E+00	8.69E-02	4.19E+00
	563.25	8.34	-2.36E-02		6.68E-01
	569.33	15.37	-7.47E-02		3.65E-01
	604.72	97.62	-2.75E-02		1.62E-01
	795.86	85.46	5.45E-02		8.69E-02
	801.95	8.69	-2.09E-01		7.70E-01
	1038.61	0.99	-1.12E+00		6.38E+00
	1167.97	1.79	1.20E+00		4.29E+00
	1365.19	3.02	-1.01E+00		1.76E+00
Cs-137	661.66	85.10	5.98E-04	7.88E-02	7.88E-02
Eu-152	121.78	28.67	1.08E-02	2.09E-01	2.09E-01
	244.70	7.61	-5.34E-01		1.00E+00
	295.94	0.45	8.04E+01		2.32E+01
	344.28	26.60	-1.56E-01		2.14E-01
	367.79	0.86	1.10E+00		6.31E+00
	411.12	2.24	-5.19E-01		2.70E+00
	443.96	2.83	2.73E-01		1.94E+00
	488.68	0.42	5.47E+00		1.31E+01
	563.99	0.49	5.52E+00		1.17E+01
	586.26	0.46	-4.57E+00		2.29E+01
	678.62	0.47	6.75E+00		1.29E+01
	688.67	0.86	-3.08E+00		6.77E+00
	719.35	0.28	2.19E+00		2.46E+01
	778.90	12.96	-5.93E-01		4.39E-01
	810.45	0.32	7.46E-01		2.13E+01
	867.37	4.26	-9.49E-01		1.51E+00
	919.33	0.43	-9.46E+00		1.47E+01
	964.08	14.65	5.19E-02		6.80E-01
	1085.87	10.24	-1.22E-01		6.39E-01
	1089.74	1.73	-2.12E+00		3.92E+00
	1112.07	13.69	-9.92E-02		5.25E-01
	1212.95	1.43	-3.20E-02		5.25E+00
	1249.94	0.19	-1.06E+01		4.18E+01
	1299.14	1.63	3.01E+00		4.63E+00
	1408.01	21.07	2.26E-01		4.21E-01
	1457.64	0.50	-2.34E+00		4.43E+01
	1528.10	0.28	-7.06E+00		1.94E+01
Eu-154	123.07	40.40	3.45E-02	1.50E-01	1.50E-01
	247.93	6.89	2.32E-03		7.91E-01
	591.76	4.95	1.04E-01		1.21E+00
	692.42	1.78	-2.34E+00		3.41E+00
	723.30	20.06	1.00E-02		4.23E-01
	756.80	4.52	9.76E-02		1.50E+00
	873.18	12.08	-2.36E-01		5.42E-01

Analysis Report for 17-Dec-19-10010
L2-10214A-FIGS-004SS

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29	10.48	-1.04E-01	1.50E-01	6.70E-01
		1004.76	18.01	3.47E-01		3.92E-01
		1274.43	34.80	-1.03E-01		2.25E-01
		1596.48	1.80	-1.02E+00		3.61E+00
	Eu-155	45.30	1.31	2.72E+00	3.34E-01	2.03E+01
		60.01	1.22	-8.19E+00		2.31E+01
		86.55	30.70	3.23E-01		3.60E-01
		105.31	21.10	2.09E-01		3.34E-01
+	Ra-226	186.21	* 3.64	4.63E+00	1.48E+00	1.48E+00
	Pa-231	27.36	10.30	3.28E+00	1.79E+00	2.24E+00
		283.69	1.70	-5.66E-01		3.18E+00
		300.07	* 2.47	2.03E+00		1.79E+00
		302.65	2.20	-1.03E+00		2.85E+00
		330.06	1.40	1.54E+00		4.35E+00
+	U-235	143.76	10.96	2.62E-02	9.41E-02	5.40E-01
		163.33	5.08	-2.39E-01		1.24E+00
		185.71	* 57.20	2.95E-01		9.41E-02
		202.11	1.08	-4.62E+00		5.37E+00
		205.31	5.01	4.83E-01		1.21E+00
	Am-241	59.54	35.90	-1.28E-01	8.12E-01	8.12E-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

Analysis Report for 17-Dec-19-10011
L2-10214A-FIGS-005SS

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10011
Sample Description : L2-10214A-FIGS-005SS
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.505E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 2:34:00PM
Acquisition Started : 12/17/2019 9:03:24AM

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 : 11/4/2019
Efficiency Calibration Used Done On : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82223
Fill Height : 1505.47 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 9:18:38AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19

Analysis Report for 17-Dec-19-10011
L2-10214A-FIGS-005SS

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.80	949 -	961	954.80	1.04E+02	14.60	4.02E+01	0.70
2	295.34	1176 -	1186	1180.64	3.55E+01	9.64	2.35E+01	0.84
3	351.99	1400 -	1413	1406.99	7.95E+01	11.30	1.75E+01	1.00
4	583.08	2325 -	2339	2330.43	4.95E+01	8.45	7.50E+00	0.34
5	609.01	2427 -	2441	2434.09	6.41E+01	9.16	6.90E+00	0.53
6	1460.29	5828 -	5847	5839.10	1.67E+02	14.18	9.80E+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	0.95	1460.82 *	10.66	3.77E+00	3.59E-01
Tl-208	0.99	583.19 *	85.00	7.48E-02	1.35E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.65E-01	2.68E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.86E-01	2.89E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		

[225]

Analysis Report for 17-Dec-19-10011
L2-10214A-FIGS-005SS

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	1.52E-01	4.31E-02
351.93 *	35.60			2.01E-01	3.28E-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
K-40	0.956	3.77E+00	3.59E-01	
Tl-208	0.998	7.48E-02	1.35E-02	
X Bi-211	0.872			
Pb-212	0.996	1.65E-01	2.68E-02	
Bi-214	0.994	1.86E-01	2.89E-02	
Pb-214	0.999	1.83E-01	2.61E-02	

Analysis Report for 17-Dec-19-10011

L2-10214A-FIGS-005SS

- ? = 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 17-Dec-19-10011
L2-10214A-FIGS-005SS

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 9:18:38AM
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	4.94E-02	5.02E-02	5.02E-02
	BE-7	477.60	10.44	1.84E-01	3.94E-01	3.94E-01
+	K-40	1460.82	* 10.66	3.77E+00	5.10E-01	5.10E-01
	Mn-54	834.85	99.98	-2.44E-02	3.52E-02	3.52E-02
	Co-60	1173.23	99.85	3.50E-02	5.08E-02	5.83E-02
		1332.49	99.98	2.41E-02		5.08E-02
	Nb-94	702.65	99.81	-2.67E-02	3.31E-02	3.31E-02
		871.09	99.89	8.01E-03		3.62E-02
	Ag-108m	79.13	6.60	1.40E+00	3.56E-02	1.18E+00
		433.94	90.50	3.95E-03		3.56E-02
		614.28	89.80	4.52E-03		5.09E-02
		722.94	90.80	-9.61E-03		4.24E-02
	Sb-125	176.31	6.84	-1.04E-01	1.21E-01	3.61E-01
		380.45	1.52	1.40E+00		2.16E+00
		427.87	29.60	7.46E-02		1.21E-01
		463.36	10.49	2.74E-02		3.17E-01
		600.60	17.65	8.73E-02		1.81E-01
		606.71	4.98	1.51E+00		1.23E+00
		635.95	11.22	-6.78E-03		3.32E-01

Analysis Report for 17-Dec-19-10011

L2-10214A-FIGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	5.57E-01	1.21E-01	1.96E+00
Ba-133	79.61	2.65	2.45E+00	6.03E-02	2.85E+00
	81.00	32.90	-2.56E-01		1.79E-01
	276.40	7.16	1.28E-01		4.21E-01
	302.85	18.34	1.83E-02		1.67E-01
	356.01	62.05	-5.72E-02		6.03E-02
	383.85	8.94	-1.11E-01		3.56E-01
Cs-134	475.36	1.48	-2.83E-01	4.31E-02	2.51E+00
	563.25	8.34	-3.18E-01		3.74E-01
	569.33	15.37	1.12E-01		2.32E-01
	604.72	97.62	-1.93E-02		5.48E-02
	795.86	85.46	-4.64E-03		4.31E-02
	801.95	8.69	1.97E-01		4.05E-01
	1038.61	0.99	-2.63E+00		4.12E+00
	1167.97	1.79	-8.12E-01		2.97E+00
	1365.19	3.02	-4.16E-01		1.58E+00
Cs-137	661.66	85.10	2.72E-02	5.01E-02	5.01E-02
Eu-152	121.78	28.67	3.67E-03	9.70E-02	1.03E-01
	244.70	7.61	2.79E-01		4.48E-01
	295.94	0.45	5.32E+00		8.94E+00
	344.28	26.60	-5.03E-02		9.70E-02
	367.79	0.86	1.00E+00		3.45E+00
	411.12	2.24	2.27E-01		1.39E+00
	443.96	2.83	-4.82E-01		1.03E+00
	488.68	0.42	-4.53E+00		7.51E+00
	563.99	0.49	-1.24E+01		5.79E+00
	586.26	0.46	-1.82E+00		1.17E+01
	678.62	0.47	-8.61E-01		7.66E+00
	688.67	0.86	1.94E+00		4.50E+00
	719.35	0.28	-5.92E+00		1.14E+01
	778.90	12.96	-9.28E-02		2.08E-01
	810.45	0.32	3.56E+00		9.40E+00
	867.37	4.26	-8.67E-01		7.96E-01
	919.33	0.43	-1.38E+00		7.98E+00
	964.08	14.65	2.54E-02		4.19E-01
	1085.87	10.24	3.82E-01		4.65E-01
	1089.74	1.73	4.86E-02		2.82E+00
	1112.07	13.69	-1.38E-01		3.45E-01
	1212.95	1.43	-1.32E+00		3.34E+00
	1249.94	0.19	-2.59E+01		2.88E+01
	1299.14	1.63	-1.98E+00		2.82E+00
	1408.01	21.07	-1.04E-01		1.91E-01
	1457.64	0.50	8.40E+01		3.25E+01
	1528.10	0.28	7.94E+00		1.52E+01
Eu-154	123.07	40.40	-2.87E-02	6.98E-02	6.98E-02
	247.93	6.89	1.60E-01		4.10E-01
	591.76	4.95	-2.63E-01		5.29E-01
	692.42	1.78	-1.62E+00		1.74E+00
	723.30	20.06	-4.11E-03		1.92E-01
	756.80	4.52	2.35E-01		8.61E-01
	873.18	12.08	-4.70E-02		2.82E-01

Analysis Report for 17-Dec-19-10011
L2-10214A-FIGS-005SS

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.31E-02	6.98E-02	4.10E-01
	1004.76	18.01	6.97E-02		2.40E-01
	1274.43	34.80	2.10E-02		1.59E-01
	1596.48	1.80	-9.91E-01		2.10E+00
Eu-155	45.30	1.31	-9.21E-01	1.65E-01	9.41E+00
	60.01	1.22	-8.96E-01		1.11E+01
	86.55	30.70	8.14E-02		1.69E-01
	105.31	21.10	-3.17E-02		1.65E-01
Ra-226	186.21	3.64	4.47E-01	8.18E-01	8.18E-01
Pa-231	27.36	10.30	7.11E-01	1.14E+00	1.14E+00
	283.69	1.70	1.00E-01		1.71E+00
	300.07	2.47	1.38E-01		1.26E+00
	302.65	2.20	3.19E-01		1.39E+00
	330.06	1.40	3.55E-01		2.23E+00
	U-235	143.76	10.96		1.52E-01
	163.33	5.08	1.03E-01		5.29E-01
	185.71	57.20	1.93E-02		5.23E-02
	202.11	1.08	-6.69E-01		2.38E+00
	205.31	5.01	-4.68E-01		5.24E-01
Am-241	59.54	35.90	-1.12E-01	3.84E-01	3.84E-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

Analysis Report for 17-Dec-19-10001
L2-10214A-FIGS-001SB

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10001
Sample Description : L2-10214A-FIGS-001SB
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.520E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:10:00PM
Acquisition Started : 12/17/2019 8:23:43AM

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82213
Fill Height : 1519.62 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 8:38:45AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1530 [231] 12/17/19

Analysis Report for 17-Dec-19-10001
L2-10214A-FIGS-001SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.55	473 -	481	477.28	1.38E+02	19.90	1.18E+02	1.09
2	295.19	585 -	595	590.44	5.75E+01	15.01	6.95E+01	1.12
3	338.01	672 -	680	675.99	2.64E+01	11.60	5.06E+01	0.92
4	351.92	698 -	708	703.79	1.45E+02	15.79	4.39E+01	1.48
5	582.91	1159 -	1170	1165.42	6.85E+01	11.83	2.85E+01	1.01
6	609.14	1212 -	1223	1217.86	1.01E+02	12.81	2.54E+01	1.50
7	1460.28	2914 -	2927	2920.61	3.28E+02	18.86	1.03E+01	2.14

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	6.17E+00	4.45E-01
Tl-208	0.98	583.19 *	85.00	8.85E-02	1.62E-02
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	1.94E-01	3.20E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	2.50E-01	3.52E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

[232]

Analysis Report for 17-Dec-19-10001

L2-10214A-FIGS-001SB

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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			2.15E-01	5.88E-02
351.93 *	35.60			3.18E-01	4.30E-02
Ac-228	0.99	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	1.78E-01	7.95E-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				

* = 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 17-Dec-19-10001

L2-10214A-FIGS-001SB

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.954	6.17E+00	4.45E-01	
Tl-208	0.988	8.85E-02	1.62E-02	
X Bi-211	0.890			
Pb-212	0.999	1.94E-01	3.20E-02	
Bi-214	0.998	2.50E-01	3.52E-02	
Pb-214	1.000	2.83E-01	3.47E-02	
Ac-228	0.998	1.78E-01	7.95E-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 17-Dec-19-10001
L2-10214A-FIGS-001SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 8:38:45AM
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	7.81E-02	5.58E-02	5.58E-02
	BE-7	477.60	10.44	2.03E-02	3.12E-01	3.12E-01
+	K-40	1460.82	* 10.66	6.17E+00	3.93E-01	3.93E-01
	Mn-54	834.85	99.98	1.28E-02	4.23E-02	4.23E-02
	Co-60	1173.23	99.85	2.86E-02	3.78E-02	4.89E-02
		1332.49	99.98	-5.86E-02		3.78E-02
	Nb-94	702.65	99.81	-2.08E-03	3.88E-02	3.88E-02
		871.09	99.89	8.77E-03		4.03E-02
	Ag-108m	79.13	6.60	7.81E-01	4.02E-02	1.23E+00
		433.94	90.50	5.69E-03		4.02E-02
		614.28	89.80	6.12E-05		5.33E-02
		722.94	90.80	1.55E-02		4.51E-02
	Sb-125	176.31	6.84	-2.32E-01	1.00E-01	4.95E-01
		380.45	1.52	1.77E-01		2.29E+00
		427.87	29.60	-2.12E-02		1.00E-01
		463.36	10.49	2.04E-02		3.18E-01
		600.60	17.65	-1.11E-01		1.96E-01
		606.71	4.98	-1.46E-02		1.36E+00
		635.95	11.22	7.34E-03		3.74E-01

Analysis Report for 17-Dec-19-10001

L2-10214A-FIGS-001SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-7.90E-01	1.00E-01	1.99E+00
Ba-133	79.61	2.65	5.75E-01	7.65E-02	2.86E+00
	81.00	32.90	-3.17E-01		1.78E-01
	276.40	7.16	-8.93E-02		4.33E-01
	302.85	18.34	6.19E-03		1.74E-01
	356.01	62.05	-4.96E-02		7.65E-02
	383.85	8.94	-4.64E-03		3.91E-01
Cs-134	475.36	1.48	2.46E-01	5.29E-02	2.23E+00
	563.25	8.34	2.12E-01		4.37E-01
	569.33	15.37	-2.22E-02		2.17E-01
	604.72	97.62	-1.01E-02		6.15E-02
	795.86	85.46	2.50E-02		5.29E-02
	801.95	8.69	-6.26E-02		4.93E-01
	1038.61	0.99	1.73E+00		4.34E+00
	1167.97	1.79	6.30E-01		2.68E+00
	1365.19	3.02	5.02E-01		1.43E+00
Cs-137	661.66	85.10	6.06E-02	5.91E-02	5.91E-02
Eu-152	121.78	28.67	3.09E-02	1.19E-01	1.19E-01
	244.70	7.61	-1.60E-01		4.45E-01
	295.94	0.45	-7.72E-01		9.14E+00
	344.28	26.60	-8.38E-02		1.29E-01
	367.79	0.86	-1.38E+00		3.62E+00
	411.12	2.24	2.75E-01		1.53E+00
	443.96	2.83	-3.21E-01		1.11E+00
	488.68	0.42	2.41E+00		8.31E+00
	563.99	0.49	1.81E+00		7.26E+00
	586.26	0.46	-2.17E+00		1.31E+01
	678.62	0.47	2.46E+00		8.53E+00
	688.67	0.86	-8.36E-01		4.22E+00
	719.35	0.28	-1.80E+00		1.15E+01
	778.90	12.96	-1.05E-02		2.98E-01
	810.45	0.32	4.43E+00		1.25E+01
	867.37	4.26	-5.78E-01		8.64E-01
	919.33	0.43	-3.16E+00		9.29E+00
	964.08	14.65	1.99E-01		3.73E-01
	1085.87	10.24	-3.66E-01		3.91E-01
	1089.74	1.73	1.07E+00		2.69E+00
	1112.07	13.69	-4.88E-01		3.39E-01
	1212.95	1.43	-2.21E+00		3.87E+00
	1249.94	0.19	6.95E+00		2.82E+01
	1299.14	1.63	1.42E-01		2.64E+00
	1408.01	21.07	2.32E-03		2.21E-01
	1457.64	0.50	-5.08E+00		3.66E+01
	1528.10	0.28	-4.28E+00		9.18E+00
Eu-154	123.07	40.40	1.32E-02	8.24E-02	8.24E-02
	247.93	6.89	-1.10E-01		4.37E-01
	591.76	4.95	3.57E-01		8.54E-01
	692.42	1.78	6.31E-01		2.30E+00
	723.30	20.06	1.51E-01		2.16E-01
	756.80	4.52	-2.21E-01		7.45E-01
	873.18	12.08	-5.53E-02		3.06E-01

Analysis Report for 17-Dec-19-10001

L2-10214A-FIGS-001SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.88E-01	8.24E-02	4.40E-01
	1004.76	18.01	-1.21E-02		2.21E-01
	1274.43	34.80	-1.04E-01		1.30E-01
	1596.48	1.80	-1.85E+00		1.96E+00
Eu-155	45.30	1.31	-1.29E+00	1.86E-01	1.06E+01
	60.01	1.22	-1.02E+01		1.18E+01
	86.55	30.70	4.99E-02		1.86E-01
	105.31	21.10	6.67E-02		1.90E-01
Ra-226	186.21	3.64	8.12E-01	1.08E+00	1.08E+00
Pa-231	27.36	10.30	9.23E-01	1.26E+00	1.26E+00
	283.69	1.70	-4.25E-01		1.83E+00
	300.07	2.47	-7.55E-02		1.31E+00
	302.65	2.20	5.15E-02		1.45E+00
	330.06	1.40	-4.16E-01		2.41E+00
U-235	143.76	10.96	-3.79E-02	6.96E-02	2.88E-01
	163.33	5.08	-7.63E-01		6.37E-01
	185.71	57.20	5.92E-02		6.96E-02
	202.11	1.08	1.08E+00		3.23E+00
	205.31	5.01	-1.96E-01		6.78E-01
Am-241	59.54	35.90	-3.22E-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

Analysis Report for 21-Jan-20-10001
L2-10214A-FIGS-001SB

GAMMA SPECTRUM ANALYSIS

Sample Identification : 21-Jan-20-10001
Sample Description : L2-10214A-FIGS-001SB
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.520E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:10:00PM
Acquisition Started : 1/21/2020 10:12:21AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 324
Geometry : 130G_SOIL_1
Live Time : 1800.0 seconds
Real Time : 1802.0 seconds

Dead Time : 0.11 %

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 : 1/21/2020
Efficiency Calibration Description :

Sample Number : 82493
Fill Height : 1519.62 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/21/2020 10:42:26AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1500 1-21-20 [238]

Analysis Report for 21-Jan-20-10001
L2-10214A-FIGS-001SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.20	151 -	158	155.00	1.79E+02	27.88	2.93E+02	0.89
2	238.64	473 -	481	477.46	2.87E+02	30.17	2.80E+02	1.15
3	295.17	585 -	595	590.41	1.71E+02	21.99	1.30E+02	1.31
4	338.41	672 -	681	676.80	8.55E+01	18.48	1.13E+02	1.13
5	351.92	698 -	708	703.79	3.63E+02	24.26	9.49E+01	1.19
6	510.81	1015 -	1026	1021.31	9.91E+01	17.04	7.59E+01	1.22
7	583.08	1160 -	1170	1165.76	1.60E+02	16.12	4.15E+01	1.67
8	609.16	1213 -	1223	1217.89	2.73E+02	19.00	3.70E+01	1.48
9	911.21	1815 -	1826	1821.87	1.02E+02	14.12	3.89E+01	1.33
10	968.55	1933 -	1943	1936.57	4.59E+01	11.99	4.01E+01	1.26
11	1120.23	2236 -	2243	2240.00	4.20E+01	9.70	2.60E+01	1.17
12	1460.35	2913 -	2928	2920.75	7.31E+02	27.14	1.92E+00	1.96
13	1763.56	3521 -	3535	3527.96	5.86E+01	8.60	5.44E+00	2.36

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	7.95E-02	1.47E-02
K-40	0.96	1460.82 *	10.66	6.88E+00	3.93E-01
Tl-208	0.99	583.19 *	85.00	1.04E-01	1.21E-02
Pb-212	1.00	115.18	0.60		[239]

Analysis Report for 21-Jan-20-10001

L2-10214A-FIGS-001SB

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	1.00	238.63 *	43.60	2.02E-01	2.67E-02
		300.09	3.30		
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	5.83E-01	1.09E-01
		87.35	3.97		
		89.78	1.46		
Bi-214	0.97	609.32 *	45.49	3.39E-01	3.12E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29 *	14.92	2.36E-01	5.55E-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	4.42E-01	6.74E-02
		1847.43	2.03		
		2118.51	1.16		
Pb-214	1.00	241.99	7.25		
		295.22 *	18.42	3.20E-01	4.85E-02
		351.93 *	35.60	3.98E-01	4.15E-02
		785.96	1.06		
Pb214-XR	0.99	74.82	5.80		
		77.11 *	9.70	1.03E+00	1.98E-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	2.88E-01	6.66E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	2.91E-01	4.22E-02
		964.77	4.99		
		968.97 *	15.80	2.22E-01	5.89E-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 21-Jan-20-10001
L2-10214A-FIGS-001SB

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
An Pk	0.992	7.95E-02	1.47E-02	
K-40	0.964	6.88E+00	3.93E-01	
Tl-208	0.998	1.04E-01	1.21E-02	
X Bi-211	0.890			
Pb-212	1.000	2.02E-01	2.67E-02	
? Pb212-XR	0.999	5.83E-01	1.09E-01	
Bi-214	0.979	3.32E-01	2.52E-02	
Pb-214	1.000	3.65E-01	3.15E-02	
? Pb214-XR	0.999	1.03E+00	1.98E-01	
Ac-228	0.995	2.72E-01	3.05E-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 21-Jan-20-10001
L2-10214A-FIGS-001SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/21/2020 10:42:26AM
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	7.95E-02	4.00E-02	4.00E-02
	BE-7	477.60	10.44	-1.44E-01	3.49E-01	3.49E-01
+	K-40	1460.82	* 10.66	6.88E+00	1.03E-01	1.03E-01
	Mn-54	834.85	99.98	-6.93E-03	2.89E-02	2.89E-02
	Co-60	1173.23	99.85	9.94E-03	3.12E-02	3.82E-02
		1332.49	99.98	-4.13E-03		3.12E-02
	Nb-94	702.65	99.81	-1.33E-02	2.34E-02	2.39E-02
		871.09	99.89	-1.85E-02		2.34E-02
	Ag-108m	79.13	6.60	-3.55E-01	2.41E-02	8.24E-01
		433.94	90.50	2.55E-03		2.41E-02
		614.28	89.80	-3.45E-02		3.86E-02
		722.94	90.80	1.81E-03		3.47E-02
	Sb-125	176.31	6.84	-5.24E-02	7.76E-02	3.76E-01
		380.45	1.52	-5.39E-01		1.44E+00
		427.87	29.60	9.18E-03		7.76E-02
		463.36	10.49	6.53E-02		2.32E-01
		600.60	17.65	-6.75E-03		1.42E-01
		606.71	4.98	-3.17E-01		1.06E+00
		635.95	11.22	-5.75E-02		2.22E-01

Analysis Report for 21-Jan-20-10001

L2-10214A-FIGS-001SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.84E+00	7.76E-02	1.40E+00
Ba-133	79.61	2.65	-1.11E+00	5.87E-02	1.96E+00
	81.00	32.90	-2.21E-01		1.26E-01
	276.40	7.16	-4.24E-02		3.31E-01
	302.85	18.34	1.82E-03		1.25E-01
	356.01	62.05	-5.36E-02		5.87E-02
	383.85	8.94	-2.60E-02		2.56E-01
Cs-134	475.36	1.48	1.01E-01	3.54E-02	1.56E+00
	563.25	8.34	5.15E-02		3.05E-01
	569.33	15.37	3.52E-02		1.61E-01
	604.72	97.62	-1.63E-02		4.81E-02
	795.86	85.46	-1.35E-02		3.54E-02
	801.95	8.69	-7.04E-02		3.46E-01
	1038.61	0.99	-2.51E-01		2.84E+00
	1167.97	1.79	5.01E-01		2.26E+00
	1365.19	3.02	5.31E-02		7.96E-01
Cs-137	661.66	85.10	3.61E-02	4.19E-02	4.19E-02
Eu-152	121.78	28.67	6.81E-04	7.93E-02	8.69E-02
	244.70	7.61	1.62E-01		3.71E-01
	295.94	0.45	-5.61E-01		6.95E+00
	344.28	26.60	-6.52E-02		7.93E-02
	367.79	0.86	-9.71E-01		2.42E+00
	411.12	2.24	4.70E-01		1.05E+00
	443.96	2.83	2.36E-01		8.16E-01
	488.68	0.42	6.43E-01		5.92E+00
	563.99	0.49	6.32E-01		5.06E+00
	586.26	0.46	-4.00E+00		9.23E+00
	678.62	0.47	-8.84E-01		5.77E+00
	688.67	0.86	-5.36E-01		3.20E+00
	719.35	0.28	4.57E-01		9.36E+00
	778.90	12.96	-3.74E-02		2.14E-01
	810.45	0.32	4.21E+00		8.98E+00
	867.37	4.26	-3.39E-01		5.57E-01
	919.33	0.43	-2.57E+00		6.09E+00
	964.08	14.65	-1.71E-01		2.89E-01
	1085.87	10.24	-7.36E-02		3.16E-01
	1089.74	1.73	-7.77E-01		1.81E+00
	1112.07	13.69	-1.04E-01		2.42E-01
	1212.95	1.43	-2.22E-02		2.55E+00
	1249.94	0.19	-1.66E+01		1.81E+01
	1299.14	1.63	-1.43E+00		2.10E+00
	1408.01	21.07	1.08E-01		1.58E-01
	1457.64	0.50	-2.60E+00		2.67E+01
	1528.10	0.28	1.13E+00		8.16E+00
Eu-154	123.07	40.40	1.35E-02	6.25E-02	6.25E-02
	247.93	6.89	2.94E-02		3.43E-01
	591.76	4.95	3.31E-01		5.43E-01
	692.42	1.78	6.27E-01		1.55E+00
	723.30	20.06	7.31E-02		1.63E-01
	756.80	4.52	-2.48E-01		5.63E-01
	873.18	12.08	8.45E-02		2.09E-01

Analysis Report for 21-Jan-20-10001
L2-10214A-FIGS-001SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-5.39E-02	6.25E-02	2.95E-01
	1004.76	18.01	-1.11E-02		1.71E-01
	1274.43	34.80	-1.42E-01		9.06E-02
	1596.48	1.80	4.51E-01		1.46E+00
Eu-155	45.30	1.31	1.74E+00	1.35E-01	8.53E+00
	60.01	1.22	-1.95E+00		9.12E+00
	86.55	30.70	6.58E-02		1.35E-01
Ra-226	105.31	21.10	3.47E-02	7.76E-01	1.36E-01
Ra-226	186.21	3.64	8.47E-01	7.76E-01	7.76E-01
	Pa-231	27.36	10.30		6.92E-01
Pa-231	283.69	1.70	1.87E-01	8.12E-01	1.35E+00
	300.07	2.47	1.55E-01		9.17E-01
	302.65	2.20	1.51E-02		1.03E+00
	330.06	1.40	-6.88E-01		1.72E+00
	U-235	143.76	10.96		-5.91E-02
U-235	163.33	5.08	-2.14E-01	4.95E-02	4.84E-01
	185.71	57.20	5.91E-02		4.95E-02
	202.11	1.08	4.68E-02		2.23E+00
	205.31	5.01	-2.50E-01		5.01E-01
Am-241	59.54	35.90	1.29E-02	3.17E-01	3.17E-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

Analysis Report for 17-Dec-19-10002
L2-10214A-FIGS-002SB

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10002
Sample Description : L2-10214A-FIGS-002SB
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.397E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 1:20:00PM
Acquisition Started : 12/17/2019 8:23:53AM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : P40818B
Geometry : 130G_SOIL_1
Live Time : 900.0 seconds
Real Time : 901.2 seconds

Dead Time : 0.14 %

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82214
Fill Height : 1396.94 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2012 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 8:39:00AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 [245] 12/17/19

Analysis Report for 17-Dec-19-10002
L2-10214A-FIGS-002SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.54	947 -	960	954.27	1.11E+02	16.75	6.13E+01	0.69
2	351.83	1400 -	1413	1407.06	8.95E+01	11.73	1.75E+01	0.97
3	582.93	2326 -	2336	2330.92	3.04E+01	7.18	8.55E+00	0.40
4	609.05	2430 -	2441	2435.36	4.36E+01	8.78	1.34E+01	0.63
5	910.52	3635 -	3649	3641.06	4.43E+01	7.42	3.75E+00	0.56
6	1460.02	5829 -	5850	5839.93	2.23E+02	15.59	5.50E+00	1.22

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	0.90	1460.82 *	10.66	5.71E+00	4.71E-01
Tl-208	0.98	583.19 *	85.00	5.21E-02	1.27E-02
Bi-211	0.91	351.07 *	13.02	7.00E-01	1.08E-01
Pb-212	0.99	115.18	0.60		
		238.63 *	43.60	2.02E-01	3.46E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.44E-01	3.02E-02
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		

[246]

Analysis Report for 17-Dec-19-10002

L2-10214A-FIGS-002SB

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Bi-214	0.99	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			2.56E-01	3.93E-02
785.96	1.06				
Ac-228	0.97	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	3.38E-01	5.86E-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 17-Dec-19-10002
 L2-10214A-FIGS-002SB

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
K-40	0.903	5.71E+00	4.71E-01	
Tl-208	0.989	5.21E-02	1.27E-02	
? Bi-211	0.912	7.00E-01	1.08E-01	
Pb-212	0.999	2.02E-01	3.46E-02	
Bi-214	0.995	1.44E-01	3.02E-02	
? Pb-214	0.512	2.56E-01	3.93E-02	
Ac-228	0.978	3.38E-01	5.86E-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 17-Dec-19-10002
L2-10214A-FIGS-002SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 8:39:00AM
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	6.22E-02	6.02E-02	6.02E-02
	BE-7	477.60	10.44	1.88E-02	4.02E-01	4.02E-01
+	K-40	1460.82	* 10.66	5.71E+00	4.69E-01	4.69E-01
	Mn-54	834.85	99.98	-1.07E-02	4.72E-02	4.72E-02
	Co-60	1173.23	99.85	1.33E-02	5.47E-02	6.18E-02
		1332.49	99.98	2.27E-02		5.47E-02
	Nb-94	702.65	99.81	7.82E-03	4.82E-02	4.82E-02
		871.09	99.89	1.55E-03		5.04E-02
	Ag-108m	79.13	6.60	7.03E-01	4.49E-02	1.92E+00
		433.94	90.50	4.24E-03		4.49E-02
		614.28	89.80	-6.99E-02		5.94E-02
		722.94	90.80	1.95E-02		5.49E-02
	Sb-125	176.31	6.84	1.46E-02	1.34E-01	5.39E-01
		380.45	1.52	8.45E-01		2.71E+00
		427.87	29.60	4.74E-02		1.34E-01
		463.36	10.49	1.32E-01		4.35E-01
		600.60	17.65	-5.26E-02		2.18E-01
		606.71	4.98	1.21E+00		1.34E+00
		635.95	11.22	3.72E-01		3.83E-01

Analysis Report for 17-Dec-19-10002

L2-10214A-FIGS-002SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	2.03E+00	1.34E-01	2.49E+00
Ba-133	79.61	2.65	1.75E+00	7.40E-02	4.59E+00
	81.00	32.90	-2.17E-01		3.05E-01
	276.40	7.16	2.76E-01		5.35E-01
	302.85	18.34	8.06E-02		2.28E-01
	356.01	62.05	-7.76E-02		7.40E-02
	383.85	8.94	7.06E-02		4.63E-01
Cs-134	475.36	1.48	-4.64E-01	5.75E-02	2.45E+00
	563.25	8.34	7.56E-02		4.81E-01
	569.33	15.37	1.37E-02		2.87E-01
	604.72	97.62	-6.52E-02		6.44E-02
	795.86	85.46	2.20E-02		5.75E-02
	801.95	8.69	1.34E-01		5.17E-01
	1038.61	0.99	2.02E+00		4.54E+00
	1167.97	1.79	-1.35E+00		3.17E+00
	1365.19	3.02	-2.85E-01		1.42E+00
Cs-137	661.66	85.10	3.45E-02	5.67E-02	5.67E-02
Eu-152	121.78	28.67	-1.44E-02	1.60E-01	1.60E-01
	244.70	7.61	4.37E-01		5.91E-01
	295.94	0.45	4.88E-01		1.06E+01
	344.28	26.60	3.13E-02		1.62E-01
	367.79	0.86	1.71E+00		4.23E+00
	411.12	2.24	1.35E+00		2.10E+00
	443.96	2.83	4.50E-02		1.44E+00
	488.68	0.42	-5.05E+00		9.69E+00
	563.99	0.49	8.26E-02		8.17E+00
	586.26	0.46	-4.74E+00		1.22E+01
	678.62	0.47	7.28E+00		9.35E+00
	688.67	0.86	-1.76E+00		4.62E+00
	719.35	0.28	-7.67E+00		1.40E+01
	778.90	12.96	5.47E-04		3.67E-01
	810.45	0.32	8.93E+00		1.55E+01
	867.37	4.26	2.47E-01		1.13E+00
	919.33	0.43	1.74E+00		9.96E+00
	964.08	14.65	2.80E-01		4.54E-01
	1085.87	10.24	-2.56E-01		5.83E-01
	1089.74	1.73	-4.37E+00		3.46E+00
	1112.07	13.69	-6.87E-03		4.35E-01
	1212.95	1.43	-9.29E-01		4.74E+00
	1249.94	0.19	-7.28E+00		3.28E+01
	1299.14	1.63	-2.72E+00		2.40E+00
	1408.01	21.07	1.39E-01		2.37E-01
	1457.64	0.50	1.22E+02		4.17E+01
	1528.10	0.28	1.88E-01		1.25E+01
Eu-154	123.07	40.40	7.08E-02	1.15E-01	1.15E-01
	247.93	6.89	-4.32E-01		5.22E-01
	591.76	4.95	-1.22E-01		7.53E-01
	692.42	1.78	-1.02E+00		2.43E+00
	723.30	20.06	7.11E-02		2.52E-01
	756.80	4.52	6.14E-01		1.14E+00
	873.18	12.08	-1.55E-01		4.02E-01

Analysis Report for 17-Dec-19-10002
L2-10214A-FIGS-002SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	1.51E-01	1.15E-01	4.54E-01
	1004.76	18.01	-1.33E-01		2.44E-01
	1274.43	34.80	4.07E-02		1.73E-01
	1596.48	1.80	1.31E+00		2.68E+00
Eu-155	45.30	1.31	-5.60E+00	2.59E-01	3.05E+01
	60.01	1.22	1.29E+00		2.95E+01
	86.55	30.70	2.79E-02		2.59E-01
	105.31	21.10	-6.81E-02		2.74E-01
Ra-226	186.21	3.64	7.10E-01	1.14E+00	1.14E+00
Pa-231	27.36	10.30	-4.00E-01	1.68E+00	3.21E+00
	283.69	1.70	-6.23E-01		1.92E+00
	300.07	2.47	-6.25E-01		1.68E+00
	302.65	2.20	1.87E+00		1.95E+00
	330.06	1.40	3.01E-01		3.02E+00
U-235	143.76	10.96	-2.55E-01	7.28E-02	3.92E-01
	163.33	5.08	1.72E-01		8.17E-01
	185.71	57.20	5.03E-02		7.28E-02
	202.11	1.08	-7.94E-01		3.72E+00
	205.31	5.01	-1.24E-01		8.04E-01
Am-241	59.54	35.90	1.53E-02	1.05E+00	1.05E+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

Analysis Report for 17-Dec-19-10003
L2-10214A-FIGS-003SB

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10003
Sample Description : L2-10214A-FIGS-003SB
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.585E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 2:50:00PM
Acquisition Started : 12/17/2019 8:24:00AM

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 : 11/4/2019
Efficiency Calibration Used Done On : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82215
Fill Height : 1585.40 gram
Certificate Name : Eu155-Na22
Certificate Date : 12/22/2008 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 8:39:17AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 [252] 12-17-19

Analysis Report for 17-Dec-19-10003
L2-10214A-FIGS-003SB

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.96	295 -	316	300.38	7.66E+01	28.59	1.44E+02	0.81
m	2	77.32	295 -	316	309.82	1.36E+02	48.27	1.58E+02	0.82
	3	186.15	739 -	750	744.48	7.45E+01	19.09	1.15E+02	0.77
M	4	238.83	948 -	975	954.90	3.12E+02	18.01	8.54E+01	1.22
m	5	241.90	948 -	975	967.15	1.05E+02	11.54	9.10E+01	1.22
	6	295.43	1172 -	1188	1180.99	1.81E+02	19.87	6.63E+01	1.03
	7	328.18	1308 -	1316	1311.84	1.98E+01	9.20	3.02E+01	0.55
	8	338.36	1346 -	1359	1352.54	7.70E+01	13.17	3.50E+01	1.16
	9	352.03	1398 -	1416	1407.13	3.53E+02	22.07	4.03E+01	0.93
	10	510.96	2034 -	2047	2042.19	5.17E+01	12.19	3.43E+01	0.78
	11	583.22	2323 -	2339	2330.98	9.39E+01	13.55	2.81E+01	1.11
	12	609.14	2428 -	2444	2434.59	2.53E+02	18.07	2.38E+01	1.50
	13	911.05	3634 -	3650	3641.64	8.54E+01	11.45	1.46E+01	0.88
	14	968.56	3866 -	3880	3871.64	4.54E+01	8.72	1.06E+01	1.05
	15	1377.71	5503 -	5514	5508.59	1.30E+01	5.98	9.00E+00	0.61
	16	1460.32	5827 -	5850	5839.21	2.79E+02	17.05	2.97E+00	2.05
	17	1763.93	7047 -	7063	7054.77	5.07E+01	7.64	2.28E+00	0.80

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
					[253]

Analysis Report for 17-Dec-19-10003

L2-10214A-FIGS-003SB

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
An Pk	1.00	511.00	*	100.00	6.06E-02	1.49E-02
K-40	0.96	1460.82	*	10.66	6.20E+00	4.65E-01
Tl-208	1.00	583.19	*	85.00	1.40E-01	2.19E-02
Pb-212	0.99	115.18		0.60		
		238.63	*	43.60	4.92E-01	4.89E-02
		300.09		3.30		
Pb212-XR	0.99	74.82	*	10.28	9.74E-01	3.77E-01
		77.11	*	17.10	9.55E-01	3.52E-01
		87.35		3.97		
		89.78		1.46		
Bi-214	0.78	609.32	*	45.49	7.27E-01	6.79E-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	7.38E-01	3.41E-01
		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	9.08E-01	1.41E-01
		1847.43		2.03		
		2118.51		1.16		
Pb-214	0.99	241.99	*	7.25	1.00E+00	1.36E-01
		295.22	*	18.42	7.67E-01	1.04E-01
		351.93	*	35.60	8.82E-01	8.96E-02
		785.96		1.06		
Ra-226	0.99	186.21	*	3.64	1.24E+00	3.32E-01
Ac-228	0.99	129.07		2.42		
		209.25		3.89		
		270.24		3.46		
		328.00	*	2.95	5.67E-01	2.68E-01
		338.32	*	11.27	5.90E-01	1.12E-01
		409.46		1.92		
		463.00		4.40		
		794.95		4.25		
		911.20	*	25.80	5.69E-01	8.00E-02
		964.77		4.99		
		968.97	*	15.80	5.15E-01	1.01E-01
		1588.20		3.22		
U-235	0.97	143.76		10.96		
		163.33		5.08		
		185.71	*	57.20	7.87E-02	2.12E-02
		202.11		1.08		
		205.31		5.01		

Analysis Report for 17-Dec-19-10003
L2-10214A-FIGS-003SB

* = 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	1.000	6.06E-02	1.49E-02	
	K-40	0.960	6.20E+00	4.65E-01	
	Tl-208	1.000	1.40E-01	2.19E-02	
X	Bi-211	0.863			
	Pb-212	0.994	4.92E-01	4.89E-02	
	Pb212-XR	0.995	9.64E-01	2.57E-01	
	Bi-214	0.789	7.60E-01	6.02E-02	
	Pb-214	0.997	8.67E-01	6.08E-02	
X	Pb214-XR	0.995			
?	Ra-226	0.999	1.24E+00	3.32E-01	
	Ac-228	0.993	5.59E-01	5.37E-02	
?	U-235	0.978	7.87E-02	2.12E-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 17-Dec-19-10003
L2-10214A-FIGS-003SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 8:39:17AM
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	6.06E-02	4.25E-02	4.25E-02
	BE-7	477.60	10.44	1.31E-01	4.45E-01	4.45E-01
+	K-40	1460.82	* 10.66	6.20E+00	3.23E-01	3.23E-01
	Mn-54	834.85	99.98	3.00E-03	5.13E-02	5.13E-02
	Co-60	1173.23	99.85	-5.08E-04	4.15E-02	6.36E-02
		1332.49	99.98	-3.02E-02		4.15E-02
	Nb-94	702.65	99.81	5.11E-03	5.07E-02	5.64E-02
		871.09	99.89	1.22E-02		5.07E-02
	Ag-108m	79.13	6.60	3.15E-01	4.98E-02	1.69E+00
		433.94	90.50	8.48E-03		4.98E-02
		614.28	89.80	-1.13E-02		8.73E-02
		722.94	90.80	-3.31E-04		6.22E-02
	Sb-125	176.31	6.84	2.63E-01	1.57E-01	6.10E-01
		380.45	1.52	-6.03E-01		2.78E+00
		427.87	29.60	5.76E-02		1.57E-01
		463.36	10.49	3.43E-01		4.79E-01
		600.60	17.65	-8.19E-02		2.35E-01
		606.71	4.98	-1.10E+00		2.24E+00
		635.95	11.22	-3.13E-02		3.80E-01

Analysis Report for 17-Dec-19-10003

L2-10214A-FIGS-003SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.94E+00	1.57E-01	2.56E+00
Ba-133	79.61	2.65	1.00E+00	1.05E-01	4.13E+00
	81.00	32.90	-1.18E-01		2.49E-01
	276.40	7.16	2.47E-01		5.70E-01
	302.85	18.34	-8.30E-03		2.42E-01
	356.01	62.05	2.65E-02		1.05E-01
	383.85	8.94	2.15E-02		4.85E-01
Cs-134	475.36	1.48	-8.93E-01	6.23E-02	3.06E+00
	563.25	8.34	-2.91E-01		6.57E-01
	569.33	15.37	5.64E-02		3.20E-01
	604.72	97.62	-9.17E-02		9.49E-02
	795.86	85.46	-1.18E-03		6.23E-02
	801.95	8.69	-4.08E-01		5.95E-01
	1038.61	0.99	-8.64E-01		5.85E+00
	1167.97	1.79	-1.14E+00		3.20E+00
	1365.19	3.02	-9.32E-02		1.73E+00
Cs-137	661.66	85.10	5.06E-02	6.56E-02	6.56E-02
Eu-152	121.78	28.67	-9.77E-03	1.50E-01	1.50E-01
	244.70	7.61	-2.57E-01		7.05E-01
	295.94	0.45	1.77E+01		1.46E+01
	344.28	26.60	7.88E-02		1.80E-01
	367.79	0.86	3.84E+00		5.37E+00
	411.12	2.24	3.12E-01		1.95E+00
	443.96	2.83	-2.07E-01		1.44E+00
	488.68	0.42	1.55E+00		1.02E+01
	563.99	0.49	-9.62E+00		1.06E+01
	586.26	0.46	2.10E+00		1.75E+01
	678.62	0.47	-5.78E+00		9.20E+00
	688.67	0.86	4.23E-01		5.56E+00
	719.35	0.28	1.01E+01		1.93E+01
	778.90	12.96	-1.29E-01		4.04E-01
	810.45	0.32	1.38E+01		1.85E+01
	867.37	4.26	5.71E-01		1.20E+00
	919.33	0.43	-1.92E+00		1.16E+01
	964.08	14.65	-9.14E-03		5.48E-01
	1085.87	10.24	1.81E-01		6.19E-01
	1089.74	1.73	6.08E-01		3.76E+00
	1112.07	13.69	-1.21E+00		4.86E-01
	1212.95	1.43	1.47E+00		4.78E+00
	1249.94	0.19	1.92E+01		3.50E+01
	1299.14	1.63	1.19E+00		3.78E+00
	1408.01	21.07	-7.06E-02		2.60E-01
	1457.64	0.50	1.31E+02		3.96E+01
	1528.10	0.28	1.13E+01		1.75E+01
Eu-154	123.07	40.40	3.82E-02	1.11E-01	1.11E-01
	247.93	6.89	-4.44E-01		5.68E-01
	591.76	4.95	-2.10E-01		1.01E+00
	692.42	1.78	1.21E+00		2.64E+00
	723.30	20.06	-2.91E-02		2.84E-01
	756.80	4.52	2.13E-01		1.22E+00
	873.18	12.08	3.19E-01		4.58E-01

Analysis Report for 17-Dec-19-10003
L2-10214A-FIGS-003SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	3.75E-01	1.11E-01	5.65E-01
	1004.76	18.01	2.31E-02		3.10E-01
	1274.43	34.80	-1.94E-01		1.90E-01
	1596.48	1.80	-2.74E+00		3.11E+00
Eu-155	45.30	1.31	2.38E+00	2.49E-01	1.53E+01
	60.01	1.22	-2.70E+00		1.72E+01
	86.55	30.70	6.41E-03		2.49E-01
	105.31	21.10	7.61E-02		2.63E-01
+ Ra-226	186.21	* 3.64	1.24E+00	1.01E+00	1.01E+00
Pa-231	27.36	10.30	1.17E+00	1.73E+00	1.73E+00
	283.69	1.70	1.08E+00		2.40E+00
	300.07	2.47	1.13E+00		1.87E+00
	302.65	2.20	-7.85E-01		2.01E+00
	330.06	1.40	2.70E+00		3.40E+00
+ U-235	143.76	10.96	3.40E-01	6.41E-02	4.45E-01
	163.33	5.08	-1.33E-01		8.43E-01
	185.71	* 57.20	7.87E-02		6.41E-02
	202.11	1.08	1.44E+00		4.06E+00
	205.31	5.01	-9.21E-01		8.35E-01
Am-241	59.54	35.90	2.44E-01	6.08E-01	6.08E-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

Analysis Report for 17-Dec-19-10004
L2-10214A-FIGS-004SB

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10004
Sample Description : L2-10214A-FIGS-004SB
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.555E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 2:55:00PM
Acquisition Started : 12/17/2019 8:24:07AM

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 : 11/4/2019
Efficiency Calibration Used Done On : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82216
Fill Height : 1554.65 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/7/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 8:39:15AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 8192


Data Validated
1530 12-17-19

Analysis Report for 17-Dec-19-10004

L2-10214A-FIGS-004SB

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.85	295 -	315	300.73	5.56E+01	10.47	9.51E+01	0.97
m	2	77.14	295 -	315	309.87	6.45E+01	10.56	9.52E+01	0.97
	3	185.85	739 -	752	744.11	8.16E+01	17.68	8.34E+01	0.93
M	4	238.65	947 -	973	955.06	2.33E+02	15.94	6.64E+01	1.12
m	5	241.77	947 -	973	967.55	4.56E+01	9.11	7.02E+01	1.12
	6	295.28	1176 -	1188	1181.34	1.36E+02	15.10	3.44E+01	1.62
	7	338.30	1349 -	1359	1353.23	1.89E+01	10.25	3.51E+01	0.38
	8	351.92	1398 -	1414	1407.67	2.40E+02	18.10	2.78E+01	0.87
	9	583.12	2324 -	2341	2331.79	6.86E+01	10.90	1.54E+01	1.00
	10	609.26	2427 -	2445	2436.29	1.67E+02	14.64	1.40E+01	1.33
	11	768.29	3067 -	3078	3072.23	1.89E+01	6.34	8.15E+00	0.82
	12	911.15	3635 -	3650	3643.63	5.61E+01	9.26	9.89E+00	1.32
	13	1120.52	4476 -	4489	4481.38	3.75E+01	7.80	8.48E+00	0.58
	14	1460.88	5832 -	5855	5843.89	2.58E+02	18.02	1.70E+01	1.70
	15	1764.49	7054 -	7067	7060.02	3.45E+01	6.66	3.50E+00	0.48

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	5.38E+00
Tl-208	0.99	583.19	*	85.00	9.77E-02

4.42E-01
1.66E-02^[260]

Analysis Report for 17-Dec-19-10004

L2-10214A-FIGS-004SB

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	3.64E-01	3.85E-02
		300.09	3.30		
Pb212-XR	1.00	74.82 *	10.28	9.62E-01	2.06E-01
		77.11 *	17.10	5.99E-01	1.16E-01
		87.35	3.97		
Bi-214	0.99	89.78	1.46		
		609.32 *	45.49	4.58E-01	4.86E-02
		768.36 *	4.89	5.59E-01	1.91E-01
		806.18	1.26		
		934.06	3.11		
		1120.29 *	14.92	4.67E-01	9.89E-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	5.77E-01	1.14E-01		
1847.43	2.03				
2118.51	1.16				
Pb-214	0.99	241.99 *	7.25	4.31E-01	9.28E-02
		295.22 *	18.42	5.63E-01	7.72E-02
		351.93 *	35.60	5.83E-01	6.41E-02
		785.96	1.06		
Ra-226	0.97	186.21 *	3.64	1.37E+00	3.16E-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	1.41E-01	7.73E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	3.53E-01	6.02E-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	8.69E-02	2.01E-02
		202.11	1.08		
		205.31	5.01		

Analysis Report for 17-Dec-19-10004

L2-10214A-FIGS-004SB

* = 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	0.999	5.38E+00	4.42E-01	
	Tl-208	0.999	9.77E-02	1.66E-02	
X	Bi-211	0.891			
	Pb-212	1.000	3.64E-01	3.85E-02	
	Pb212-XR	1.000	6.86E-01	1.01E-01	
	Bi-214	0.999	4.78E-01	3.98E-02	
	Pb-214	0.999	5.43E-01	4.35E-02	
X	Pb214-XR	1.000			
?	Ra-226	0.979	1.37E+00	3.16E-01	
	Ac-228	1.000	2.73E-01	4.75E-02	
?	U-235	0.998	8.69E-02	2.01E-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 17-Dec-19-10004
L2-10214A-FIGS-004SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 8:39:15AM
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	6.00E-02	5.70E-02	5.70E-02
	BE-7	477.60	10.44	-7.26E-02	4.08E-01	4.08E-01
+	K-40	1460.82	* 10.66	5.38E+00	6.38E-01	6.38E-01
	Mn-54	834.85	99.98	-1.06E-02	4.73E-02	4.73E-02
	Co-60	1173.23	99.85	4.78E-03	5.37E-02	5.58E-02
		1332.49	99.98	1.82E-02		5.37E-02
	Nb-94	702.65	99.81	-2.07E-02	4.86E-02	4.91E-02
		871.09	99.89	-3.27E-02		4.86E-02
	Ag-108m	79.13	6.60	-9.25E-01	3.94E-02	1.67E+00
		433.94	90.50	-1.86E-02		3.94E-02
		614.28	89.80	6.19E-03		9.51E-02
		722.94	90.80	-1.01E-02		6.06E-02
	Sb-125	176.31	6.84	4.16E-02	1.26E-01	5.77E-01
		380.45	1.52	-1.25E+00		2.62E+00
		427.87	29.60	-7.81E-02		1.26E-01
		463.36	10.49	-3.34E-01		4.41E-01
		600.60	17.65	9.30E-02		2.43E-01
		606.71	4.98	3.89E+00		1.80E+00
		635.95	11.22	-1.02E-02		3.93E-01

Analysis Report for 17-Dec-19-10004

L2-10214A-FIGS-004SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-1.76E+00	1.26E-01	2.58E+00
Ba-133	79.61	2.65	-2.96E+00	1.06E-01	4.09E+00
	81.00	32.90	-1.55E-01		2.79E-01
	276.40	7.16	4.66E-01		6.20E-01
	302.85	18.34	6.61E-02		2.27E-01
	356.01	62.05	-3.56E-02		1.06E-01
	383.85	8.94	-1.33E-01		4.50E-01
Cs-134	475.36	1.48	-1.80E+00	5.58E-02	2.82E+00
	563.25	8.34	-9.41E-02		4.93E-01
	569.33	15.37	-4.26E-02		2.75E-01
	604.72	97.62	1.08E-02		8.48E-02
	795.86	85.46	1.04E-02		5.58E-02
	801.95	8.69	-7.01E-03		5.58E-01
	1038.61	0.99	1.62E+00		5.05E+00
	1167.97	1.79	-6.50E-01		3.01E+00
	1365.19	3.02	-4.64E-01		1.55E+00
Cs-137	661.66	85.10	6.19E-03	5.64E-02	5.64E-02
Eu-152	121.78	28.67	3.11E-02	1.47E-01	1.69E-01
	244.70	7.61	5.31E-02		6.19E-01
	295.94	0.45	1.22E+01		1.32E+01
	344.28	26.60	4.43E-02		1.47E-01
	367.79	0.86	-8.58E-01		4.47E+00
	411.12	2.24	-6.07E-01		1.86E+00
	443.96	2.83	7.38E-01		1.36E+00
	488.68	0.42	1.73E+00		1.01E+01
	563.99	0.49	7.52E+00		8.63E+00
	586.26	0.46	6.44E-01		1.39E+01
	678.62	0.47	1.27E+00		9.94E+00
	688.67	0.86	1.74E+00		4.79E+00
	719.35	0.28	-1.03E+00		1.78E+01
	778.90	12.96	-8.95E-02		3.44E-01
	810.45	0.32	-9.43E+00		1.34E+01
	867.37	4.26	-1.16E+00		1.15E+00
	919.33	0.43	-2.01E+01		1.19E+01
	964.08	14.65	1.78E-02		4.92E-01
	1085.87	10.24	-2.00E-01		4.94E-01
	1089.74	1.73	1.21E+00		3.12E+00
	1112.07	13.69	-2.67E-01		4.05E-01
	1212.95	1.43	4.08E+00		5.08E+00
	1249.94	0.19	-3.03E+01		3.21E+01
	1299.14	1.63	-1.85E-01		3.49E+00
	1408.01	21.07	7.44E-02		2.85E-01
	1457.64	0.50	1.16E+02		3.74E+01
	1528.10	0.28	-4.45E+00		1.19E+01
Eu-154	123.07	40.40	1.08E-01	1.20E-01	1.20E-01
	247.93	6.89	-6.91E-02		5.70E-01
	591.76	4.95	2.60E-01		7.82E-01
	692.42	1.78	1.19E+00		2.62E+00
	723.30	20.06	1.73E-01		2.83E-01
	756.80	4.52	1.12E+00		1.14E+00
	873.18	12.08	-3.51E-02		4.29E-01

Analysis Report for 17-Dec-19-10004

L2-10214A-FIGS-004SB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Eu-154	996.29	10.48	1.89E-01	1.20E-01	4.08E-01
		1004.76	18.01	1.57E-01		2.76E-01
		1274.43	34.80	-7.24E-03		1.64E-01
		1596.48	1.80	-9.04E-02		3.14E+00
	Eu-155	45.30	1.31	-6.93E+00	2.37E-01	2.16E+01
		60.01	1.22	-1.09E+01		2.46E+01
		86.55	30.70	5.54E-02		2.75E-01
		105.31	21.10	4.56E-03		2.37E-01
+	Ra-226	186.21	* 3.64	1.37E+00	9.11E-01	9.11E-01
	Pa-231	27.36	10.30	1.52E+00	1.94E+00	2.47E+00
		283.69	1.70	-4.47E-01		2.49E+00
		300.07	2.47	6.15E-01		1.96E+00
		302.65	2.20	1.83E+00		1.94E+00
		330.06	1.40	1.05E+00		2.88E+00
+	U-235	143.76	10.96	-4.30E-02	5.80E-02	3.92E-01
		163.33	5.08	7.47E-01		8.25E-01
		185.71	* 57.20	8.69E-02		5.80E-02
		202.11	1.08	-1.79E+00		3.84E+00
		205.31	5.01	-1.09E-01		8.59E-01
	Am-241	59.54	35.90	-3.85E-01	8.67E-01	8.67E-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

Analysis Report for 17-Dec-19-10005
L2-10214A-FIGS-005SB

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10005
Sample Description : L2-10214A-FIGS-005SB
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.584E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 3:05:00PM
Acquisition Started : 12/17/2019 8:43:20AM

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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82217
Fill Height : 1583.93 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 8:58:23AM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1530 [266] 12-17-19

Analysis Report for 17-Dec-19-10005
L2-10214A-FIGS-005SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	238.62	472 -	480	477.43	1.50E+02	19.23	1.02E+02	1.14
2	295.11	587 -	594	590.28	5.67E+01	12.20	4.43E+01	1.23
3	338.28	671 -	680	676.52	4.23E+01	11.30	3.67E+01	1.16
4	351.74	698 -	708	703.42	1.31E+02	14.73	3.63E+01	1.28
5	583.16	1162 -	1170	1165.93	5.73E+01	10.19	2.17E+01	1.30
6	609.18	1213 -	1222	1217.94	7.19E+01	11.34	2.51E+01	1.32
7	910.80	1816 -	1827	1821.05	7.36E+01	9.32	5.38E+00	1.44
8	968.62	1933 -	1943	1936.70	3.87E+01	7.03	4.34E+00	1.85
9	1460.37	2913 -	2928	2920.79	3.02E+02	18.23	1.01E+01	2.01

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	5.62E+00	4.18E-01
Tl-208	1.00	583.19 *	85.00	7.33E-02	1.38E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	2.09E-01	3.17E-02
		300.09	3.30		
Bi-214	0.99	609.32 *	45.49	1.77E-01	2.99E-02
		768.36	4.89		
		806.18	1.26		

[267]

Analysis Report for 17-Dec-19-10005

L2-10214A-FIGS-005SB

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	2.11E-01	4.84E-02
		351.93 *	35.60	2.84E-01	3.93E-02
Ac-228	0.98	785.96	1.06		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	2.83E-01	7.90E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	4.16E-01	5.57E-02
		964.77	4.99		
968.97 *	15.80	3.71E-01	6.94E-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

INTERFERENCE CORRECTED REPORT

Analysis Report for 17-Dec-19-10005

L2-10214A-FIGS-005SB

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/grams)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>	
	K-40	0.967	5.62E+00	4.18E-01	
	Tl-208	1.000	7.33E-02	1.38E-02	
X	Bi-211	0.931			
	Pb-212	1.000	2.09E-01	3.17E-02	
	Bi-214	0.999	1.77E-01	2.99E-02	
	Pb-214	0.996	2.55E-01	3.05E-02	
	Ac-228	0.988	3.71E-01	3.81E-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 17-Dec-19-10005
L2-10214A-FIGS-005SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 8:58:23AM
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	4.59E-02	4.87E-02	4.87E-02
	BE-7	477.60	10.44	1.92E-01	3.23E-01	3.23E-01
+	K-40	1460.82	* 10.66	5.62E+00	4.02E-01	4.02E-01
	Mn-54	834.85	99.98	-8.26E-03	4.13E-02	4.13E-02
	Co-60	1173.23	99.85	1.67E-02	5.07E-02	5.14E-02
		1332.49	99.98	4.29E-02		5.07E-02
	Nb-94	702.65	99.81	1.43E-02	3.20E-02	3.69E-02
		871.09	99.89	-4.01E-03		3.20E-02
	Ag-108m	79.13	6.60	1.57E-01	3.32E-02	1.21E+00
		433.94	90.50	-7.65E-03		3.32E-02
		614.28	89.80	-2.09E-02		4.94E-02
		722.94	90.80	-8.23E-03		3.77E-02
	Sb-125	176.31	6.84	1.28E-01	9.47E-02	4.84E-01
		380.45	1.52	-8.09E-01		1.89E+00
		427.87	29.60	-9.81E-03		9.47E-02
		463.36	10.49	7.79E-02		3.48E-01
		600.60	17.65	3.22E-03		2.04E-01
		606.71	4.98	-9.53E-02		1.22E+00
		635.95	11.22	-1.89E-01		2.81E-01

Analysis Report for 17-Dec-19-10005

L2-10214A-FIGS-005SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	1.81E-01	9.47E-02	1.88E+00
Ba-133	79.61	2.65	-1.18E-01	6.46E-02	2.87E+00
	81.00	32.90	-1.24E-01		2.01E-01
	276.40	7.16	1.78E-02		4.42E-01
	302.85	18.34	7.50E-02		1.75E-01
	356.01	62.05	-3.36E-02		6.46E-02
	383.85	8.94	-3.13E-03		3.39E-01
Cs-134	475.36	1.48	5.38E-01	5.06E-02	2.19E+00
	563.25	8.34	1.29E-01		4.43E-01
	569.33	15.37	3.51E-02		2.06E-01
	604.72	97.62	-9.66E-03		5.66E-02
	795.86	85.46	3.29E-02		5.06E-02
	801.95	8.69	-1.98E-01		4.36E-01
	1038.61	0.99	2.49E+00		5.19E+00
	1167.97	1.79	1.38E+00		2.82E+00
	1365.19	3.02	-4.41E-01		1.18E+00
Cs-137	661.66	85.10	3.03E-02	4.77E-02	4.77E-02
Eu-152	121.78	28.67	-9.24E-03	1.09E-01	1.09E-01
	244.70	7.61	7.43E-02		4.54E-01
	295.94	0.45	6.81E+00		8.82E+00
	344.28	26.60	-1.08E-01		1.18E-01
	367.79	0.86	-1.39E-01		3.80E+00
	411.12	2.24	-1.75E-01		1.46E+00
	443.96	2.83	-5.61E-02		1.15E+00
	488.68	0.42	1.24E+00		7.74E+00
	563.99	0.49	2.26E+00		7.36E+00
	586.26	0.46	-3.75E+00		1.17E+01
	678.62	0.47	6.04E-01		7.85E+00
	688.67	0.86	3.57E+00		4.79E+00
	719.35	0.28	1.07E+00		1.26E+01
	778.90	12.96	-4.97E-02		2.95E-01
	810.45	0.32	-5.40E+00		1.04E+01
	867.37	4.26	-4.38E-01		8.04E-01
	919.33	0.43	-6.23E+00		7.55E+00
	964.08	14.65	-1.83E-01		3.72E-01
	1085.87	10.24	-2.18E-01		4.35E-01
	1089.74	1.73	5.77E-01		2.71E+00
	1112.07	13.69	-3.38E-01		3.00E-01
	1212.95	1.43	4.72E-01		3.97E+00
	1249.94	0.19	-1.62E+01		2.44E+01
	1299.14	1.63	1.47E+00		3.12E+00
	1408.01	21.07	-5.65E-02		1.58E-01
	1457.64	0.50	-1.97E-01		3.46E+01
	1528.10	0.28	5.26E-01		1.26E+01
Eu-154	123.07	40.40	-2.62E-02	7.63E-02	7.63E-02
	247.93	6.89	4.67E-03		4.22E-01
	591.76	4.95	-2.77E-02		6.84E-01
	692.42	1.78	-5.01E-01		2.06E+00
	723.30	20.06	-1.56E-02		1.71E-01
	756.80	4.52	2.59E-02		9.25E-01
	873.18	12.08	-1.17E-02		2.72E-01

Analysis Report for 17-Dec-19-10005
L2-10214A-FIGS-005SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	6.99E-02	7.63E-02	4.35E-01
	1004.76	18.01	-9.52E-02		2.31E-01
	1274.43	34.80	-5.76E-04		1.20E-01
	1596.48	1.80	-5.51E-01		1.73E+00
Eu-155	45.30	1.31	1.79E-01	1.79E-01	1.15E+01
	60.01	1.22	-5.12E+00		1.18E+01
	86.55	30.70	8.78E-02		1.83E-01
	105.31	21.10	-1.27E-02		1.79E-01
Ra-226	186.21	3.64	3.81E-01	9.91E-01	9.91E-01
Pa-231	27.36	10.30	3.41E-01	1.01E+00	1.01E+00
	283.69	1.70	-1.12E-01		1.71E+00
	300.07	2.47	-1.63E-01		1.34E+00
	302.65	2.20	6.25E-01		1.46E+00
	330.06	1.40	8.42E-01		2.32E+00
U-235	143.76	10.96	-3.82E-02	6.37E-02	2.76E-01
	163.33	5.08	1.30E-01		6.85E-01
	185.71	57.20	4.32E-02		6.37E-02
	202.11	1.08	-1.07E+00		3.02E+00
	205.31	5.01	-4.94E-01		6.45E-01
Am-241	59.54	35.90	-1.91E-01	4.12E-01	4.12E-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

Analysis Report for 17-Dec-19-10030
L2-10214A-FIGS-005SB

GAMMA SPECTRUM ANALYSIS

Sample Identification : 17-Dec-19-10030
Sample Description : L2-10214A-FIGS-005SB
Sample Type : Soil
Unit :
Sample Point :

Sample Size : 1.584E+03 grams
Facility : Default

Sample Taken On : 12/16/2019 3:05:00PM
Acquisition Started : 12/17/2019 1:19:25PM

Procedure : 130G_SOIL_1
Operator : Administrator
Detector Name : 324
Geometry : 130G_SOIL_1
Live Time : 1800.0 seconds
Real Time : 1800.8 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 : 12/17/2019
Efficiency Calibration Description :

Sample Number : 82243
Fill Height : 1583.93 gram
Certificate Name : Eu155-Na22
Certificate Date : 1/30/2013 12:00:00PM

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 12/17/2019 1:49:30PM

Peak Analysis From Channel : 120
Peak Analysis To Channel : 4096


Data Validated
1530 [273] 12/17/19

Analysis Report for 17-Dec-19-10030
L2-10214A-FIGS-005SB

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	77.20	151 -	158	155.00	1.45E+02	25.85	2.58E+02	0.85
2	238.63	472 -	481	477.44	2.83E+02	29.50	2.50E+02	1.11
3	295.06	585 -	594	590.17	8.11E+01	19.04	1.25E+02	1.32
4	338.04	672 -	680	676.06	5.60E+01	15.34	8.40E+01	0.74
5	351.74	698 -	708	703.42	1.95E+02	20.30	9.13E+01	1.15
6	582.94	1159 -	1171	1165.49	1.21E+02	17.33	6.59E+01	1.49
7	609.03	1211 -	1223	1217.63	1.35E+02	16.86	5.69E+01	1.70
8	910.91	1816 -	1827	1821.27	1.08E+02	12.55	1.98E+01	1.15
9	968.74	1933 -	1943	1936.95	4.39E+01	10.79	2.81E+01	1.34
10	1460.32	2913 -	2928	2920.69	6.58E+02	26.67	1.78E+01	1.98
11	1587.34	3172 -	3179	3175.03	1.12E+01	4.57	4.77E+00	0.68
12	1764.01	3524 -	3534	3528.88	3.72E+01	6.99	4.79E+00	1.37

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	6.13E+00	3.64E-01
Tl-208	0.99	583.19 *	85.00	7.74E-02	1.20E-02
Pb-212	1.00	115.18	0.60		
		238.63 *	43.60	1.97E-01	2.60E-02
		300.09	3.30		

[274]

Analysis Report for 17-Dec-19-10030

L2-10214A-FIGS-005SB

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
Pb212-XR	0.99	74.82	10.28		
		77.11 *	17.10	4.70E-01	9.68E-02
		87.35	3.97		
		89.78	1.46		
Bi-214	0.98	609.32 *	45.49	1.66E-01	2.30E-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	2.78E-01	5.33E-02		
1847.43	2.03				
2118.51	1.16				
Pb-214	0.99	241.99	7.25		
		295.22 *	18.42	1.51E-01	3.74E-02
		351.93 *	35.60	2.12E-01	2.78E-02
Pb214-XR	0.99	785.96	1.06		
		74.82	5.80		
		77.11 *	9.70	8.28E-01	1.75E-01
Ac-228	0.98	87.35	2.24		
		89.78	0.82		
		129.07	2.42		
		209.25	3.89		
		270.24	3.46		
		328.00	2.95		
		338.32 *	11.27	1.87E-01	5.35E-02
		409.46	1.92		
		463.00	4.40		
		794.95	4.25		
		911.20 *	25.80	3.05E-01	3.79E-02
964.77	4.99				
968.97 *	15.80	2.10E-01	5.26E-02		
1588.20 *	3.22	3.68E-01	1.51E-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 17-Dec-19-10030
L2-10214A-FIGS-005SB

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.960	6.13E+00	3.64E-01	
	Tl-208	0.991	7.74E-02	1.20E-02	
X	Bi-211	0.931			
	Pb-212	1.000	1.97E-01	2.60E-02	
?	Pb212-XR	0.999	4.70E-01	9.68E-02	
	Bi-214	0.989	1.84E-01	2.11E-02	
	Pb-214	0.995	1.90E-01	2.23E-02	
?	Pb214-XR	0.999	8.28E-01	1.75E-01	
	Ac-228	0.988	2.55E-01	2.62E-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 17-Dec-19-10030
L2-10214A-FIGS-005SB

UNIDENTIFIED PEAKS

Peak Locate Performed on : 12/17/2019 1:49:30PM
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	5.03E-02	3.49E-02	3.49E-02
	BE-7	477.60	10.44	1.05E-01	2.29E-01	2.29E-01
+	K-40	1460.82	* 10.66	6.13E+00	2.57E-01	2.57E-01
	Mn-54	834.85	99.98	8.88E-03	2.78E-02	2.78E-02
	Co-60	1173.23	99.85	-1.89E-03	2.62E-02	3.53E-02
		1332.49	99.98	-8.81E-03		2.62E-02
	Nb-94	702.65	99.81	1.44E-02	2.74E-02	2.78E-02
		871.09	99.89	7.56E-03		2.74E-02
	Ag-108m	79.13	6.60	-4.59E-01	2.29E-02	7.87E-01
		433.94	90.50	-7.35E-03		2.29E-02
		614.28	89.80	-6.97E-03		3.19E-02
		722.94	90.80	-1.80E-02		2.88E-02
	Sb-125	176.31	6.84	-1.84E-01	7.65E-02	3.38E-01
		380.45	1.52	4.71E-01		1.50E+00
		427.87	29.60	3.33E-02		7.65E-02
		463.36	10.49	6.72E-02		2.30E-01
		600.60	17.65	3.14E-05		1.40E-01
		606.71	4.98	6.75E-02		8.21E-01
		635.95	11.22	-6.28E-02		1.89E-01

Analysis Report for 17-Dec-19-10030

L2-10214A-FIGS-005SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Sb-125	671.44	1.79	-8.86E-01	7.65E-02	1.27E+00
Ba-133	79.61	2.65	-1.51E+00	4.39E-02	1.85E+00
	81.00	32.90	-2.05E-01		1.22E-01
	276.40	7.16	-1.78E-02		3.02E-01
	302.85	18.34	5.44E-02		1.22E-01
	356.01	62.05	-3.26E-02		4.39E-02
	383.85	8.94	-1.25E-01		2.44E-01
Cs-134	475.36	1.48	6.54E-01	3.35E-02	1.61E+00
	563.25	8.34	1.78E-01		2.85E-01
	569.33	15.37	2.19E-02		1.49E-01
	604.72	97.62	1.14E-04		3.82E-02
	795.86	85.46	2.50E-02		3.35E-02
	801.95	8.69	4.02E-02		3.13E-01
	1038.61	0.99	1.55E-01		2.60E+00
	1167.97	1.79	-6.67E-01		1.96E+00
	1365.19	3.02	7.91E-02		7.45E-01
Cs-137	661.66	85.10	1.47E-03	2.97E-02	2.97E-02
Eu-152	121.78	28.67	3.00E-02	8.13E-02	8.13E-02
	244.70	7.61	-9.02E-02		3.18E-01
	295.94	0.45	-1.52E+00		5.93E+00
	344.28	26.60	-4.28E-02		8.29E-02
	367.79	0.86	-1.46E-01		2.56E+00
	411.12	2.24	1.70E-01		1.04E+00
	443.96	2.83	-2.44E-01		7.51E-01
	488.68	0.42	-1.15E+00		5.15E+00
	563.99	0.49	2.22E+00		4.78E+00
	586.26	0.46	8.13E-01		8.76E+00
	678.62	0.47	2.59E+00		5.29E+00
	688.67	0.86	-2.62E-01		2.76E+00
	719.35	0.28	-4.15E-01		8.88E+00
	778.90	12.96	-1.50E-01		1.86E-01
	810.45	0.32	2.93E-01		8.27E+00
	867.37	4.26	-2.11E-01		6.02E-01
	919.33	0.43	1.47E+00		6.36E+00
	964.08	14.65	-4.61E-02		2.60E-01
	1085.87	10.24	1.29E-01		2.95E-01
	1089.74	1.73	3.71E-01		1.75E+00
	1112.07	13.69	-4.13E-01		2.22E-01
	1212.95	1.43	-1.04E+00		2.51E+00
	1249.94	0.19	-3.19E+00		1.63E+01
	1299.14	1.63	3.05E-01		1.99E+00
	1408.01	21.07	5.54E-02		1.25E-01
	1457.64	0.50	-1.54E+00		2.53E+01
	1528.10	0.28	-2.58E+00		7.09E+00
Eu-154	123.07	40.40	1.06E-02	5.66E-02	5.66E-02
	247.93	6.89	1.92E-02		3.11E-01
	591.76	4.95	-4.15E-01		4.83E-01
	692.42	1.78	4.96E-01		1.46E+00
	723.30	20.06	-2.75E-02		1.34E-01
	756.80	4.52	-7.01E-02		5.57E-01
	873.18	12.08	-5.20E-02		2.27E-01

Analysis Report for 17-Dec-19-10030

L2-10214A-FIGS-005SB

Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
Eu-154	996.29	10.48	-1.06E-01	5.66E-02	2.68E-01
	1004.76	18.01	4.31E-02		1.61E-01
	1274.43	34.80	-6.84E-02		8.89E-02
	1596.48	1.80	4.79E-01		1.15E+00
Eu-155	45.30	1.31	1.28E+00	1.24E-01	7.40E+00
	60.01	1.22	-1.61E+00		8.38E+00
	86.55	30.70	-6.93E-03		1.24E-01
	105.31	21.10	-2.15E-02		1.26E-01
Ra-226	186.21	3.64	4.02E-01	6.98E-01	6.98E-01
Pa-231	27.36	10.30	8.15E-01	8.21E-01	8.21E-01
	283.69	1.70	-2.06E-01		1.26E+00
	300.07	2.47	-3.00E-01		9.28E-01
	302.65	2.20	4.53E-01		1.02E+00
	330.06	1.40	4.65E-01		1.72E+00
U-235	143.76	10.96	-2.65E-02	4.37E-02	1.97E-01
	163.33	5.08	9.23E-03		4.69E-01
	185.71	57.20	9.13E-03		4.37E-02
	202.11	1.08	-1.91E+00		2.05E+00
	205.31	5.01	-2.81E-02		4.57E-01
Am-241	59.54	35.90	1.38E-03	2.96E-01	2.96E-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

ATTACHMENT 8
EBERLINE ANALYTICAL REPORTS



EBS-OR-46670

February 4, 2020

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

CASE NARRATIVE
Work Order # 20-01037-OR

SAMPLE RECEIPT

This work order contains fourteen soil samples received 01/09/2020. Samples were analyzed for Total Strontium, Tritium, Nickel-63 and by Gamma Spectroscopy.

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
L2-10214-A-FIGS-001-SS-A	20-01037-04	L2-10214-D-FSGS-007-SS-A	20-01037-11
L2-10214-A-QIGS-001-SS-A	20-01037-05	L2-10214-D-FSGS-003-SS-A	20-01037-12
L2-10214-A-FIGS-002-SS-A	20-01037-06	L2-10214-D-FIGS-006-SS-A	20-01037-13
L2-10214-B-FSGS-003-SS-A	20-01037-07	L2-10214-E-FSGS-008-SS-A	20-01037-14
L2-10214-B-FSGS-015-SS-A	20-01037-08	L2-10214-E-FSGS-006-SB-A	20-01037-15
L2-10214-C-FSGS-016-SS-A	20-01037-09	L2-10214-F-FSGS-001-SS-A	20-01037-16
L2-10214-C-FIGS-005-SS-A	20-01037-10	L2-10214-F-QIGS-001-SS-A	20-01037-17

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 an acceptable relative percent difference and normalized difference. 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.

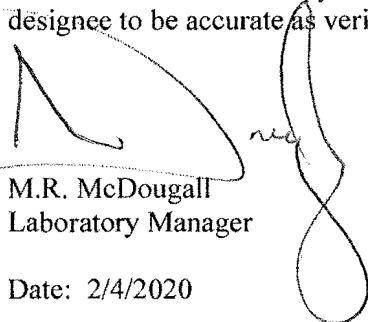
ANALYTICAL RESULTS CONTINUED

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 Actinium-228, Bismuth-214 and Potassium-40 replicate demonstrated an acceptable relative percent difference and normalized difference. 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: 2/4/2020

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:						
			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-01	LCS	KNOWN	01/09/20 00:00	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	2.02E+02	7.27E+00				pCi/g	
20-01037-01	LCS	SPIKE	01/09/20 00:00	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	2.35E+02	8.10E+00	1.54E+01	5.44E+00		pCi/g	
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	9.58E-01	3.26E+00	3.26E+00	5.60E+00	U	pCi/g	
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	-1.14E+00	3.15E+00	3.15E+00	5.54E+00	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	7.56E-01	3.21E+00	3.21E+00	5.53E+00	U	pCi/g	
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	7.35E-01	3.12E+00	3.12E+00	5.38E+00	U	pCi/g	
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	-1.85E-01	3.12E+00	3.12E+00	5.43E+00	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	5.54E-01	3.13E+00	3.13E+00	5.41E+00	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	1.21E+00	2.97E+00	2.97E+00	5.08E+00	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	1.47E+00	3.15E+00	3.15E+00	5.38E+00	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	9.05E-01	3.08E+00	3.09E+00	5.30E+00	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	-9.12E-01	3.04E+00	3.04E+00	5.34E+00	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	5.58E-01	3.16E+00	3.16E+00	5.45E+00	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/15/2020	20-01037	Tritium	LANL ER-210 Modified	-3.66E-01	3.07E+00	3.07E+00	5.36E+00	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/16/2020	20-01037	Tritium	LANL ER-210 Modified	-1.46E+00	3.03E+00	3.03E+00	5.35E+00	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/16/2020	20-01037	Tritium	LANL ER-210 Modified	0.00E+00	3.04E+00	3.04E+00	5.28E+00	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/16/2020	20-01037	Tritium	LANL ER-210 Modified	-9.27E-01	3.09E+00	3.09E+00	5.43E+00	U	pCi/g	
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/16/2020	20-01037	Tritium	LANL ER-210 Modified	5.36E-01	3.03E+00	3.03E+00	5.23E+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 CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

0019

Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:							
			Jeffrey Graham						SDG:	20-01037						
			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		
20-01037-01	LCS	KNOWN	01/09/20 00:00	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	1.50E+03	4.51E+01				pCi/g		
20-01037-01	LCS	SPIKE	01/09/20 00:00	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	1.48E+03	1.30E+01	8.82E+01	3.20E+00		pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-6.06E-01	1.84E+00	1.84E+00	3.20E+00	U	pCi/g		
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	4.55E-01	1.96E+00	1.96E+00	3.36E+00	U	pCi/g		
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-6.03E-01	1.83E+00	1.83E+00	3.18E+00	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	5.49E-01	1.98E+00	1.98E+00	3.38E+00	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-7.54E-01	2.00E+00	2.00E+00	3.48E+00	U	pCi/g		
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-3.53E-01	1.88E+00	1.88E+00	3.26E+00	U	pCi/g		
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-1.50E+00	2.09E+00	2.09E+00	3.68E+00	U	pCi/g		
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-8.95E-01	1.89E+00	1.89E+00	3.30E+00	U	pCi/g		
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-2.31E-01	1.91E-01	1.91E-01	3.41E-01	U	pCi/g		
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	5.40E-01	1.94E+00	1.94E+00	3.32E+00	U	pCi/g		
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-6.49E-01	1.96E+00	1.97E+00	3.42E+00	U	pCi/g		
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/14/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-1.85E+00	1.83E+00	1.84E+00	3.26E+00	U	pCi/g		
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/15/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-8.77E-01	1.85E+00	1.85E+00	3.24E+00	U	pCi/g		
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/15/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-4.40E-01	1.87E+00	1.87E+00	3.25E+00	U	pCi/g		
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/15/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-7.78E-01	2.75E+00	2.75E+00	4.79E+00	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/15/2020	20-01037	Nickel-63	ASTM 3500-Ni Modified	-2.15E+00	2.49E+00	2.49E+00	4.40E+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 CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

0020

Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:						
			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-01	LCS	KNOWN	01/09/20 00:00	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	5.44E+01	3.04E-01				pCi/g	
20-01037-01	LCS	SPIKE	01/09/20 00:00	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	4.96E+01	1.38E+00	1.73E+01	8.80E-01		pCi/g	
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	1.80E-01	3.42E-01	3.47E-01	8.53E-01	U	pCi/g	
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	3.03E-01	3.29E-01	3.45E-01	8.03E-01	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	3.22E-01	2.95E-01	3.16E-01	7.12E-01	U	pCi/g	
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	5.59E-01	2.56E-01	3.21E-01	5.69E-01	U	pCi/g	
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	3.37E-01	3.12E-01	3.34E-01	7.56E-01	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	4.22E-01	3.55E-01	3.84E-01	8.56E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	2.99E-01	2.65E-01	2.84E-01	6.38E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	7.30E-02	2.59E-01	2.60E-01	6.56E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	-2.90E-02	3.80E-01	3.80E-01	9.75E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	7.26E-01	3.73E-01	4.51E-01	8.58E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	3.44E-01	3.55E-01	3.75E-01	8.63E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	8.58E-01	4.08E-01	5.06E-01	9.31E-01	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	4.93E-01	3.70E-01	4.08E-01	8.80E-01	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	1.87E-01	2.85E-01	2.93E-01	7.07E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	2.28E-01	3.75E-01	3.83E-01	9.31E-01	U	pCi/g	
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/14/2020	20-01037	Strontium-90	EiChroM SRW01 Modified	3.54E-01	3.61E-01	3.81E-01	8.79E-01	U	pCi/g	
20-01037-01	LCS	KNOWN	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	1.31E+02	5.10E+00				pCi/g	
20-01037-01	LCS	KNOWN	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	8.26E+01	3.39E+00				pCi/g	
20-01037-01	LCS	SPIKE	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	1.34E+02	7.67E+00	1.03E+01	9.92E-01		pCi/g	
20-01037-01	LCS	SPIKE	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	8.80E+01	7.53E+00	8.78E+00	1.83E+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



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<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:						Work Order Details:							
			Jeffrey Graham						SDG:	20-01037						
			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		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Actinium-228	EPA 901.1 Modified	-2.50E-02	7.77E-02	7.77E-02	1.14E-01	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Silver-108m	EPA 901.1 Modified	-8.61E-04	1.80E-02	1.80E-02	3.00E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Americium-241	EPA 901.1 Modified	-1.49E-02	4.63E-02	4.63E-02	6.98E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Barium-133	EPA 901.1 Modified	-4.31E-03	2.80E-02	2.80E-02	4.21E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Bismuth-214	EPA 901.1 Modified	4.67E-02	4.99E-02	5.00E-02	9.05E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	1.88E-02	2.41E-02	2.42E-02	3.95E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Cesium-134	EPA 901.1 Modified	-1.03E-02	2.85E-02	2.86E-02	2.13E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	7.65E-03	2.04E-02	2.04E-02	3.62E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Europium-152	EPA 901.1 Modified	-9.02E-03	8.63E-02	8.63E-02	9.91E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Europium-154	EPA 901.1 Modified	-3.56E-03	3.40E-02	3.40E-02	4.90E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Europium-155	EPA 901.1 Modified	1.57E-02	5.30E-02	5.30E-02	7.88E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Holmium-166m	EPA 901.1 Modified	6.98E-03	2.97E-02	2.97E-02	3.56E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Iodine-129	EPA 901.1 Modified	1.89E-02	1.28E-01	1.28E-01	2.11E-01	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.82E-01	2.01E-01	2.01E-01	4.48E-01	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Manganese-54	EPA 901.1 Modified	1.26E-02	1.76E-02	1.76E-02	3.42E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	-9.96E-04	1.90E-02	1.90E-02	2.81E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Niobium-94	EPA 901.1 Modified	2.35E-02	1.71E-02	1.71E-02	3.50E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Lead-210	EPA 901.1 Modified	3.81E-01	4.96E-01	4.97E-01	8.50E-01	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Lead-212	EPA 901.1 Modified	4.36E-02	3.06E-02	3.07E-02	5.51E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Lead-214	EPA 901.1 Modified	-1.25E-02	4.58E-02	4.56E-02	6.77E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Promethium-145	EPA 901.1 Modified	1.49E-02	7.77E-02	7.77E-02	1.30E-01	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Radium-226	EPA 901.1 Modified	4.67E-02	4.99E-02	5.00E-02	9.05E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Antimony-125	EPA 901.1 Modified	-1.95E-03	6.01E-02	6.01E-02	9.32E-02	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Thonium-234	EPA 901.1 Modified	8.77E-01	3.75E-01	3.78E-01	6.96E-01	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Thallium-208	EPA 901.1 Modified	7.48E-02	6.68E-02	6.69E-02	1.06E-01	U	pCi/g		
20-01037-02	MBL	BLANK	01/09/20 00:00	1/9/2020	1/10/2020	20-01037	Uranium-235	EPA 901.1 Modified	3.03E-02	1.06E-01	1.06E-01	1.68E-01	U	pCi/g		

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Eberline Analytical Final Report of Analysis									Report To:			Work Order Details:					
									Jeffrey Graham			SDG:	20-01037				
									Zion Solutions			Purchase Order:	677118				
									2701 Deborah Ave			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			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Actinium-228	EPA 901.1 Modified	6.41E-01	1.78E-01	1.81E-01	5.51E-01		pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Silver-108m	EPA 901.1 Modified	8.84E-03	3.13E-02	3.13E-02	5.22E-02	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Americium-241	EPA 901.1 Modified	3.01E-02	1.34E-01	1.34E-01	1.73E-01	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Barium-133	EPA 901.1 Modified	-1.34E-02	4.47E-02	4.47E-02	7.77E-02	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Bismuth-214	EPA 901.1 Modified	9.09E-01	1.61E-01	1.68E-01	1.92E-01		pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	-4.51E-03	5.08E-02	5.08E-02	7.33E-02	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Cesium-134	EPA 901.1 Modified	-1.34E-03	2.35E-02	2.35E-02	7.11E-02	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	2.58E-01	8.06E-02	8.17E-02	1.10E-01		pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Europium-152	EPA 901.1 Modified	-9.94E-03	1.29E-01	1.29E-01	2.20E-01	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Europium-154	EPA 901.1 Modified	-8.60E-02	1.56E-01	1.56E-01	1.13E-01	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Europium-155	EPA 901.1 Modified	1.26E-01	9.91E-02	9.93E-02	1.62E-01	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Holmium-166m	EPA 901.1 Modified	-1.68E-03	3.22E-02	3.23E-02	9.12E-02	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Iodine-129	EPA 901.1 Modified	2.14E-01	1.82E-01	1.82E-01	2.65E-01	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.19E+01	1.73E+00	1.84E+00	1.02E+00		pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Manganese-54	EPA 901.1 Modified	7.17E-03	4.67E-02	4.67E-02	7.50E-02	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	1.89E-02	3.98E-02	3.98E-02	5.83E-02	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Niobium-94	EPA 901.1 Modified	2.45E-02	4.08E-02	4.08E-02	6.84E-02	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Lead-210	EPA 901.1 Modified	1.31E+00	1.39E+00	1.39E+00	2.32E+00	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Lead-212	EPA 901.1 Modified	6.24E-01	1.31E-01	1.35E-01	2.46E-01		pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Lead-214	EPA 901.1 Modified	9.47E-01	1.70E-01	1.77E-01	2.39E-01		pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Promethium-145	EPA 901.1 Modified	-1.66E-01	2.03E-01	2.04E-01	2.45E-01	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Radium-226	EPA 901.1 Modified	9.09E-01	1.61E-01	1.68E-01	1.92E-01		pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Antimony-125	EPA 901.1 Modified	6.44E-02	1.14E-01	1.14E-01	2.02E-01	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Thorium-234	EPA 901.1 Modified	1.53E+00	1.26E+00	1.26E+00	1.75E+00	U	pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Thallium-208	EPA 901.1 Modified	4.59E-01	1.28E-01	1.30E-01	1.87E-01		pCi/g			
20-01037-03	DUP	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Uranium-235	EPA 901.1 Modified	3.32E-01	3.44E-01	3.44E-01	4.86E-01	U	pCi/g			

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			Jeffrey Graham						SDG:	20-01037					
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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	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Actinium-228	EPA 901.1 Modified	6.11E-01	2.05E-01	2.07E-01	4.22E-01		pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Silver-108m	EPA 901.1 Modified	2.06E-02	3.14E-02	3.15E-02	4.94E-02	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Americium-241	EPA 901.1 Modified	-1.48E-01	1.46E-01	1.47E-01	1.71E-01	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Barium-133	EPA 901.1 Modified	1.79E-02	3.08E-02	3.08E-02	8.47E-02	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Bismuth-214	EPA 901.1 Modified	8.37E-01	1.58E-01	1.64E-01	2.31E-01		pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	-1.93E-02	5.58E-02	5.58E-02	5.83E-02	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Cesium-134	EPA 901.1 Modified	-6.47E-03	2.38E-02	2.38E-02	7.00E-02	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	1.92E-01	8.62E-02	8.68E-02	1.31E-01		pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Europium-152	EPA 901.1 Modified	1.23E-02	1.29E-01	1.29E-01	2.29E-01	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Europium-154	EPA 901.1 Modified	-4.07E-02	1.55E-01	1.55E-01	1.13E-01	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Europium-155	EPA 901.1 Modified	1.25E-01	1.00E-01	1.00E-01	1.64E-01	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Holmium-166m	EPA 901.1 Modified	3.76E-02	8.30E-02	8.30E-02	9.02E-02	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Iodine-129	EPA 901.1 Modified	1.19E-01	1.94E-01	1.94E-01	2.72E-01	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.29E+01	1.84E+00	1.95E+00	1.11E+00		pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Manganese-54	EPA 901.1 Modified	2.84E-02	4.65E-02	4.65E-02	7.85E-02	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	2.46E-02	3.98E-02	3.98E-02	5.83E-02	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Niobium-94	EPA 901.1 Modified	-3.27E-03	1.43E-02	1.43E-02	6.49E-02	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Lead-210	EPA 901.1 Modified	1.24E+00	1.30E+00	1.30E+00	1.82E+00	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Lead-212	EPA 901.1 Modified	6.06E-01	1.31E-01	1.34E-01	2.16E-01		pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Lead-214	EPA 901.1 Modified	8.27E-01	1.87E-01	1.92E-01	2.30E-01		pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Promethium-145	EPA 901.1 Modified	-1.56E-01	1.92E-01	1.93E-01	2.24E-01	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Radium-226	EPA 901.1 Modified	8.37E-01	1.58E-01	1.64E-01	2.31E-01		pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Antimony-125	EPA 901.1 Modified	4.00E-02	1.06E-01	1.06E-01	1.85E-01	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Thorium-234	EPA 901.1 Modified	2.49E+00	1.95E+00	1.95E+00	3.23E+00	U	pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Thallium-208	EPA 901.1 Modified	5.84E-01	1.73E-01	1.76E-01	3.29E-01		pCi/g	
20-01037-04	DO	L2-10214-A-FIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Uranium-235	EPA 901.1 Modified	1.79E-01	2.89E-01	2.89E-01	4.57E-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



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Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:							
			Jeffrey Graham						SDG:	20-01037						
			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		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Actinium-228	EPA 901.1 Modified	9.66E-01	2.48E-01	2.53E-01	5.08E-01		pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Silver-108m	EPA 901.1 Modified	1.95E-02	3.12E-02	3.12E-02	6.63E-02	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Americium-241	EPA 901.1 Modified	-1.06E-01	1.50E-01	1.50E-01	2.06E-01	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Barium-133	EPA 901.1 Modified	6.87E-02	1.69E-01	1.69E-01	1.53E-01	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Bismuth-214	EPA 901.1 Modified	1.24E+00	1.91E-01	2.02E-01	2.40E-01		pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	2.89E-02	5.61E-02	5.61E-02	6.61E-02	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Cesium-134	EPA 901.1 Modified	2.89E-03	2.88E-02	2.88E-02	9.34E-02	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	2.19E-01	9.35E-02	9.42E-02	1.42E-01		pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Europium-152	EPA 901.1 Modified	-1.33E-01	2.58E-01	2.58E-01	2.79E-01	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Europium-154	EPA 901.1 Modified	2.39E-02	1.55E-01	1.55E-01	1.43E-01	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Europium-155	EPA 901.1 Modified	3.29E-01	1.63E-01	1.64E-01	2.85E-01		pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Holmium-166m	EPA 901.1 Modified	1.05E-02	9.53E-02	9.53E-02	1.07E-01	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Iodine-129	EPA 901.1 Modified	-6.54E-02	2.12E-01	2.12E-01	3.06E-01	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.23E+01	1.87E+00	1.98E+00	1.49E+00		pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Manganese-54	EPA 901.1 Modified	3.46E-03	6.29E-02	6.29E-02	8.93E-02	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	-1.38E-02	5.42E-02	5.42E-02	7.05E-02	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Niobium-94	EPA 901.1 Modified	2.01E-02	5.72E-02	5.72E-02	7.95E-02	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Lead-210	EPA 901.1 Modified	2.78E+00	1.89E+00	1.89E+00	3.10E+00	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Lead-212	EPA 901.1 Modified	8.88E-01	1.77E-01	1.83E-01	2.59E-01		pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Lead-214	EPA 901.1 Modified	1.32E+00	2.08E-01	2.18E-01	5.04E-01		pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Promethium-145	EPA 901.1 Modified	7.36E-02	1.81E-01	1.81E-01	2.69E-01	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Radium-226	EPA 901.1 Modified	1.24E+00	1.91E-01	2.02E-01	2.40E-01		pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Antimony-125	EPA 901.1 Modified	5.52E-02	1.46E-01	1.46E-01	2.26E-01	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Thorium-234	EPA 901.1 Modified	2.28E+00	1.34E+00	1.35E+00	2.06E+00	U	pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Thallium-208	EPA 901.1 Modified	8.48E-01	1.82E-01	1.88E-01	2.64E-01		pCi/g		
20-01037-05	TRG	L2-10214-A-QIGS-001-SS-A	12/16/19 13:34	1/9/2020	1/10/2020	20-01037	Uranium-235	EPA 901.1 Modified	3.02E-02	3.92E-01	3.92E-01	5.75E-01	U	pCi/g		

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			Jeffrey Graham						SDG:	20-01037						
			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		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Actinium-228	EPA 901.1 Modified	6.28E-01	1.95E-01	1.98E-01	3.41E-01		pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Silver-108m	EPA 901.1 Modified	9.24E-03	2.82E-02	2.82E-02	6.14E-02	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Americium-241	EPA 901.1 Modified	-3.82E-01	1.57E-01	1.58E-01	1.93E-01	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Barium-133	EPA 901.1 Modified	-3.82E-03	2.53E-02	2.53E-02	1.49E-01	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Bismuth-214	EPA 901.1 Modified	9.11E-01	1.60E-01	1.66E-01	2.24E-01		pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	-1.69E-02	6.32E-02	6.32E-02	8.83E-02	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Cesium-134	EPA 901.1 Modified	3.16E-03	2.85E-02	2.85E-02	8.42E-02	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	2.32E-01	6.07E-02	6.19E-02	9.32E-02		pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Europium-152	EPA 901.1 Modified	4.80E-02	8.57E-02	8.57E-02	2.58E-01	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Europium-154	EPA 901.1 Modified	2.29E-02	1.40E-01	1.40E-01	1.32E-01	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Europium-155	EPA 901.1 Modified	1.11E-01	1.54E-01	1.54E-01	2.28E-01	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Holmium-166m	EPA 901.1 Modified	-7.41E-02	9.89E-02	9.90E-02	9.94E-02	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Iodine-129	EPA 901.1 Modified	-3.25E-02	2.06E-01	2.06E-01	2.99E-01	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.16E+01	1.71E+00	1.81E+00	1.11E+00		pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Manganese-54	EPA 901.1 Modified	-3.56E-02	6.60E-02	6.60E-02	8.25E-02	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	-4.01E-02	5.55E-02	5.55E-02	6.80E-02	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Niobium-94	EPA 901.1 Modified	4.01E-02	3.75E-02	3.75E-02	6.54E-02	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Lead-210	EPA 901.1 Modified	2.58E+00	1.52E+00	1.53E+00	2.47E+00	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Lead-212	EPA 901.1 Modified	8.26E-01	1.93E-01	1.98E-01	2.40E-01		pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Lead-214	EPA 901.1 Modified	1.16E+00	2.04E-01	2.12E-01	2.71E-01		pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Promethium-145	EPA 901.1 Modified	3.10E-02	1.76E-01	1.76E-01	2.58E-01	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Radium-226	EPA 901.1 Modified	9.11E-01	1.60E-01	1.66E-01	2.24E-01		pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Antimony-125	EPA 901.1 Modified	5.25E-02	1.31E-01	1.31E-01	2.04E-01	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Thorium-234	EPA 901.1 Modified	1.98E+00	1.65E+00	1.65E+00	2.73E+00	U	pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Thallium-208	EPA 901.1 Modified	6.32E-01	1.60E-01	1.64E-01	1.79E-01		pCi/g		
20-01037-06	TRG	L2-10214-A-FIGS-002-SS-A	12/16/19 13:36	1/9/2020	1/10/2020	20-01037	Uranium-235	EPA 901.1 Modified	3.32E-02	3.68E-01	3.68E-01	5.39E-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



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601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

Eberline Analytical Final Report of Analysis		Report To:							Work Order Details:						
		Jeffrey Graham							SDG:	20-01037					
		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	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Actinium-228	EPA 901.1 Modified	4.19E-01	1.84E-01	1.85E-01	4.01E-01		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Silver-108m	EPA 901.1 Modified	-7.03E-02	6.17E-02	6.18E-02	5.33E-02	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Americium-241	EPA 901.1 Modified	-2.00E-01	1.44E-01	1.45E-01	1.57E-01	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Barium-133	EPA 901.1 Modified	-1.36E-01	8.66E-02	8.69E-02	8.26E-02	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Bismuth-214	EPA 901.1 Modified	5.02E-01	1.31E-01	1.34E-01	1.93E-01		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	2.29E-02	5.02E-02	5.02E-02	8.09E-02	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Cesium-134	EPA 901.1 Modified	4.09E-03	3.10E-02	3.10E-02	7.27E-02	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	1.22E-01	6.23E-02	6.26E-02	9.26E-02		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Europium-152	EPA 901.1 Modified	-6.37E-04	2.05E-01	2.05E-01	2.12E-01	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Europium-154	EPA 901.1 Modified	7.77E-02	1.31E-01	1.31E-01	1.09E-01	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Europium-155	EPA 901.1 Modified	2.05E-01	1.10E-01	1.11E-01	2.04E-01		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Holmium-166m	EPA 901.1 Modified	4.62E-02	7.71E-02	7.72E-02	8.53E-02	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Iodine-129	EPA 901.1 Modified	1.51E-01	1.87E-01	1.88E-01	2.70E-01	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.27E+01	1.85E+00	1.96E+00	1.00E+00		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Manganese-54	EPA 901.1 Modified	6.38E-03	4.92E-02	4.92E-02	7.90E-02	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	7.46E-03	3.74E-02	3.74E-02	4.87E-02	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Niobium-94	EPA 901.1 Modified	1.73E-02	3.49E-02	3.49E-02	6.45E-02	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Lead-210	EPA 901.1 Modified	3.06E+00	1.38E+00	1.39E+00	2.16E+00		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Lead-212	EPA 901.1 Modified	6.01E-01	1.55E-01	1.58E-01	1.90E-01		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Lead-214	EPA 901.1 Modified	4.51E-01	1.30E-01	1.32E-01	1.98E-01		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Promethium-145	EPA 901.1 Modified	-1.38E-01	1.87E-01	1.87E-01	2.28E-01	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Radium-226	EPA 901.1 Modified	5.02E-01	1.31E-01	1.34E-01	1.93E-01		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Antimony-125	EPA 901.1 Modified	3.09E-02	1.02E-01	1.02E-01	1.78E-01	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Thorium-234	EPA 901.1 Modified	8.83E-01	1.21E+00	1.21E+00	1.64E+00	U	pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Thallium-208	EPA 901.1 Modified	4.14E-01	1.55E-01	1.56E-01	3.11E-01		pCi/g	
20-01037-07	TRG	L2-10214-B-FSGS-003-SS-A	12/14/19 12:34	1/9/2020	1/10/2020	20-01037	Uranium-235	EPA 901.1 Modified	5.01E-02	3.60E-01	3.60E-01	4.71E-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



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Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:						
			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Actinium-228	EPA 901.1 Modified	1.16E+00	3.02E-01	3.08E-01	5.72E-01		pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Silver-108m	EPA 901.1 Modified	3.13E-03	4.71E-02	4.71E-02	8.45E-02	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Americium-241	EPA 901.1 Modified	-2.02E-02	6.57E-02	6.57E-02	2.55E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Barium-133	EPA 901.1 Modified	-3.58E-02	3.27E-02	3.28E-02	2.13E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Bismuth-214	EPA 901.1 Modified	2.76E+00	2.98E-01	3.30E-01	2.88E-01		pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	-2.67E-02	6.74E-02	6.74E-02	9.20E-02	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Cesium-134	EPA 901.1 Modified	-6.67E-03	2.25E-02	2.25E-02	1.23E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	-1.04E-02	2.43E-02	2.43E-02	1.10E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Europium-152	EPA 901.1 Modified	8.70E-02	1.48E-01	1.48E-01	3.37E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Europium-154	EPA 901.1 Modified	9.45E-02	1.41E-01	1.41E-01	1.72E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Europium-155	EPA 901.1 Modified	7.78E-01	2.56E-01	2.59E-01	3.37E-01		pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Holmium-166m	EPA 901.1 Modified	-8.11E-02	1.36E-01	1.36E-01	1.38E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Iodine-129	EPA 901.1 Modified	-1.06E-01	2.50E-01	2.50E-01	3.55E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.13E+01	1.81E+00	1.91E+00	1.59E+00		pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Manganese-54	EPA 901.1 Modified	-2.82E-02	7.72E-02	7.72E-02	1.00E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	6.99E-03	5.92E-02	5.92E-02	7.57E-02	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Niobium-94	EPA 901.1 Modified	1.35E-02	6.39E-02	6.39E-02	9.20E-02	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Lead-210	EPA 901.1 Modified	2.87E+00	1.93E+00	1.93E+00	3.16E+00	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Lead-212	EPA 901.1 Modified	1.41E+00	2.31E-01	2.42E-01	3.74E-01		pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Lead-214	EPA 901.1 Modified	3.16E+00	4.11E-01	4.42E-01	3.34E-01		pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Promethium-145	EPA 901.1 Modified	1.32E-01	2.13E-01	2.13E-01	3.18E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Radium-226	EPA 901.1 Modified	2.76E+00	2.98E-01	3.30E-01	2.88E-01		pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Antimony-125	EPA 901.1 Modified	1.37E-01	1.77E-01	1.77E-01	2.79E-01	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Thorium-234	EPA 901.1 Modified	2.49E+00	1.99E+00	1.99E+00	3.30E+00	U	pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Thallium-208	EPA 901.1 Modified	1.11E+00	2.31E-01	2.38E-01	1.82E-01		pCi/g	
20-01037-08	TRG	L2-10214-B-FSGS-015-SS-A	12/14/19 12:58	1/9/2020	1/10/2020	20-01037	Uranium-235	EPA 901.1 Modified	4.00E-01	5.04E-01	5.05E-01	7.53E-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



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			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Actinium-228	EPA 901.1 Modified	3.96E-01	2.91E-01	2.91E-01	6.49E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Silver-108m	EPA 901.1 Modified	-1.27E-02	7.47E-02	7.47E-02	9.07E-02	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Americium-241	EPA 901.1 Modified	-1.02E-01	1.40E-01	1.40E-01	2.10E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Barium-133	EPA 901.1 Modified	-1.54E-01	1.54E-01	1.54E-01	1.72E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Bismuth-214	EPA 901.1 Modified	6.54E-01	2.01E-01	2.04E-01	1.36E-01		pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Cobalt-60	EPA 901.1 Modified	-3.07E-02	9.44E-02	9.44E-02	1.02E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Cesium-134	EPA 901.1 Modified	-1.79E-02	2.60E-02	2.60E-02	1.18E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Cesium-137	EPA 901.1 Modified	2.30E-01	9.58E-02	9.65E-02	1.68E-01		pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Europium-152	EPA 901.1 Modified	-2.96E-02	2.12E-01	2.12E-01	3.07E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Europium-154	EPA 901.1 Modified	2.33E-01	1.71E-01	1.71E-01	1.59E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Europium-155	EPA 901.1 Modified	7.88E-02	1.73E-01	1.73E-01	2.56E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Holmium-166m	EPA 901.1 Modified	1.11E-01	8.48E-02	8.50E-02	1.43E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Iodine-129	EPA 901.1 Modified	-1.22E-01	3.00E-01	3.00E-01	5.52E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.03E+01	1.96E+00	2.03E+00	1.40E+00		pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Manganese-54	EPA 901.1 Modified	7.24E-03	3.67E-02	3.67E-02	1.29E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	4.91E-02	4.51E-02	4.51E-02	9.14E-02	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Niobium-94	EPA 901.1 Modified	-6.29E-02	6.61E-02	6.61E-02	8.17E-02	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Lead-210	EPA 901.1 Modified	4.59E+00	2.81E+00	2.82E+00	4.57E+00		pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Lead-212	EPA 901.1 Modified	4.57E-01	1.36E-01	1.38E-01	5.33E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Lead-214	EPA 901.1 Modified	5.76E-01	2.17E-01	2.19E-01	3.81E-01		pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Promethium-145	EPA 901.1 Modified	-1.79E-01	2.42E-01	2.42E-01	3.75E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Radium-226	EPA 901.1 Modified	6.54E-01	2.01E-01	2.04E-01	1.36E-01		pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Antimony-125	EPA 901.1 Modified	1.35E-02	1.81E-01	1.81E-01	2.80E-01	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Thorium-234	EPA 901.1 Modified	1.55E+00	1.22E+00	1.22E+00	2.08E+00	U	pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Thallium-208	EPA 901.1 Modified	4.86E-01	1.92E-01	1.93E-01	3.44E-01		pCi/g	
20-01037-09	TRG	L2-10214-C-FSGS-016-SS-A	12/13/19 13:30	1/9/2020	1/10/2020	20-01037	Uranium-235	EPA 901.1 Modified	2.12E-01	3.81E-01	3.81E-01	5.88E-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



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601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

0029

Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:						
			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Actinium-228	EPA 901.1 Modified	1.85E+00	3.67E-01	3.79E-01	6.56E-01		pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Silver-108m	EPA 901.1 Modified	3.74E-02	3.92E-02	3.92E-02	9.73E-02	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Americium-241	EPA 901.1 Modified	-5.05E-02	7.39E-02	7.39E-02	2.89E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Barium-133	EPA 901.1 Modified	-5.89E-03	5.46E-02	5.46E-02	2.78E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Bismuth-214	EPA 901.1 Modified	5.35E+00	4.66E-01	5.41E-01	4.07E-01		pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Cobalt-60	EPA 901.1 Modified	-1.68E-02	4.94E-02	4.94E-02	1.08E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Cesium-134	EPA 901.1 Modified	1.81E-02	3.59E-02	3.59E-02	1.44E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Cesium-137	EPA 901.1 Modified	7.57E-02	9.11E-02	9.12E-02	1.33E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Europium-152	EPA 901.1 Modified	1.00E-03	1.39E-01	1.39E-01	4.14E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Europium-154	EPA 901.1 Modified	-3.46E-02	1.84E-01	1.84E-01	2.10E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Europium-155	EPA 901.1 Modified	1.33E+00	2.96E-01	3.04E-01	4.14E-01		pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Holmium-166m	EPA 901.1 Modified	2.91E-02	1.29E-01	1.29E-01	1.61E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Iodine-129	EPA 901.1 Modified	1.37E-01	2.93E-01	2.93E-01	4.31E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.62E+01	2.29E+00	2.43E+00	1.84E+00		pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Manganese-54	EPA 901.1 Modified	1.11E-02	2.78E-02	2.78E-02	1.29E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	2.65E-02	7.71E-02	7.71E-02	1.09E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Niobium-94	EPA 901.1 Modified	-3.52E-02	8.06E-02	8.06E-02	1.06E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Lead-210	EPA 901.1 Modified	9.56E-01	1.84E+00	1.84E+00	2.70E+00	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Lead-212	EPA 901.1 Modified	2.54E+00	3.95E-01	4.16E-01	4.33E-01		pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Lead-214	EPA 901.1 Modified	5.50E+00	6.57E-01	7.15E-01	4.17E-01		pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Promethium-145	EPA 901.1 Modified	-1.62E-01	2.53E-01	2.53E-01	3.56E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Radium-226	EPA 901.1 Modified	5.35E+00	4.66E-01	5.41E-01	4.07E-01		pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Antimony-125	EPA 901.1 Modified	1.42E-01	2.16E-01	2.16E-01	3.29E-01	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Thorium-234	EPA 901.1 Modified	3.39E+00	2.34E+00	2.35E+00	3.88E+00	U	pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Thallium-208	EPA 901.1 Modified	2.21E+00	3.13E-01	3.33E-01	3.40E-01		pCi/g	
20-01037-10	TRG	L2-10214-C-FIGS-005-SS-A	12/13/19 13:08	1/9/2020	1/13/2020	20-01037	Uranium-235	EPA 901.1 Modified	4.35E-01	6.12E-01	6.13E-01	8.95E-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



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0030

Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:						
			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Actinium-228	EPA 901.1 Modified	1.14E+00	3.08E-01	3.14E-01	4.56E-01		pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Silver-108m	EPA 901.1 Modified	2.07E-02	4.69E-02	4.69E-02	7.65E-02	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Americium-241	EPA 901.1 Modified	-2.21E-01	2.14E-01	2.14E-01	2.48E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Barium-133	EPA 901.1 Modified	7.41E-02	6.85E-02	6.86E-02	1.20E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Bismuth-214	EPA 901.1 Modified	1.23E+00	2.13E-01	2.23E-01	4.71E-01		pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Cobalt-60	EPA 901.1 Modified	3.34E-02	6.67E-02	6.67E-02	1.14E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Cesium-134	EPA 901.1 Modified	-4.81E-03	3.77E-02	3.77E-02	1.04E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Cesium-137	EPA 901.1 Modified	1.79E-01	7.16E-02	7.22E-02	1.44E-01		pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Europium-152	EPA 901.1 Modified	-1.18E-02	2.53E-01	2.53E-01	3.05E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Europium-154	EPA 901.1 Modified	-1.47E-01	2.27E-01	2.27E-01	1.61E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Europium-155	EPA 901.1 Modified	6.92E-02	2.26E-01	2.26E-01	2.96E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Holmium-166m	EPA 901.1 Modified	1.18E-02	1.11E-01	1.11E-01	1.28E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Iodine-129	EPA 901.1 Modified	-1.21E-01	3.16E-01	3.16E-01	4.05E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Potassium-40	EPA 901.1 Modified	2.20E+01	2.92E+00	3.13E+00	1.50E+00		pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Manganese-54	EPA 901.1 Modified	-6.17E-02	8.69E-02	8.70E-02	1.19E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	2.71E-03	5.73E-02	5.73E-02	8.87E-02	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Niobium-94	EPA 901.1 Modified	-3.28E-03	6.03E-02	6.03E-02	9.39E-02	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Lead-210	EPA 901.1 Modified	2.49E+00	1.87E+00	1.88E+00	2.66E+00	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Lead-212	EPA 901.1 Modified	1.26E+00	2.22E-01	2.31E-01	3.75E-01		pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Lead-214	EPA 901.1 Modified	1.43E+00	2.47E-01	2.58E-01	3.10E-01		pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Promethium-145	EPA 901.1 Modified	-2.01E-01	3.15E-01	3.15E-01	3.81E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Radium-226	EPA 901.1 Modified	1.23E+00	2.13E-01	2.23E-01	4.71E-01		pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Antimony-125	EPA 901.1 Modified	-6.70E-03	1.63E-01	1.63E-01	2.71E-01	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Thorium-234	EPA 901.1 Modified	2.91E+00	1.75E+00	1.76E+00	2.49E+00	U	pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Thallium-208	EPA 901.1 Modified	1.02E+00	2.32E-01	2.38E-01	3.62E-01		pCi/g	
20-01037-11	TRG	L2-10214-D-FSGS-007-SS-A	12/11/19 10:02	1/9/2020	1/13/2020	20-01037	Uranium-235	EPA 901.1 Modified	1.68E-01	5.33E-01	5.33E-01	7.07E-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



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0031

<h1 style="margin: 0;">Eberline Analytical</h1> <h2 style="margin: 0;">Final Report of Analysis</h2>				Report To:					Work Order Details:						
				Jeffrey Graham					SDG:	20-01037					
				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	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Actinium-228	EPA 901.1 Modified	1.28E+00	3.37E-01	3.43E-01	5.31E-01		pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Silver-108m	EPA 901.1 Modified	-3.42E-03	2.47E-02	2.47E-02	9.30E-02	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Americium-241	EPA 901.1 Modified	-1.16E-01	1.49E-01	1.49E-01	2.27E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Barium-133	EPA 901.1 Modified	-1.77E-02	4.06E-02	4.06E-02	1.82E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Bismuth-214	EPA 901.1 Modified	1.14E+00	2.37E-01	2.45E-01	3.54E-01		pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Cobalt-60	EPA 901.1 Modified	9.22E-02	9.34E-02	9.35E-02	9.57E-02	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Cesium-134	EPA 901.1 Modified	-1.52E-02	2.70E-02	2.70E-02	1.13E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Cesium-137	EPA 901.1 Modified	2.28E-01	1.28E-01	1.28E-01	2.01E-01		pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Europium-152	EPA 901.1 Modified	5.05E-02	1.74E-01	1.74E-01	3.03E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Europium-154	EPA 901.1 Modified	1.30E-01	1.92E-01	1.92E-01	1.51E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Europium-155	EPA 901.1 Modified	1.75E-01	2.08E-01	2.08E-01	3.10E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Holmium-166m	EPA 901.1 Modified	6.09E-02	1.29E-01	1.29E-01	1.20E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Iodine-129	EPA 901.1 Modified	3.20E-01	3.61E-01	3.61E-01	5.77E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Potassium-40	EPA 901.1 Modified	2.11E+01	2.85E+00	3.05E+00	9.60E-01		pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Manganese-54	EPA 901.1 Modified	3.28E-02	8.14E-02	8.14E-02	1.27E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	7.85E-03	6.40E-02	6.40E-02	1.00E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Niobium-94	EPA 901.1 Modified	1.48E-02	5.89E-02	5.89E-02	9.70E-02	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Lead-210	EPA 901.1 Modified	2.68E+00	1.97E+00	1.98E+00	3.23E+00	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Lead-212	EPA 901.1 Modified	1.19E+00	2.95E-01	3.01E-01	3.64E-01		pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Lead-214	EPA 901.1 Modified	1.11E+00	2.51E-01	2.57E-01	3.32E-01		pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Promethium-145	EPA 901.1 Modified	-1.62E-02	2.48E-01	2.48E-01	3.96E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Radium-226	EPA 901.1 Modified	1.14E+00	2.37E-01	2.45E-01	3.54E-01		pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Antimony-125	EPA 901.1 Modified	4.78E-02	1.87E-01	1.87E-01	2.92E-01	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Thorium-234	EPA 901.1 Modified	1.78E+00	1.31E+00	1.32E+00	2.21E+00	U	pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Thallium-208	EPA 901.1 Modified	1.07E+00	2.49E-01	2.55E-01	2.50E-01		pCi/g	
20-01037-12	TRG	L2-10214-D-FSGS-003-SS-A	12/11/19 09:24	1/9/2020	1/13/2020	20-01037	Uranium-235	EPA 901.1 Modified	2.45E-01	4.35E-01	4.35E-01	6.59E-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



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0032

Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:						
			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Actinium-228	EPA 901.1 Modified	9.28E-01	2.82E-01	2.86E-01	4.86E-01		pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Silver-108m	EPA 901.1 Modified	2.32E-02	3.72E-02	3.72E-02	8.20E-02	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Americium-241	EPA 901.1 Modified	-2.68E-01	1.95E-01	1.96E-01	2.58E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Barium-133	EPA 901.1 Modified	1.78E-03	3.64E-02	3.64E-02	1.90E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Bismuth-214	EPA 901.1 Modified	1.22E+00	2.18E-01	2.26E-01	3.36E-01		pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Cobalt-60	EPA 901.1 Modified	2.00E-02	7.70E-02	7.70E-02	1.08E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Cesium-134	EPA 901.1 Modified	-1.62E-02	4.30E-02	4.30E-02	1.22E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Cesium-137	EPA 901.1 Modified	1.94E-01	8.36E-02	8.42E-02	1.23E-01		pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Europium-152	EPA 901.1 Modified	-4.59E-02	1.37E-01	1.37E-01	3.18E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Europium-154	EPA 901.1 Modified	-1.13E-01	2.30E-01	2.30E-01	1.60E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Europium-155	EPA 901.1 Modified	5.18E-01	2.15E-01	2.17E-01	3.46E-01		pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Holmium-166m	EPA 901.1 Modified	5.11E-02	1.21E-01	1.21E-01	1.28E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Iodine-129	EPA 901.1 Modified	-3.66E-01	2.93E-01	2.94E-01	3.85E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Potassium-40	EPA 901.1 Modified	2.71E+01	3.28E+00	3.56E+00	1.32E+00		pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Manganese-54	EPA 901.1 Modified	-5.24E-03	8.12E-02	8.12E-02	1.13E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	3.39E-02	7.06E-02	7.06E-02	9.90E-02	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Niobium-94	EPA 901.1 Modified	-5.29E-02	7.78E-02	7.79E-02	9.34E-02	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Lead-210	EPA 901.1 Modified	2.06E+00	1.88E+00	1.88E+00	3.11E+00	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Lead-212	EPA 901.1 Modified	1.15E+00	2.17E-01	2.25E-01	3.01E-01		pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Lead-214	EPA 901.1 Modified	1.39E+00	2.40E-01	2.50E-01	3.33E-01		pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Promethium-145	EPA 901.1 Modified	-4.71E-03	2.42E-01	2.42E-01	3.53E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Radium-226	EPA 901.1 Modified	1.22E+00	2.18E-01	2.26E-01	3.36E-01		pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Antimony-125	EPA 901.1 Modified	-3.84E-02	1.67E-01	1.67E-01	2.46E-01	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Thorium-234	EPA 901.1 Modified	3.78E+00	1.72E+00	1.73E+00	2.67E+00	U	pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Thallium-208	EPA 901.1 Modified	9.87E-01	2.58E-01	2.63E-01	4.53E-01		pCi/g	
20-01037-13	TRG	L2-10214-D-FIGS-006-SS-A	12/11/19 09:30	1/9/2020	1/13/2020	20-01037	Uranium-235	EPA 901.1 Modified	5.63E-01	4.41E-01	4.42E-01	6.87E-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



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0033

Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:						
			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Actinium-228	EPA 901.1 Modified	1.04E+00	2.84E-01	2.89E-01	5.35E-01		pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Silver-108m	EPA 901.1 Modified	-1.77E-03	6.27E-02	6.27E-02	6.30E-02	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Americium-241	EPA 901.1 Modified	-1.14E-01	1.62E-01	1.62E-01	1.91E-01	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Barium-133	EPA 901.1 Modified	2.72E-02	3.08E-02	3.08E-02	8.82E-02	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Bismuth-214	EPA 901.1 Modified	9.74E-01	2.56E-01	2.61E-01	3.90E-01		pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Cobalt-60	EPA 901.1 Modified	5.63E-02	6.26E-02	6.27E-02	8.66E-02	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Cesium-134	EPA 901.1 Modified	1.70E-03	2.37E-02	2.37E-02	9.37E-02	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Cesium-137	EPA 901.1 Modified	1.33E-01	6.95E-02	6.99E-02	1.06E-01		pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Europium-152	EPA 901.1 Modified	0.00E+00	1.56E-01	1.56E-01	2.54E-01	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Europium-154	EPA 901.1 Modified	-4.24E-03	1.94E-01	1.94E-01	1.34E-01	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Europium-155	EPA 901.1 Modified	1.12E-01	1.13E-01	1.13E-01	1.88E-01	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Holmium-166m	EPA 901.1 Modified	4.55E-02	8.97E-02	8.97E-02	1.03E-01	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Iodine-129	EPA 901.1 Modified	3.49E-02	2.16E-01	2.16E-01	2.91E-01	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.71E+01	2.29E+00	2.46E+00	1.29E+00		pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Manganese-54	EPA 901.1 Modified	-2.56E-02	5.86E-02	5.86E-02	8.49E-02	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	-4.38E-02	5.27E-02	5.28E-02	6.27E-02	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Niobium-94	EPA 901.1 Modified	-1.45E-02	4.81E-02	4.81E-02	7.17E-02	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Lead-210	EPA 901.1 Modified	1.55E+00	1.52E+00	1.53E+00	2.53E+00	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Lead-212	EPA 901.1 Modified	9.83E-01	1.80E-01	1.87E-01	2.08E-01		pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Lead-214	EPA 901.1 Modified	1.07E+00	2.18E-01	2.25E-01	2.82E-01		pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Promethium-145	EPA 901.1 Modified	-4.88E-02	2.35E-01	2.35E-01	2.97E-01	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Radium-226	EPA 901.1 Modified	9.74E-01	2.56E-01	2.61E-01	3.90E-01		pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Antimony-125	EPA 901.1 Modified	-3.30E-02	1.07E-01	1.07E-01	1.76E-01	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Thorium-234	EPA 901.1 Modified	4.14E-01	1.49E+00	1.49E+00	1.91E+00	U	pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Thallium-208	EPA 901.1 Modified	7.51E-01	1.81E-01	1.85E-01	2.70E-01		pCi/g	
20-01037-14	TRG	L2-10214-E-FSGS-008-SS-A	12/10/19 12:44	1/9/2020	1/13/2020	20-01037	Uranium-235	EPA 901.1 Modified	1.96E-01	3.87E-01	3.87E-01	5.26E-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 CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

0034

Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:						
			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Actinium-228	EPA 901.1 Modified	3.73E-01	1.44E-01	1.45E-01	2.73E-01		pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Silver-108m	EPA 901.1 Modified	1.54E-02	2.00E-02	2.00E-02	5.03E-02	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Americium-241	EPA 901.1 Modified	-5.89E-02	7.07E-02	7.08E-02	1.08E-01	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Barium-133	EPA 901.1 Modified	-4.95E-02	9.38E-02	9.39E-02	8.59E-02	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Bismuth-214	EPA 901.1 Modified	3.29E-01	1.05E-01	1.07E-01	1.77E-01		pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Cobalt-60	EPA 901.1 Modified	-1.68E-02	4.76E-02	4.76E-02	4.91E-02	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Cesium-134	EPA 901.1 Modified	-3.17E-03	1.47E-02	1.47E-02	6.12E-02	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Cesium-137	EPA 901.1 Modified	8.77E-02	5.44E-02	5.46E-02	8.53E-02		pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Europium-152	EPA 901.1 Modified	1.80E-02	1.17E-01	1.17E-01	1.53E-01	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Europium-154	EPA 901.1 Modified	-1.67E-02	1.06E-01	1.06E-01	7.79E-02	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Europium-155	EPA 901.1 Modified	1.79E-01	1.01E-01	1.01E-01	1.57E-01		pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Holmium-166m	EPA 901.1 Modified	4.96E-03	6.11E-02	6.11E-02	5.82E-02	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Iodine-129	EPA 901.1 Modified	2.28E-03	1.61E-01	1.61E-01	2.62E-01	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Potassium-40	EPA 901.1 Modified	7.45E+00	1.13E+00	1.20E+00	3.79E-01		pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Manganese-54	EPA 901.1 Modified	-7.12E-03	3.94E-02	3.94E-02	5.97E-02	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	-4.37E-03	3.50E-02	3.50E-02	4.39E-02	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Niobium-94	EPA 901.1 Modified	-2.13E-02	3.79E-02	3.79E-02	4.99E-02	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Lead-210	EPA 901.1 Modified	1.02E+00	7.27E-01	7.29E-01	1.24E+00	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Lead-212	EPA 901.1 Modified	4.84E-01	1.26E-01	1.28E-01	1.56E-01		pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Lead-214	EPA 901.1 Modified	4.36E-01	1.15E-01	1.17E-01	1.81E-01		pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Promethium-145	EPA 901.1 Modified	-5.20E-02	1.12E-01	1.12E-01	1.78E-01	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Radium-226	EPA 901.1 Modified	3.29E-01	1.05E-01	1.07E-01	1.77E-01		pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Antimony-125	EPA 901.1 Modified	7.68E-02	1.05E-01	1.05E-01	1.69E-01	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Thorium-234	EPA 901.1 Modified	2.62E-01	6.45E-01	6.45E-01	1.06E+00	U	pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Thallium-208	EPA 901.1 Modified	4.66E-01	1.30E-01	1.32E-01	1.33E-01		pCi/g	
20-01037-15	TRG	L2-10214-E-FSGS-006-SB-A	12/11/19 12:55	1/9/2020	1/13/2020	20-01037	Uranium-235	EPA 901.1 Modified	1.90E-01	2.10E-01	2.10E-01	3.26E-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



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0035

<h1>Eberline Analytical</h1> <h2>Final Report of Analysis</h2>			Report To:						Work Order Details:						
			Jeffrey Graham						SDG:	20-01037					
			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	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Actinium-228	EPA 901.1 Modified	4.28E-01	1.82E-01	1.84E-01	3.49E-01		pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Silver-108m	EPA 901.1 Modified	-4.63E-02	6.48E-02	6.49E-02	5.49E-02	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Americium-241	EPA 901.1 Modified	-2.10E-01	1.31E-01	1.31E-01	1.70E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Barium-133	EPA 901.1 Modified	1.73E-02	1.00E-01	1.00E-01	1.17E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Bismuth-214	EPA 901.1 Modified	5.98E-01	1.28E-01	1.31E-01	1.50E-01		pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Cobalt-60	EPA 901.1 Modified	5.28E-02	5.14E-02	5.15E-02	7.59E-02	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Cesium-134	EPA 901.1 Modified	8.23E-03	2.56E-02	2.56E-02	8.80E-02	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Cesium-137	EPA 901.1 Modified	8.34E-02	6.34E-02	6.36E-02	1.03E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Europium-152	EPA 901.1 Modified	3.00E-02	1.23E-01	1.23E-01	2.22E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Europium-154	EPA 901.1 Modified	-1.12E-01	1.41E-01	1.41E-01	1.15E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Europium-155	EPA 901.1 Modified	3.54E-02	9.58E-02	9.58E-02	1.85E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Holmium-166m	EPA 901.1 Modified	5.84E-03	7.23E-02	7.23E-02	8.74E-02	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Iodine-129	EPA 901.1 Modified	2.12E-01	1.87E-01	1.87E-01	2.87E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.12E+01	1.64E+00	1.74E+00	9.14E-01		pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Manganese-54	EPA 901.1 Modified	-8.00E-03	5.65E-02	5.65E-02	7.84E-02	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	1.36E-02	4.51E-02	4.51E-02	5.79E-02	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Niobium-94	EPA 901.1 Modified	-1.96E-03	5.10E-02	5.10E-02	7.24E-02	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Lead-210	EPA 901.1 Modified	3.04E+00	1.33E+00	1.33E+00	2.08E+00		pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Lead-212	EPA 901.1 Modified	5.53E-01	1.63E-01	1.66E-01	2.25E-01		pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Lead-214	EPA 901.1 Modified	5.51E-01	1.46E-01	1.49E-01	2.52E-01		pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Promethium-145	EPA 901.1 Modified	-1.06E-01	1.58E-01	1.58E-01	2.24E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Radium-226	EPA 901.1 Modified	5.98E-01	1.28E-01	1.31E-01	1.50E-01		pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Antimony-125	EPA 901.1 Modified	1.63E-01	1.18E-01	1.18E-01	2.04E-01	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Thorium-234	EPA 901.1 Modified	2.37E+00	1.12E+00	1.12E+00	1.77E+00	U	pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Thallium-208	EPA 901.1 Modified	4.58E-01	1.38E-01	1.40E-01	2.40E-01		pCi/g	
20-01037-16	TRG	L2-10214-F-FSGS-001-SS-A	12/12/19 10:00	1/9/2020	1/13/2020	20-01037	Uranium-235	EPA 901.1 Modified	6.20E-02	3.11E-01	3.11E-01	4.66E-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



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0036

Eberline Analytical Final Report of Analysis			Report To:						Work Order Details:							
			Jeffrey Graham						SDG:	20-01037						
			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		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Actinium-228	EPA 901.1 Modified	4.83E-01	2.18E-01	2.19E-01	5.91E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Silver-108m	EPA 901.1 Modified	6.57E-03	3.47E-02	3.47E-02	6.72E-02	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Americium-241	EPA 901.1 Modified	-1.18E-02	6.86E-02	6.86E-02	1.88E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Barium-133	EPA 901.1 Modified	-1.65E-02	4.81E-02	4.81E-02	1.24E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Bismuth-214	EPA 901.1 Modified	7.28E-01	1.70E-01	1.74E-01	2.64E-01		pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Cobalt-60	EPA 901.1 Modified	9.56E-03	7.72E-02	7.72E-02	1.01E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Cesium-134	EPA 901.1 Modified	2.10E-02	3.45E-02	3.46E-02	8.89E-02	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Cesium-137	EPA 901.1 Modified	1.20E-03	7.52E-02	7.52E-02	1.13E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Europium-152	EPA 901.1 Modified	5.13E-02	2.07E-01	2.07E-01	2.65E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Europium-154	EPA 901.1 Modified	5.11E-02	1.64E-01	1.64E-01	1.37E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Europium-155	EPA 901.1 Modified	2.19E-01	1.48E-01	1.48E-01	2.80E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Holmium-166m	EPA 901.1 Modified	1.26E-01	6.01E-02	6.04E-02	1.14E-01		pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Iodine-129	EPA 901.1 Modified	2.44E-01	2.35E-01	2.36E-01	3.55E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Potassium-40	EPA 901.1 Modified	1.77E+01	2.41E+00	2.58E+00	5.29E-01		pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Manganese-54	EPA 901.1 Modified	-2.92E-02	7.10E-02	7.10E-02	9.64E-02	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Molybdenum-93	EPA 901.1 Modified	-1.05E-02	5.37E-02	5.37E-02	5.58E-02	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Niobium-94	EPA 901.1 Modified	9.68E-03	5.19E-02	5.19E-02	8.55E-02	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Lead-210	EPA 901.1 Modified	2.82E+00	1.91E+00	1.92E+00	3.12E+00	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Lead-212	EPA 901.1 Modified	5.65E-01	1.81E-01	1.84E-01	2.56E-01		pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Lead-214	EPA 901.1 Modified	7.32E-01	2.16E-01	2.19E-01	3.25E-01		pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Promethium-145	EPA 901.1 Modified	-1.98E-02	2.58E-01	2.58E-01	3.30E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Radium-226	EPA 901.1 Modified	7.28E-01	1.70E-01	1.74E-01	2.64E-01		pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Antimony-125	EPA 901.1 Modified	1.08E-01	1.15E-01	1.15E-01	2.21E-01	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Thorium-234	EPA 901.1 Modified	2.16E+00	1.64E+00	1.64E+00	2.70E+00	U	pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Thallium-208	EPA 901.1 Modified	5.89E-01	1.74E-01	1.77E-01	2.64E-01		pCi/g		
20-01037-17	TRG	L2-10214-F-QIGS-001-SS-A	12/12/19 12:45	1/9/2020	1/13/2020	20-01037	Uranium-235	EPA 901.1 Modified	3.85E-03	4.59E-01	4.59E-01	5.90E-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 CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

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ZS-WM-131
Revision 0
Information Use

20F01037

Attachment 1 - Chain-of-Custody Form

	Sample ID	Sample Log	Matrix	Sample Type	Sample Container			Sample Date	Sample Time	Analysis Type	Preservative	Remarks
					Vol	Unit	Type Qty					
4	L2-10214-A-FIGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/16/19	1334	5 ROC HTD	NA	706.48
5	L2-10214-A-QIGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/16/19	1334	5 ROC HTD	NA	624.27
6	L2-10214-A-FIGS-002-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/16/19	1336	5 ROC HTD	NA	640.46
7	L2-10214-B-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/14/19	1234	5 ROC HTD	NA	586.29
8	L2-10214-B-FSGS-015-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/14/19	1258	5 ROC HTD	NA	700.59
9	L2-10214-C-FSGS-016-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/13/19	1330	5 ROC HTD	NA	493.05
10	L2-10214-C-FIGS-005-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/13/19	1308	5 ROC HTD	NA	679.18
11	L2-10214-D-FSGS-007-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/11/19	1002	5 ROC HTD	NA	488.04
12	L2-10214-D-FSGS-003-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/11/19	0924	5 ROC HTD	NA	541.25
13	L2-10214-D-FIGS-006-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/11/19	0930	5 ROC HTD	NA	538.3
14	L2-10214-E-FSGS-008-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/10/19	1244	5 ROC HTD	NA	659.59
15	L2-10214-E-FSGS-006-SB-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/11/19	1255	5 ROC HTD	NA	842.9
16	L2-10214-F-FSGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/12/19	1000	5 ROC HTD	NA	572.48
17	L2-10214-F-QIGS-001-SS-A	NA	NA	SOIL	500	ml	MARINELLI 1	12/12/19	1245	5 ROC HTD	NA	557.5

[303]

REC 1-9-20 1327

