ZION SOLUTIONS LLC
An EnergySolutions Company

ZION STATION RESTORATION PROJECT
FINAL STATUS SURVEY RELEASE RECORD

ADJACENT OF SOUTH RESTRICTED AREA - LAKESHORE
SURVEY UNIT 10220C

Revision 1

June 2019

Summary of Changes in this Revision:

- Rev. 1: Revised Release Record. Changes include the following;
  - Added additional acronyms to "List of Acronyms and Abbreviations
  - Corrected spelling errors
  - Corrected version of NAD.
  - Spelled out acronyms used 1st time in text
  - Added statement pertaining to subsurface soil sampling during FSS
  - Added statement pertaining to selection of reported values for results <MDC
  - Corrected use of MARSSIM 2000 software
  - Added units to header for Tables 9 and 10
  - Corrected sample ID number presentation in Tables 9 and 10
  - Corrected sample ID number presentation in text.
  - Changed investigation level for scanning to be consistent with Table 11
  - Added clarifying language for inferring HTD concentrations
  - Corrected title to Table H.1 of NUREG-1757
  - Renumbered the Attachments such that the gamma spec and Eberline reports were last.

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LIST OF ACRONYMS AND ABBREVIATIONS

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

TSD	Technical Support Documents
UBGR	Upper Bound of the Gray Region
UCL	Upper Confidence Level
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 10220C, "Adjacent of South Restricted Area - Lakeshore," has been generated for the Zion Station Restoration Project (ZSRP) in accordance with Zion*Solutions* procedure ZS-LT-300-001-005, *"Final Status Survey Data Reporting"* (Reference 1) and satisfies the requirements of Section 5.11 of the *"Zion Station Restoration Project License Termination Plan"* (LTP) (Reference 2).

A Final Status Survey (FSS) package (L3-10220C-F) was developed in accordance with Zion*Solutions* procedure ZS-LT-300-001-001, *"Final Status Survey Package Development"* (Reference 3), the ZSRP LTP, and with guidance from NUREG-1575, Revision 1, "*Multi-Agency Radiation Survey and Site Investigation Manual"* (MARSSIM) (Reference 4).

This open land survey unit has a MARSSIM classification of 3. 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. Fourteen (14) randomly located surface soil samples were acquired from the survey unit. In addition, surface scanning was performed on 5% of the total surface area in the survey unit. As an investigation of the creek that runs west-east through the center of the survey unit, five (5) additional judgmental samples were taken. The analytical results for all soil samples (random and judgmental) taken in survey unit 10220C indicate that the Sum-of-Fraction (SOF) for each sample, considering the concentration of all applicable Radionuclides of Concern (ROC), either by direct measurement or by inference, is less than 0.1 when applying the respective Operational Derived Concentration Guideline Levels (OpDCGL). Therefore, the null hypothesis is rejected and survey unit 10220C is acceptable for unrestricted release.

Picture 1 – Survey Unit 10220C

2. SURVEY UNIT DESCRIPTION

Adjacent of South Restricted Area - Lakeshore, survey unit 10220C, is an impacted Class 3 open land survey unit. It is bounded by Class 2 survey unit 10220A to the north, wetlands areas to the west and south, and Class 3 survey unit 10224 and Lake Michigan to the east. "Bull Creek" traverses the center of the survey unit in an east/west direction. The survey unit area is 27,870 m^2.

The topography of the survey unit is mainly flat with some small dips and depressions. The soil is mostly loam and beach sand. The terrain consists of thick underbrush, wetlands, trees, and an asphalt road. Solid physical items such as rocks, wooden stakes, a concrete and metal gate, chain-link fencing with barbed wire, an air monitoring system, an underground concrete housing, and a fire hydrant are present in the area.

The boundary of the survey unit was defined using a Global Positioning System (GPS) based on the Illinois State Plane System North American Datum (NAD) 1983 East. The reference coordinates associated with this survey unit are denoted on Figure 1 located in Attachment 1.

3. CLASSIFICATION BASIS

Survey unit 10220C was classified in accordance with Zion*Solutions* procedure ZS-LT-300-001-002, "*Survey Unit Classification*" (Reference 5).

Impacted Class 3 open land survey unit 10220 was originally designated as a Class 3 survey unit by the *"Historical Site Assessment"* (HSA) (Reference 6). The survey unit was broken into three (3) smaller Class 3 survey units on July 23, 2012. 10220C is the south section of the original area. The HSA does not cite any processes and/or incidents involving the use and/or handling of radioactive material in this open land survey unit and an inspection of the survey unit did not identify any visual indications that there are any subsurface burial sites present in this area.

Characterization surveys were performed in this survey unit from November 5, 2012, through December 19, 2012. The survey design for this survey unit called for the acquisition of thirty-one (31) surface soil samples taken at random locations and five (5) additional surface soil samples taken at judgmental locations.

Three-thousand four-hundred and fifty-three (3,453) square meters or approximately 14% of the total surface area in the survey unit was scanned using a Ludlum Model 2350-1 and a Model 44-10 Sodium Iodide (NaI) detector. For the area scanned, the average observed background in the survey unit was 5,395 counts per minute (cpm). The average observed scan measurement was 6,037 cpm with a maximum observed measurement of 8,418 cpm.

Nine (9) scan alarms were observed in this survey unit with the scan alarm set-point set at the Minimum Detectable Count Rate (MDCR) plus background. The area exhibiting elevated activity, which was primarily located in and around Bull Creek, was investigated by additional scans and twenty (20) investigative surface soil samples were acquired at the locations where the scan alarms were observed.

Fifty-six (56) surface soil samples and two (2) Quality Control (QC) split samples were acquired and analyzed by the on-site gamma spectroscopy system. Cs-137 was identified at concentrations greater than the Minimum Detectable Concentration (MDC) of the instrument in forty-two (42) of the surface soil samples taken. No other potential plant-derived radionuclides were positively identified. The average Cs-137 concentration observed in the analysis of the surface soil samples was 0.32 pCi/g with a maximum observed concentration of 1.14 pCi/g. The majority of the samples with elevated Cs-137 concentration were located in and around Bull Creek. It is postulated that background levels of Cs-137 in the soil surrounding Bull Creek concentrates in this area due to the fluctuating water levels in the creek.

The locations of scan areas and surface soil samples taken during characterization in survey unit 10220C are illustrated on Figure 2 in Attachment 1. A summary of the analysis results for the surface soil samples taken during site characterization are presented in Table 1.

Table 1 - Statistical Quantities for Cs-137 and Co-60 from the 2012 Characterization Survey

Statistical Quantities	Cs-137 (pCi/g)	Co-60 (pCi/g)
Minimum Value :	0.028	0.010
Maximum Value :	1.140	0.180
Mean :	0.277	0.051
Median :	0.225	0.048
Standard Deviation :	0.025	0.030

A Radiological Engineer (RE) performed a visual inspection and walk-down of the survey unit on 05/02/2016 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 procedure ZS-LT-300-001-002, "*Survey Unit Classification*" as part of the survey design for FSS.

Based upon completion of Survey Unit Classification Basis for final classification, which included a review of the historic information, the results of the Characterization Survey data and, completion of a final Survey Unit Classification Worksheet, it was concluded that there was a low probability for the presence of residual radioactivity in soils in concentrations greater than 50% of the OpDCGLs, justifying a final survey unit classification of Class 3.

4. DATA QUALITY OBJECTIVES (DQO)

Final Status Survey 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 is described in the ZSRP LTP in accordance with MARSSIM. The appropriate design for a given survey will be 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 10220C did not exceed the release criteria specified in the LTP and that the potential dose from residual radioactivity is As Low As Reasonably Achievable (ALARA).

Zion*Solutions* TSD 11-001, *"Potential Radionuclides of Concern During the Decommissioning of Zion Station"* (Reference 7) established the basis for an initial suite of potential ROC for the decommissioning of the Zion Nuclear Power Station (ZNPS). LTP Chapter 2 provides detailed characterization data that describes the results of surveys taken of soils. Surface and subsurface soil samples were taken in each impacted open land survey units and analyzed for the presence of plant-derived radionuclides. The results of surface and subsurface soil characterization in the impacted area surrounding ZNPS indicate that there is minimal residual radioactivity in soil. Consequently, due to the absence of any significant source term in soil, the suite of ROC and radionuclide mixture

derived for non-activated concrete was considered as a reasonably conservative mixture to apply to soils for FSS planning and implementation.

LTP Chapter 6, section 6.5.2 discusses the process used to derive the ROC for the decommissioning of ZNPS, including the elimination of insignificant dose contributors (IC) from the initial suite. Based upon the analysis of the mixture, it was determined that Co-60, Ni-63, Sr-90, Cs-134 and Cs-137 accounted for 99.5% of all dose in the non-activated contaminated concrete mixes.

Table 2 presents the ROC for the decommissioning of soils at ZNPS and the normalized mixture fractions based on the radionuclide mixture.

Table 2 - Dose Significant Radionuclides and Mixture

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

(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 are derived from activity/dose relationships through various exposure pathway scenarios. 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 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 historic information, there are no expectations of encountering a source term geometry that is comprised of a clean surface layer of soil over a contaminated subsurface soil layer. Zion*Solutions* TSD 14-011, *"Soil Area Factors"* (Reference 8) and LTP Chapter 6, section 6.8 provides the exposure scenarios and modeling parameters that were used to

calculate the site-specific DCGLs for soils (referred to a Base Case Soil DCGLs [BcDCGL] in this Release Record).

At ZNPS, compliance is demonstrated through the summation of dose from four distinct source terms for the end-state (basements, soils, buried pipe and groundwater). 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 provided in Table 3 and Table 4, respectively. The IC dose percentage of 10% was used to adjust the DCGLs in soils to account for the dose from the eliminated IC radionuclides.

Table 3 - 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 4 - 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 Total Effective Dose Equivalent (TEDE) of 25 mrem per year to an Average Member of the Critical Group (AMCG). To ensure that the summation of dose from each source term is

25 mrem/year or less after all FSS is completed, the BcDCGLs are reduced based on an expected, or *a priori*, fraction of the 25 mrem/year dose limit from each source term. The reduced DCGLs, or "Operational" DCGLs can be related to the BcDCGLs as an expected fraction of dose based on an *a priori* assessment of what the expected dose should be based on the results of site characterization, process knowledge and the extent of planned remediation. The OpDCGL is then used as the DCGL for the FSS design of the survey unit (calculation of surrogate DCGLs, investigations levels, etc.). Details of the OpDCGLs derived for each dose component and the basis for the applied *a priori* dose fractions are provided in Zion*Solutions* TSD 17-004, *"Operational Derived Concentration Guideline Levels for Final Status Survey"* (Reference 9).

The OpDCGLs for the FSS of surface and subsurface soils are presented in Table 5 and Table 6, respectively.

Table 5 - 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 6 - Operational DCGLs for Subsurface Soils ($OpDCGL_{SB}$)

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

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

residual radioactivity in subsurface soil. Consequently, Zion proposes to perform minimal subsurface sampling during FSS.

Instrument DQOs included a verification of the ability of the survey instrument to detect the radiation(s) of interest relative to the 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 assure 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 minimum acceptable MDC for measurements obtained using field instruments was 50 percent of the applicable OpDCGL.

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 procedure ZS-LT-300-001-001 "*Final Status Survey Package Development*." The FSS plan uses an integrated sample design that combines scanning surveys and sampling which can be either random or judgmental.

The DQO process determined that Co-60, Ni-63, Sr-90, Cs-134 and Cs-137 would be the ROC in survey unit 10220C. During FSS, concentrations for Hard-to-Detect (HTD) ROC Ni-63 and Sr-90 are 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 Zion*Solutions* TSD 14-019, *"Radionuclides of Concern for Soil and Basement Fill Model Source Terms"* (Reference 10) and are presented in Table 7. The maximum ratios will be used in the surrogate calculations during FSS unless area specific ratios are determined by continuing characterization.

Table 7 - 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 10220C, the surrogate OpDCGLs for Co-60 and Cs-137 were computed based on the maximum ratios from Table 7.

The equation for calculating a surrogate DCGL is as follows:

Equation 1

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

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

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

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

Using the OpDCGLs presented in Table 5 and the maximum ratios from Table 7, the following surrogate calculations were performed:

Equation 2

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

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

Equation 3

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

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

The action level for investigation in a Class 3 open land survey unit is 50% of the OpDCGL. The surrogate DCGL for Co-60 while inferring Ni-63 is 0.898 pCi/g, and the

surrogate DCGL for Cs-137 while inferring Sr-90 is 3.622 pCi/g. Using the normalized mixture for gamma-emitting ROC from Table 2, the surrogate adjusted gamma DCGL is then calculated as follows:

Equation 4

$$Surrogate_{DCGL\ (gamma)} = \frac{1}{\left[\left(\frac{0.012}{0.898_{(Co-60)}}\right) + \left(\frac{0.00001}{1.733_{Cs-134}}\right) + \left(\frac{0.988}{3.622_{(Cs-137)}}\right)\right]} = 3.494\ pCi/g$$

The surrogate adjusted gamma DCGL equals 3.494 pCi/g. The action levels for survey unit 10220C are based on 50% of the DCGL and are presented in Table 8.

Table 8 - Action Levels for Survey Unit 10220C

ROC	DCGL (pCi/g)
Co-60 (1)	0.449
Cs-134(2)	0.867
Cs-137 (3)	1.811
Gross Gamma (4)	1.747

(1) Based on 50% of surrogate adjusted DCGL of 0.898 pCi/g for Co-60 while inferring Ni-63
(2) Based on 50% of Operational DCGL
(3) Based on 50% of surrogate adjusted DCGL of 3.622 pCi/g for Cs-137 while inferring Sr-90
(4) Based on 50% of normalized surrogate adjusted DCGLs of 3.494 pCi/g for gamma emitting ROC

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 Elevated Measurement Comparison (EMC) did not apply to this survey unit since it is a Class 3 survey unit and discrete, elevated areas of contamination were not expected.

The number of soil samples for FSS was determined in accordance with procedure ZS-LT-300-001-001 "*Final Status Survey Package Development*." The relative shift (Δ/σ) for the survey unit data set is defined as shift (Δ), which is the Upper Boundary 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 1 and 3. The largest value the Δ/σ can have is 3. If the Δ/σ exceeds 3, then the value of 3 will be used for Δ/σ. The Δ/σ for survey unit 10220C based on Cs-137 was calculated as follows:

Equation 5

$$\Delta/\sigma \quad = \quad 0.5/0.025 \quad = \quad 20$$

As the calculated relative shift (20) was greater than 3, then a value of 3 was used as the adjusted Δ/σ. 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 14.

A Prospective Power Curve was generated using MARSSIM 2000, a software package developed for implementation of the MARSSIM in support of the decommissioning license termination rule (10CFR20, Subpart E). The result of the MARSSIM 2000 computer run showed adequate power for the survey design. The survey design specified fourteen (14) surface soil samples for non-parametric statistical testing. Based upon a review of the historical information and characterization survey data, the locations for taking five (5) additional judgmental surface soil samples were selected at biased locations in the creek area in the center of the survey unit.

As the survey unit was classified as Class 3, sample locations were selected at random. The random locations of the surface soil samples were selected using Visual Sample Plan (VSP), in accordance with ZS-LT-300-001-001. Input parameters included use of Bing or Google Maps aerial photographs and the random sampling tool set with a predetermined number (14) of sample points. These coordinates were integrated with a GPS to locate sample locations in the field. Sample measurement locations for the surface soil samples taken for random design are listed with the GPS coordinates in Table 9.

ZSRP LTP Chapter 5, section 5.1 states that soil samples will be collected during FSS to confirm the HTD to surrogate radionuclide ratios (Table 7). 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 (see Table 7). The maximum ratios (Table 7) 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.

Table 9 – Random Sample Measurement Locations

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L3-10220C-FRGS-001-SS	641406.6753	343682.9801
L3-10220C-FRGS-002-SS	641413.6981	343618.1135
L3-10220C-FRGS-003-SS	641399.6525	343617.9865
L3-10220C-FRGS-004-SS	641390.0500	343573.0890
L3-10220C-FRGS-005-SS	641417.2095	343552.9929
L3-10220C-FRGS-006-SS	641410.1867	343487.9993
L3-10220C-FRGS-007-SS	641403.1639	343488.1263
L3-10220C-FRGS-008-SS	641368.0498	343444.6703
L3-10220C-FRGS-009-SS	641354.0041	343466.3348
L3-10220C-FRGS-010-SS	641361.0270	343531.4553
L3-10220C-FRGS-011-SS	641346.9813	343531.3284
L3-10220C-FRGS-012-SS	641371.5612	343574.7844
L3-10220C-FRGS-013-SS	641357.5156	343661.3156
L3-10220C-FRGS-014-SS	641354.3650	343661.1070

Fourteen (14) surface soil samples were required for the non-parametric statistical test (sample size N = 14). In addition, five (5) judgmental surface soil samples were taken to investigate the creek area. In total, nineteen (19) surface soil samples were collected for the FSS of this survey unit. Sample Measurement Locations for the judgmental surface soil samples are listed with the GPS coordinates in Table 10.

Table 10 – Judgmental Sample Measurement Locations

MEASUREMENT ID	NORTHING (meters)	EASTING (meters)
L3-10220C-FJGS-015-SS	641386.958	343541.547
L3-10220C-FJGS-016-SS	641380.290	343497.453
L3-10220C-FJGS-017-SS	641387.409	343604.253
L3-10220C-FJGS-018-SS	641379.687	343716.721
L3-10220C-FJGS-019-SS	641377.847	343573.230

A map of the random and judgmental surface soil sample locations are provided in Figure 3 in Attachment 1.

The selection of two (2) soil samples met the requirement that 10% of the samples collected for the FSS of survey unit 10220C be analyzed for HTD ROC. Sample #s L3-10220C-FRGS-002-SS and L3-10220C-FRGS-009-SS were selected based on exhibiting the highest concentration of Cs-137. Each selected sample was sent off-site (Eberline Analytical) for analysis of the HTD ROC as specified in LTP Chapter 5, section 5.1.

The implementation of quality control measures as referenced by LTP Chapter 5, section 5.9 and Zion*Solutions* ZS-LT-01, "*Quality Assurance Project Plan (for Characterization and FSS)*" (QAPP) (Reference 11) 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, #L3-10220C-FQGS-011-SS was selected randomly for split sample analysis for the FSS of this survey unit.

LTP Chapter 5, section 5.6.4.4 and Table 5-24 specifies that for Class 3 survey units, judgmental (biased) surface scans will be performed on areas with the greatest potential of contamination. For open land areas, this may include surface drainage areas and collection points. The fraction of scanning coverage required for survey unit 10220C was determined during the DQO process with the total amount and location(s) based on the likelihood of finding elevated activity during FSS. Based on the HSA, the results of the characterization survey, and the operational use of this survey unit, fourteen (14) different scan areas representing 1,400 m^2, or approximately 5% of the survey unit, of surface area was chosen at random. A map of the scan grid locations are provided in Figure 3.

For this Class 3 open land survey unit, the "Investigation Levels" for area scanning and soil sample measurement results are those levels specified in LTP Chapter 5, Table 5-25 and are reproduced below in Table 11.

Table 11 – Investigation Levels

Classification	Scan Investigation Levels	Direct Investigation Levels
Class 3	>Operational DCGL or >MDC_{scan} if MDC_{scan} is greater than Operational DCGL	>0.5 Operational DCGL

Table 12 provides a synopsis of the survey design for survey unit 10220C.

Table 12 – Synopsis of Survey Design

FEATURE	DESIGN CRITERIA	BASIS
Survey Unit Land Area	27,870 m^2	GPS measurements of area
Number of Measurements (N)	14 (random)	• $\sigma = 0.025$ • UBGR = SOF of 1 • LBGR = SOF of 0.5 • Type I error = 0.05 • Type II error = 0.05 • $\Delta/\sigma = 3$ (adjusted) (MARSSIM Table 5.5)
Grid Spacing	Random	(LTP Chapter 5, section 5.6.4.5.2)
DCGLs	• Co-60 – 1.091 pCi/g • Cs-134 – 1.733 pCi/g • Cs-137 – 3.630 pCi/g • Ni-63 – 914.458 pCi/g • Sr-90 – 3.095 pCi/g	Operational DCGLs for Surface Soils, (LTP Chapter 5, Table 5-7)
HTD ROC Analysis	Two (2) surface soil samples selected for HTD ROC analysis	(LTP Chapter 5, section 5.1)
Soil Investigation Level	>0.5 Operational DCGL	(LTP Chapter 5, Table 5-25)
Scan Survey Area Coverage	1,400 m^2 or ~5% areal coverage	Judgmental areal coverage, (LTP Chapter 5, Table 5-24)
Scan Investigation Level	>Operational DCGL or >MDC_{scan} if MDC_{scan} is greater than Operational DCGL	(LTP Chapter 5, Table 5-25)
QC	One (1) surface soil sample selected randomly for split sample analysis	(LTP Chapter 5, section 5.9)

6. SURVEY IMPLEMENTATION

For survey unit 10220C, 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, section 5.7.1.6.2, no subsurface soil sample(s) will be taken as part of the survey design in Class 3 open land survey units. However, if during the performance of FSS, the analysis of a surface soil sample, or the results of a surface gamma scan indicates 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 not encountered during the FSS of survey unit 10220C. Consequently, no subsurface soil samples were collected during FSS.

In addition, LTP Chapter 5, section 5.1 states that if levels of residual gamma radioactivity in an individual soil sample exceed a SOF of 0.1, then the sample(s) will be analyzed for HTD ROC. Again, this threshold was not encountered during the FSS of survey unit 10220C. Consequently, no additional surface soil samples in excess of the two (2) surface soil samples designated during survey design were analyzed for HTD ROC.

FSS field activities were conducted under FSS Sample Plan L3-10220C-F. FSS Sample Plan L3-10220C-F included DQOs, survey design, detailed FSS instructions, job safety analysis, and related procedures for reference. A "Field Log" (ZS-LT-300-001-001 Attachment 14) was used to document field activities and other information pertaining to the performance of the FSS.

FSS field activities were projected to take eight (8) working days to complete. Daily briefings were conducted to discuss the expectations for job performance and to review safety aspects of the job. The survey required field activities were performed during normal working hours starting on March 29, 2016 and concluding on May 31, 2016.

The fourteen (14) random surface soil sample locations were marked with flags based on GPS coordinates provided by VSP. Around each surface soil sample location, a 100 m^2 scan area was marked out. A total of fourteen (14) different scan areas were established, constituting an areal scan coverage of 1,400 m^2, or approximately 5% of the surface area in survey unit 10220C. Background was assessed in the survey unit and it was determined that, using a Ludlum 2350-1 paired with a Model 44-10 (2" x 2") sodium iodide (NaI) detector, background ranged from 2,908 counts per minute (cpm) up to 4,510 cpm.

All designated scan areas as denoted on Figure 3 in Attachment 1 were scanned 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 as close to the ground as possible and was moved at a scan speed of approximately 0.25 meters per second. In accordance with Zion*Solutions* TSD 11-004, "*Ludlum Model 44-10 Detector Sensitivity*" (Reference 12), scan MDC was sufficient to detect residual radioactivity at the action level (adjusted gross gamma DCGL of 1.747 pCi/g, which was based on 50% of the normalized surrogate adjusted OpDCGLs for gamma emitting ROC). Complete scan results are provided in Attachment 2.

In accordance with FSS design, fourteen (14) surface soil samples were collected at random locations. In addition, five (5) judgmental surface soil samples were taken to adequately bound the creek area in the central portion of the survey unit. The addition of the random and judgmental samples results in a total of nineteen (19) surface soil samples collected for the FSS of this survey unit. Each surface soil sample consisted of 1 liter of soil. The sample media was sifted to remove stones and other media larger than 1 centimeter in diameter. All collected soil samples were controlled, transported, stored, and transferred to the on-site laboratory using Chain-of-Custody (CoC) process from Zion*Solutions* procedure ZS-LT-100-001-004, "*Sample Media Preparation*" (Reference 13).

Two (2) samples (L3-10220C-FRGS-002-SS and L3-10220C-FRGS-009-SS) were selected for HTD radionuclide analysis.

The implementation of survey specific QC measures included the collection of one (1) sample (L3-10220C-FQGS-011-SS) for "split sample" analysis.

7. SURVEY RESULTS

The scan areas identified in the FSS plan were scanned for elevated radiation levels. The areas were scanned in accordance with the FSS plan between May 2, 2016 and May 23, 2016. No elevated measurement locations were identified by surface scan. Table 13 provides an overview of the scan results. Complete scan results are provided in Attachment 2.

Table 13 – Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level(1) (cpm)	# of Scan Alarms	Investigation Samples
GS001	5149	5374	None	None
GS002	5210	5228	None	None
GS003	4990	5228	None	None
GS004	3980	4079	None	None
GS005	3850	4079	None	None
GS006	3870	4079	None	None
GS007	3970	4079	None	None
GS008	4593	4798	None	None
GS009	4608	4798	None	None
GS010	4970	5186	None	None
GS011	4610	5186	None	None
GS012	4705	4798	None	None
GS013	3529	3943	None	None
GS014	3324	3943	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 on-site laboratory analyzed the fourteen (14) soil samples taken for non-parametric statistical testing using the on-site gamma spectroscopy system. A summary of the fourteen (14) samples collected for non-parametric statistical testing results is provided in Table 14. Gamma spectroscopy results (summarized in Table 14) revealed fourteen (14) samples above MDC for Cs-137 and no samples above MDC for Co-60 or Cs-134. The concentration for Ni-63 and Sr-90 are inferred based on the maximum ratios as specified in Table 7. 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 at within the vicinity of the ZNPS as presented in Zion*Solutions* TSD 13-004, "*Examination of Cs-137 Global Fallout in Soils at Zion Station*" (Reference 14). The complete gamma spectroscopy reports are presented in Attachment 6. The basic statistics for the random sample population is summarized in Table 15.

Table 14 – 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)
L3-10220C-FRGS-001-SS	3.68E-04	0.00E+00	**5.59E-02**	6.64E-02	1.12E-04
L3-10220C-FRGS-002-SS	6.01E-04	2.04E-04	**3.52E-01**	1.08E-01	7.04E-04
L3-10220C-FRGS-003-SS	8.89E-03	1.47E-02	**1.03E-01**	1.60E+00	2.06E-04
L3-10220C-FRGS-004-SS	2.01E-02	0.00E+00	**2.74E-01**	3.63E+00	5.48E-04
L3-10220C-FRGS-005-SS	2.00E-02	1.62E-02	**1.41E-01**	3.61E+00	2.82E-04
L3-10220C-FRGS-006-SS	1.53E-02	1.30E-02	**2.28E-01**	2.76E+00	4.56E-04
L3-10220C-FRGS-007-SS	2.93E-02	5.47E-03	**8.82E-02**	5.29E+00	1.76E-04
L3-10220C-FRGS-008-SS	3.49E-03	1.57E-02	**4.10E-02**	6.30E-01	8.20E-05
L3-10220C-FRGS-009-SS	7.91E-04	2.45E-03	**3.12E-01**	1.43E-01	6.24E-04
L3-10220C-FRGS-010-SS	5.46E-04	3.12E-03	**2.92E-01**	9.85E-02	5.84E-04
L3-10220C-FRGS-011-SS	1.81E-03	6.88E-04	**1.65E-01**	3.27E-01	3.30E-04
L3-10220C-FRGS-012-SS	4.22E-03	1.33E-03	**2.24E-01**	7.61E-01	4.48E-04
L3-10220C-FRGS-013-SS	5.50E-04	1.95E-02	**4.51E-02**	9.92E-02	9.02E-05
L3-10220C-FRGS-014-SS	3.53E-03	6.41E-03	**1.90E-02**	6.37E-01	3.80E-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 15 – Basic Statistical Properties of Random Sample Population

ROC	Mean (pCi/g)	Median (pCi/g)	Max (pCi/g)	Min (pCi/g)	Std. Dev.	BcDCGL (pCi/g)	Avg. SOF per ROC	Avg. Dose Per ROC
Co-60	7.82E-03	3.51E-03	2.93E-02	3.68E-04	9.47E-03	4.26	1.84E-03	4.59E-02
Cs-134	7.06E-03	4.30E-03	1.95E-02	0.00E+00	7.16E-03	6.77	1.04E-03	2.61E-02
Cs-137	1.67E-01	1.53E-01	3.52E-01	1.90E-02	1.13E-01	14.18	1.18E-02	2.95E-01
Ni-63	1.41E+00	6.33E-01	5.29E+00	6.64E-02	1.71E+00	3572.1	3.95E-04	9.88E-03
Sr-90	3.34E-04	3.06E-04	7.04E-04	3.80E-05	2.25E-04	12.09	2.77E-05	6.91E-04

The off-site laboratory, Eberline Analytical, processed the two (2) samples selected for HTD ROC analysis as specified in the survey design. Sample #s L3-10220C-FRGS-002-SS and L3-10220C-FRGS-009-SS were selected. Only HTD radionuclides included as ROC (Ni-63 and Sr-90 for soils) were included in the analysis. All analyses met the required MDC.

Cs-137 was positively detected in the off-site analysis of sample L3-10220C-FRGS-002-SS at a concentration of 4.03 E-01 pCi/g and in sample L3-10220C-FRGS-009-SS at a concentration of 3.38 E-01 pCi/g. Co-60 was also positively detected in sample L3-10220C-FRGS-009-SS at a concentration of 2.51 E-02 pCi/g. The results are provided in Table 16.

Table 16 – Off-Site Analysis Results (Eberline Analytical) for Sample ID #s L3-10220C-FRGS-002-SS and L3-10220C-FRGS-009-SS

Sample # L3-10220C-FRGS-002-SS

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	-3.32E-02	4.28E-02	5.98E-02	No
Cs-134	6.49E-03	2.04E-02	4.57E-02	No
Cs-137	4.03E-01	7.19E-02	8.51E-02	Yes
Ni-63	6.89E-01	1.40E+00	2.37E+00	No
Sr-90	6.39E-02	3.97E-01	8.41E-01	No

Sample # L3-10220C-FRGS-009-SS

ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
Co-60	2.51E-02	1.55E-02	2.24E-02	Yes
Cs-134	-5.07E-03	9.42E-03	2.76E-02	No
Cs-137	3.38E-01	4.02E-02	3.33E-02	Yes
Ni-63	1.09E+00	1.42E+00	2.39E+00	No
Sr-90	3.09E-01	3.90E-01	8.00E-01	No

The on-site laboratory analyzed the five (5) judgmental surface soil samples taken along the Bull Creek area using the on-site gamma spectroscopy system. A summary of the analytical results for the five (5) surface samples collected at judgmental locations is provided in Table 17. Gamma spectroscopy results (summarized in Table 17) revealed three (3) samples above MDC for Cs-137 and no samples above MDC for Co-60 or Cs-134. The concentration for Ni-63 and Sr-90 are inferred based on the maximum ratios as specified in Table 7. The complete gamma spectroscopy reports are presented in Attachment 6.

Table 17 – Summary of Gamma Spectroscopy Results for Judgmental 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)
L3-10220C-FJGS-015-SS	1.78E-02	2.33E-03	**1.85E-01**	0.00E+00	3.70E-04
L3-10220C-FJGS-016-SS	9.63E-03	5.20E-04	2.48E-02	1.74E+00	4.96E-05
L3-10220C-FJGS-017-SS	8.76E-03	5.19E-04	**2.46E-01**	0.00E+00	4.92E-04
L3-10220C-FJGS-018-SS	3.30E-03	1.54E-02	1.62E-02	5.95E-01	3.24E-05
L3-10220C-FJGS-019-SS	1.70E-02	1.80E-02	**1.79E-01**	0.00E+00	3.58E-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 implementation of survey specific QC measures included the collection of one (1) sample (L3-10220C-FQGS-011-SS) for "split sample" analysis. The on-site laboratory analyzed the designated QC sample using the on-site gamma spectroscopy system. A summary of the analytical results for the QC sample is provided in Table 18. Gamma spectroscopy results (summarized in Table 18) indicate that the measured concentration for Cs-137 was above MDC in the sample. The concentrations for Co-60 and Cs-134 were less than MDC in the sample. The concentration for Ni-63 and Sr-90 are inferred based on the maximum ratios as specified in Table 7.

Table 18 – Summary of Gamma Spectroscopy Results for QC Surface Soil Sample

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)
L3-10220C-FQGS-011-SS	8.09E-03	6.82E-03	**1.95E-01**	1.46E+00	3.90E-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 6

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

Where: C_n = concentration of radionuclide *n*

$DCGL_n$ = DCGL of radionuclide *n*.

The results of the unity rule calculation for the ROC in the random sample population as well as the judgmental samples for survey unit 10220C are provided in Table 19. QC results are presented in Table 20.

Table 19 – Sum-of-Fractions for Individual Surface Soil Samples (Random)

MEASUREMENT ID	FRACTION OF OPERATIONAL DCGL					SOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L3-10220C-FRGS-001-SS	0.0003	0.0000	0.0154	0.0001	0.0000	0.0158
L3-10220C-FRGS-002-SS	0.0006	0.0001	0.0970	0.0001	0.0002	0.0980
L3-10220C-FRGS-003-SS	0.0081	0.0085	0.0284	0.0018	0.0001	0.0468
L3-10220C-FRGS-004-SS	0.0184	0.0000	0.0755	0.0040	0.0002	0.0980
L3-10220C-FRGS-005-SS	0.0183	0.0269	0.0388	0.0039	0.0001	0.0706
L3-10220C-FRGS-006-SS	0.0140	0.0032	0.0628	0.0030	0.0001	0.0875
L3-10220C-FRGS-007-SS	0.0269	0.0007	0.0243	0.0058	0.0001	0.0601
L3-10220C-FRGS-008-SS	0.0032	0.0091	0.0113	0.0007	0.0000	0.0243
L3-10220C-FRGS-009-SS	0.0007	0.0014	0.0860	0.0002	0.0002	0.0884
L3-10220C-FRGS-010-SS	0.0005	0.0018	0.0804	0.0001	0.0002	0.0830
L3-10220C-FRGS-011-SS	0.0017	0.0004	0.0455	0.0004	0.0001	0.0480
L3-10220C-FRGS-012-SS	0.0039	0.0008	0.0617	0.0008	0.0001	0.0673
L3-10220C-FRGS-013-SS	0.0005	0.0113	0.0124	0.0001	0.0000	0.0243
L3-10220C-FRGS-014-SS	0.0032	0.0037	0.0052	0.0007	0.0000	0.0129

Random Measurements

Number of Random Measurements =	14
# of Random Measurements with OpSOF $\geq$ 1 =	0
# of Random Measurements with OpSOF > 0.1 (HTD Assessment) =	0
Max Individual Random Measurement OpSOF =	0.0980
Mean Random Measurement OpSOF =	0.0589

Table 19 (continued) – Sum-of-Fractions for Individual Surface Soil Samples (Judgmental)

MEASUREMENT ID	FRACTION OF OPERATIONAL DCGL					SOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L3-10220C-FJGS-015-SS	0.0163	0.0013	0.0510	0.0000	0.0001	0.0687
L3-10220C-FJGS-016-SS	0.0088	0.0003	0.0068	0.0019	0.0000	0.0179
L3-10220C-FJGS-017-SS	0.0080	0.0003	0.0678	0.0000	0.0002	0.0763
L3-10220C-FJGS-018-SS	0.0030	0.0089	0.0045	0.0007	0.0000	0.0170
L3-10220C-FJGS-019-SS	0.0156	0.0104	0.0493	0.0000	0.0001	0.0754

Table 20 – Sum-of-Fractions for QC Surface Soil Samples

MEASUREMENT ID	FRACTION OF OpDCGL					OpSOF
	Co-60	Cs-134	Cs-137	Ni-63	Sr-90	
L3-10220C-FQGS-011-SS	0.0074	0.0039	0.0537	0.0016	0.0001	0.0668

The mean BcSOF for survey unit 10220C is 0.0151 which equates to a dose of 0.3772 mrem/yr TEDE.

The mean of all identified isotopes are less than the Consultation Triggers for Residential Soil Concentration depicted in Table H.1 of NUREG 1757, Vol. 1, Rev. 2 (MOU Table 1). The full table is included in Attachment 3 of this Release Record.

8. QUALITY CONTROL

The on-site laboratory processed one (1) split sample, L3-10220C-FQGS-011-SS, using gamma spectroscopy analysis. The data was evaluated using USNRC acceptance criteria specified in Inspection Procedure No. 84750, *"Radioactive Waste Treatment, and Effluent and Environmental Monitoring"*(Reference 15). There was acceptable agreement between field split results. Refer to Attachment 4 for data and quality control analysis results.

9. INVESTIGATIONS AND RESULTS

No investigations were performed in survey unit 10220C.

10. REMEDIATION AND RESULTS

Historically, no radiological remedial action as described by MARSSIM Section 5.4 was performed in this survey unit prior to or as a result of the FSS. Chapter 4 of the ZSRP LTP determined that remediation beyond that required to meet the release criteria is unnecessary and that the remaining residual radioactivity in soil was ALARA.

11. CHANGES FROM THE FINAL STATUS SURVEY PLAN

Procedure ZS-LT-300-001-001, "*Final Status Survey Package Development*" states, "If a selected location is found to be either inaccessible or unsuitable, then the location will be adjusted to the closest adjacent suitable location. In these cases, a notation will be made in Attachment 14, "FSS Field Log," and the coordinates of the new location documented." Random sample locations 1, 4 and 13 were relocated due to obstructions or standing water.

12. DATA QUALITY ASSESSMENT (DQA)

The DQO sample design and data were reviewed in accordance with Zion*Solutions* procedure ZS-LT-300-001-004, *"Final Status Survey Data Assessment"* (Reference 16) for completeness and consistency. Documentation was complete and legible. Surveys and sample collection were consistent with the DQOs and were sufficient to ensure that the survey unit was properly designated as Class 3. The sampling design had adequate power as indicated by the Retrospective Power Curve.

The analytical results of all samples were less than a SOF of one. Additionally, the maximum activity for each ROC did not exceed 10% of their respective OpDCGL for surface soils.

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 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 5.

13. ANOMALIES

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

14. CONCLUSION

Survey unit 10220C has met the DQOs of the FSS plan. The ALARA criteria for soils as specified in Chapter 4 of the LTP were achieved. The EMC for soils was not applicable and remediation was not required.

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

The sample data passed the Sign Test. The null hypothesis was rejected. The Retrospective Power Curve showed that adequate power was achieved. The survey unit is properly classified as Class 3.

The mean SOF, when the analytical results were compared to the Base Case DCGLs, was 0.0151, which results in a dose contribution from soil in survey unit 10220C of 0.3772 mrem/yr TEDE, based on the average concentration of the ROC in samples used for non-parametric statistical sampling.

Survey unit 10220C is acceptable for unrestricted release.

15. REFERENCES

1. Zion*Solutions* procedure ZS-LT-300-001-005, “Final Status Survey Data Reporting”
2. “Zion Station Restoration Project License Termination Plan”
3. Zion*Solutions* procedure ZS-LT-300-001-001, “Final Status Survey Package Development”
4. NUREG-1575, Revision 1, “Multi-Agency Radiation Survey and Site Investigation Manual” (MARSSIM)
5. Zion*Solutions* procedure ZS-LT-300-001-002, “Survey Unit Classification”
6. “Historical Site Assessment” (HSA)
7. Zion*Solutions* TSD 11-001, “Potential Radionuclides of Concern during the Decommissioning of Zion Station”
8. Zion*Solutions* TSD 14-011, “Soil Area Factors”

9. Zion*Solutions* TSD 17-004, "Operational Derived Concentration Guideline Levels for Final Status Survey"
10. Zion*Solutions* TSD 14-019, "Radionuclides of Concern for Soil and Basement Fill Model Source Terms"
11. Zion*Solutions* ZS-LT-01, "Quality Assurance Project Plan (for Characterization and FSS)" (QAPP)
12. Zion*Solutions* TSD 11-004, "Ludlum Model 44-10 Detector Sensitivity"
13. Zion*Solutions* procedure ZS-LT-100-001-004, "Sample Media Preparation"
14. Zion*Solutions* TSD 13-004, "Examination of Cs-137 Global Fallout in Soils at Zion Station"
15. U.S. NRC Inspection Procedure No. 84750, "Radioactive Waste Treatment, and Effluent and Environmental Monitoring"
16. Zion*Solutions* procedure ZS-LT-300-001-004, "Final Status Survey Data Assessment"

16. ATTACHMENTS

Attachment 1 – Figures and Maps

Attachment 2 – Scan Data

Attachment 3 – Consultation Triggers for Residential and Commercial/Industrial Soil Contamination

Attachment 4 – QC Sample Assessment

Attachment 5 – Graphical Presentations

Attachment 6 – Sample Analytical Reports

Attachment 7 – Eberline Analytical Reports

ATTACHMENT 1
FIGURES AND MAPS

Figure 1 Survey Unit 10220C Boundary

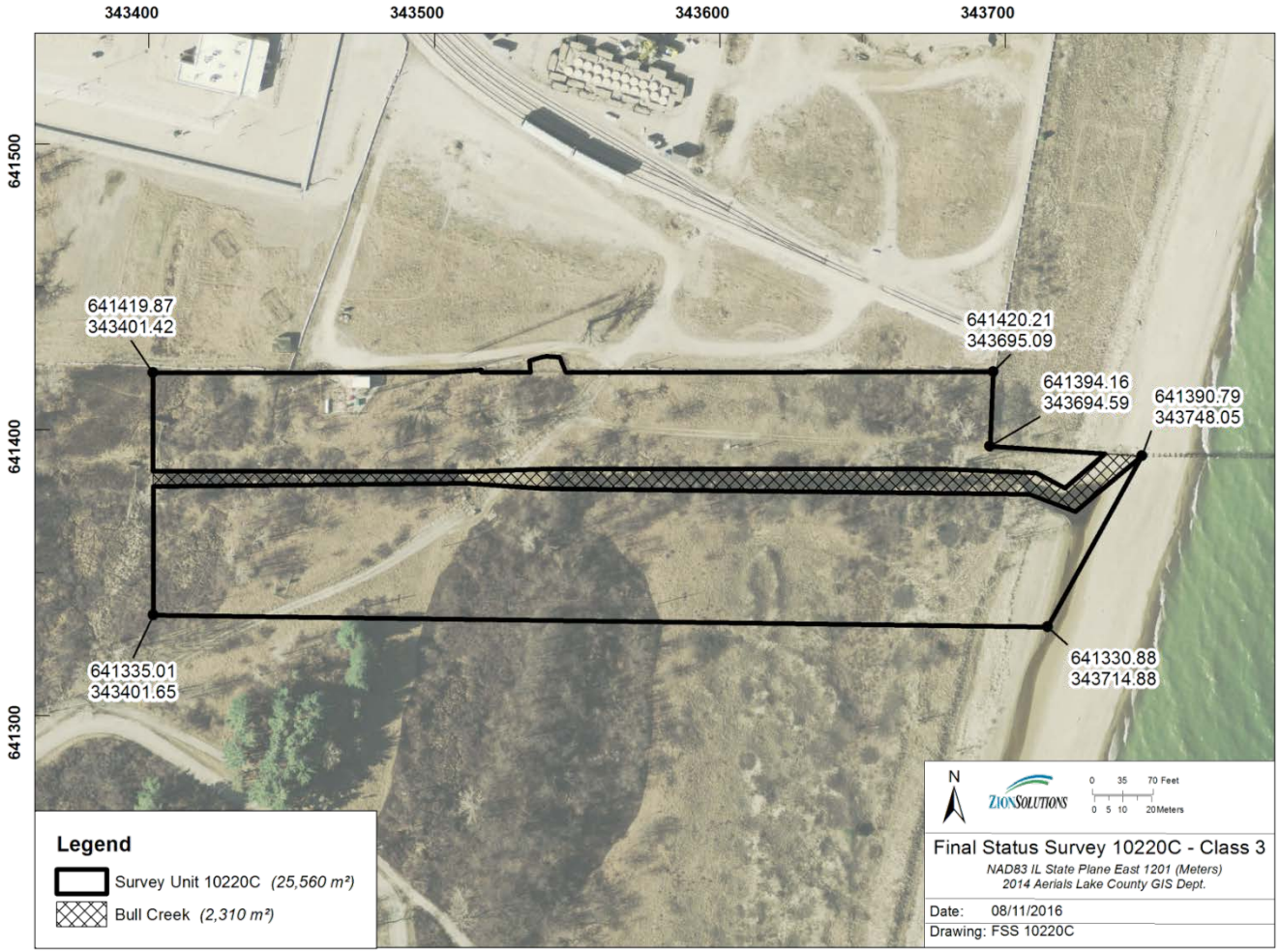


Figure 2 Survey Unit 10220C Characterization Survey

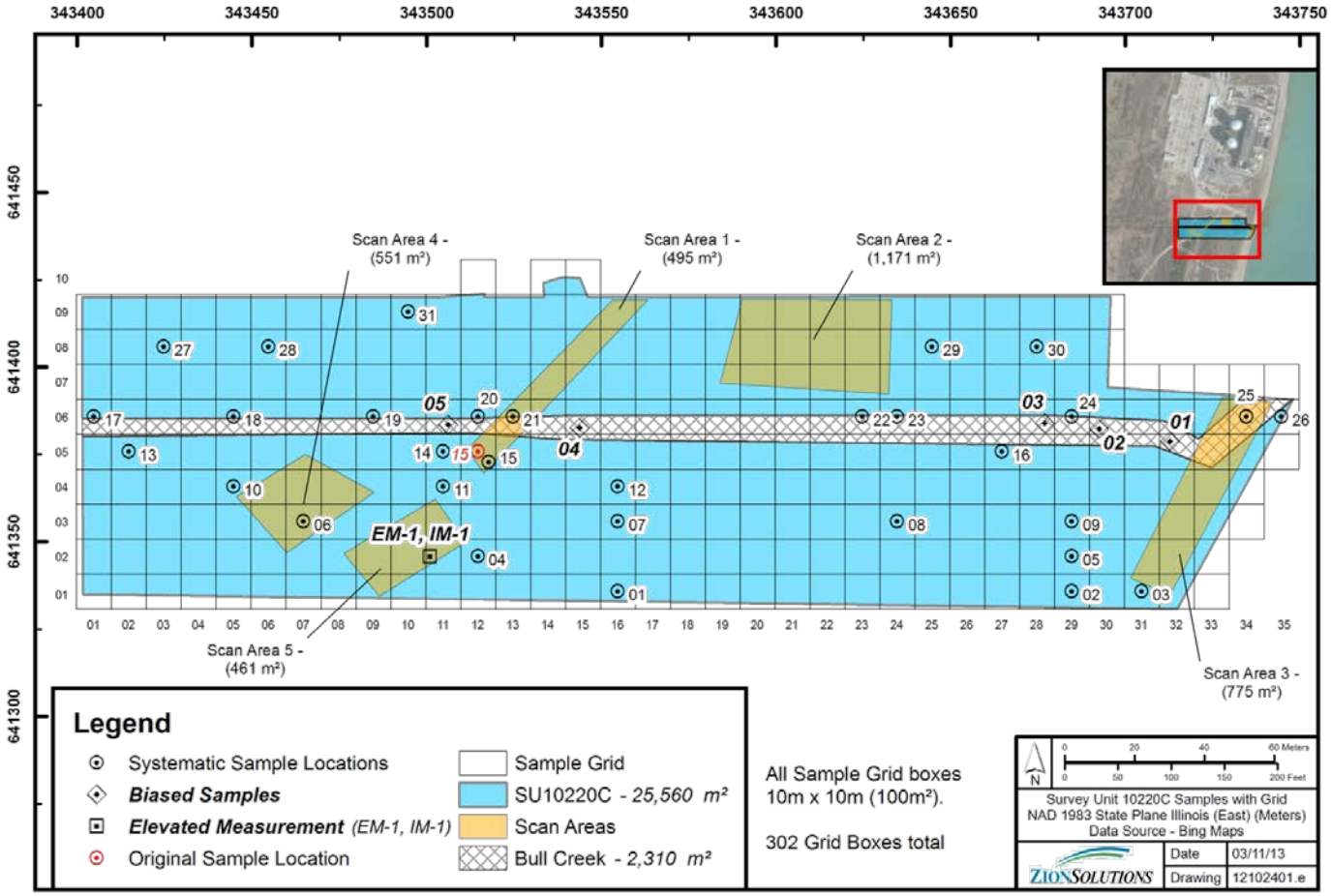
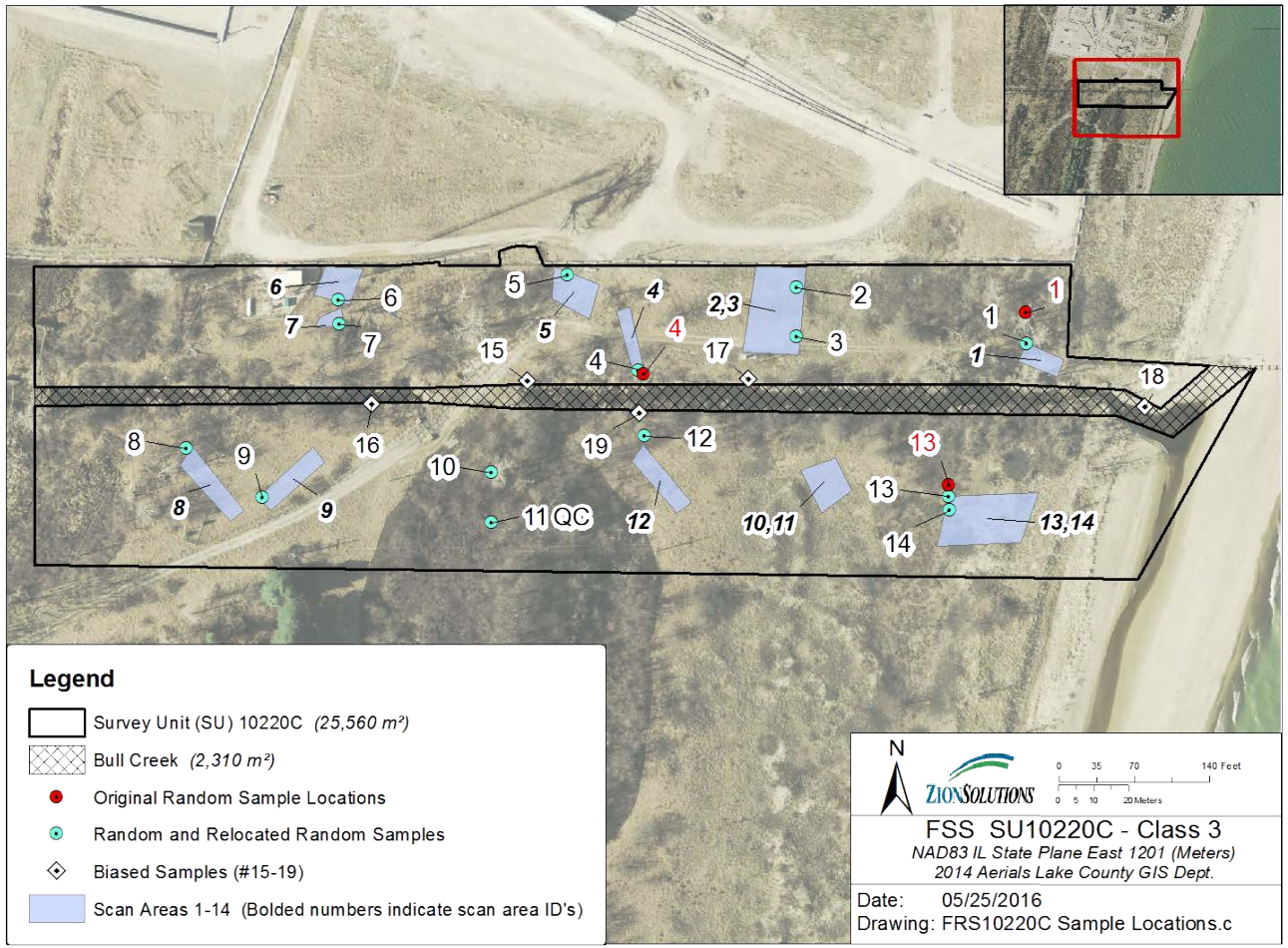


Figure 3 Survey Unit 10220C Final Status Survey



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
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44-10	PR311756	266669	10220	GS014	5/3/2016 8:09	2866	2908	3943	No
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44-10	PR311756	266669	10220	GS014	5/3/2016 8:10	2973	2908	3943	No
44-10	PR311756	266669	10220	GS014	5/3/2016 8:10	3118	2908	3943	No
44-10	PR311756	266669	10220	GS014	5/3/2016 8:11	3131	2908	3943	No
44-10	PR311756	266669	10220	GS014	5/3/2016 8:11	3124	2908	3943	No
44-10	PR311756	266669	10220	GS014	5/3/2016 8:11	3020	2908	3943	No
44-10	PR311756	266669	10220	GS014	5/3/2016 8:12	2776	2908	3943	No
44-10	PR311756	266669	10220	GS014	5/3/2016 8:12	3049	2908	3943	No
44-10	PR311756	266669	10220	GS014	5/3/2016 8:13	3110	2908	3943	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:04	3420	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:06	4970	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:07	3610	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:08	2490	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:11	4510	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:12	4490	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:48	4320	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 14:04	4850	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 14:10	4350	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:13	4350	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:13	4510	3975	5186	No
44-10	PR320649	304726	10220	GS010	5/2/2016 13:14	4300	3975	5186	No
44-10	PR320649	304726	10220	GS011	5/2/2016 13:15	4610	3975	5186	No
44-10	PR320649	304726	10220	GS011	5/2/2016 13:16	4120	3975	5186	No
44-10	PR320649	304726	10220	GS011	5/2/2016 13:17	4140	3975	5186	No
44-10	PR320649	304726	10220	GS011	5/2/2016 13:18	4370	3975	5186	No

44-10	PR320649	304726	10220	GS011	5/2/2016 13:18	4330	3975	5186	No
44-10	PR320649	304726	10220	GS011	5/2/2016 13:23	4560	3975	5186	No
44-10	PR320649	304726	10220	GS011	5/2/2016 13:25	4100	3975	5186	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
QC SAMPLE ASSESSMENT

Duplicate Sample Assessment

Survey Unit # 10220C Survey Unit Name Adjacent of South Restricted Area, Lakeshore

Sample Plan # L3-10220C

Sample Description: Comparison of split samples collected from surface soil samples from location #11 and analyzed using gamma spectroscopy by on-site HpGe System. The standard sample was L3-10220C-FRGS-011-SS, the comparison sample was L3-10220C-FQGS-011-SS.

STANDARD					COMPARISON			
ROC	Activity Value	Standard Error	Resolution	Agreement Range	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)
Cs-137	1.65E-01	3.68E-02	4.48	0.5-2.0	1.95E-01	4.52E-02	0.85	Y

Comments/Corrective Actions: There was acceptable agreement. No further action is necessary.

Table is provided to show acceptance criteria used to assess split samples.

Resolution	Agreement Range
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:  Date: 06/20/2019

RF Yetter III

Reviewed by:  Date: 06/20/2019

J. Graham

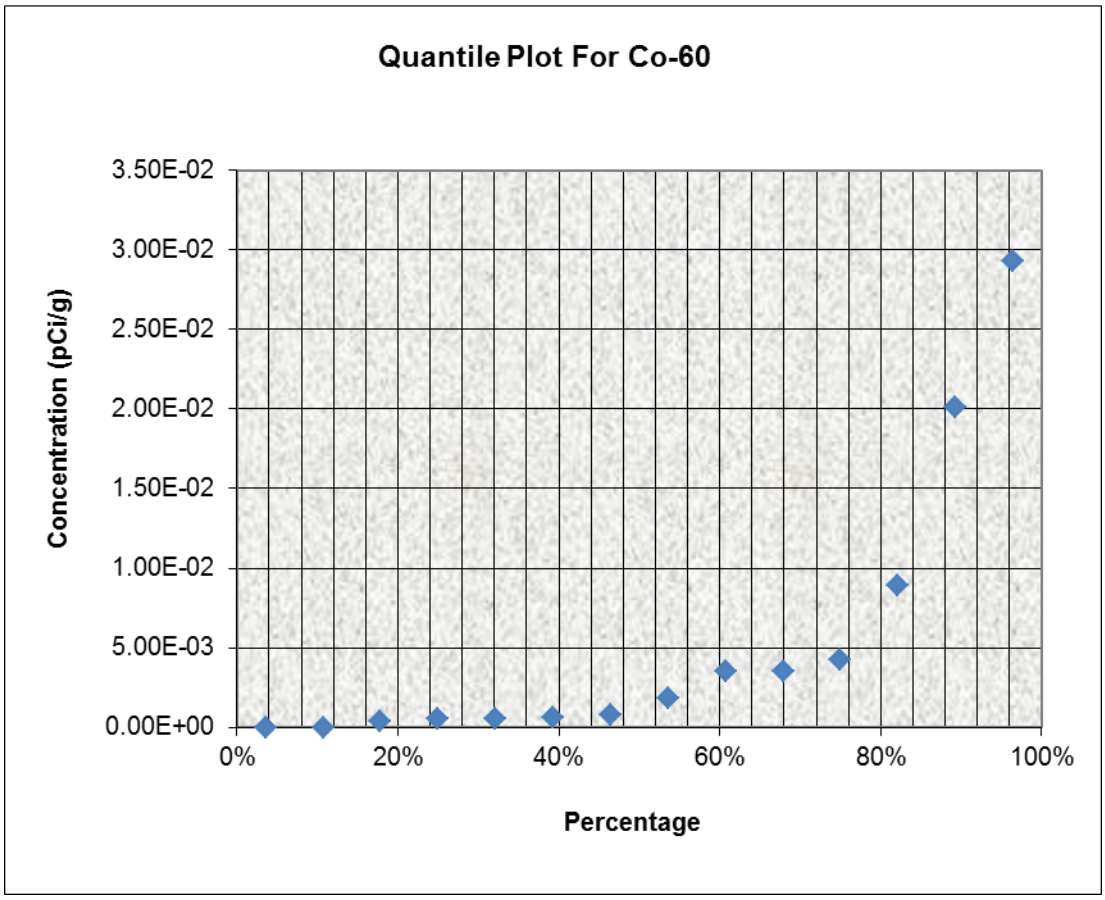
ATTACHMENT 5
GRAPHICAL PRESENTATIONS

Quantile Plot for Co-60

Survey Unit: 10220C

Survey Unit Name: Open Land –Adjacent of South Restricted Area - Lakeshore

Mean: 7.82E-03 pCi/g

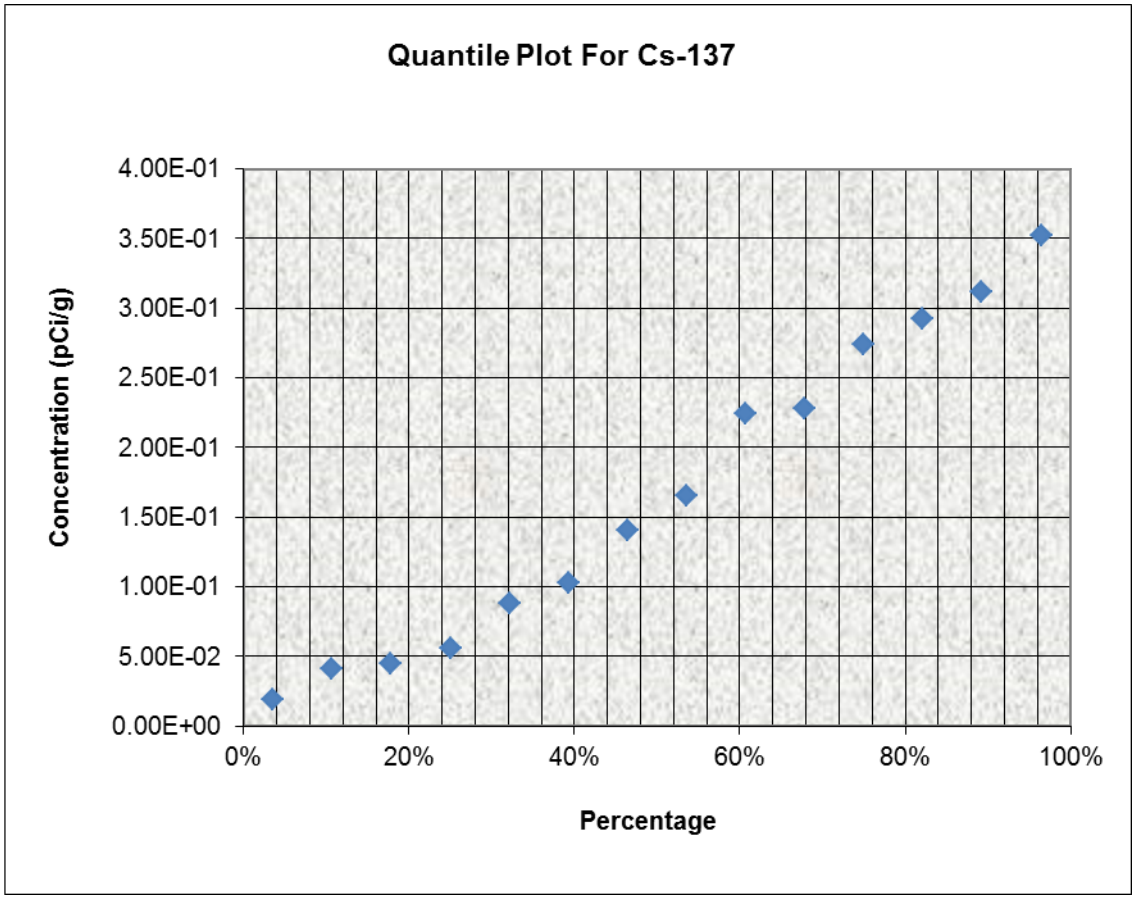


Quantile Plot for Cs-137

Survey Unit: 10220C

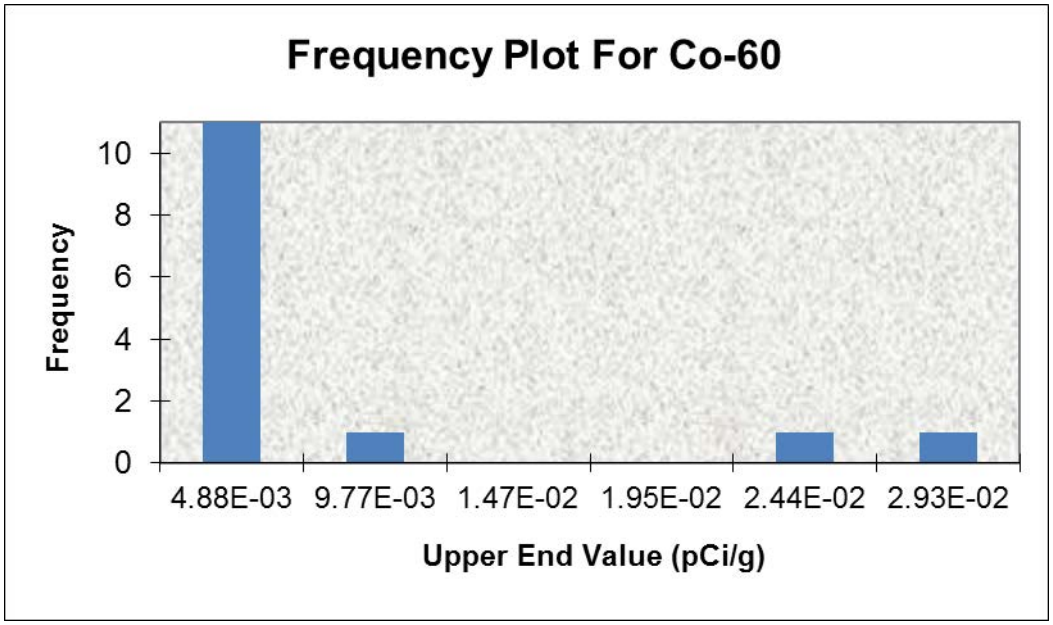
Survey Unit Name: Open Land - Adjacent of South Restricted Area - Lakeshore

Mean: 1.67E-01 pCi/g



Histogram for Co-60

Survey Unit:	10220C	
Survey Unit Name:	Open Land - Adjacent of South Restricted Area, Lakeshore	
Mean:	7.82E-03	pCi/g
Median:	3.51E-03	pCi/g
ST DEV:	9.47E-03	
Skew:	1.23E+00	



Upper Value	Observation Frequency	Observation %
4.88E-03	11	79%
9.77E-03	1	7%
1.47E-02	0	0%
1.95E-02	0	0%
2.44E-02	1	7%
2.93E-02	1	7%
TOTAL	14	

Histogram for Cs-137

Survey Unit: 10220C

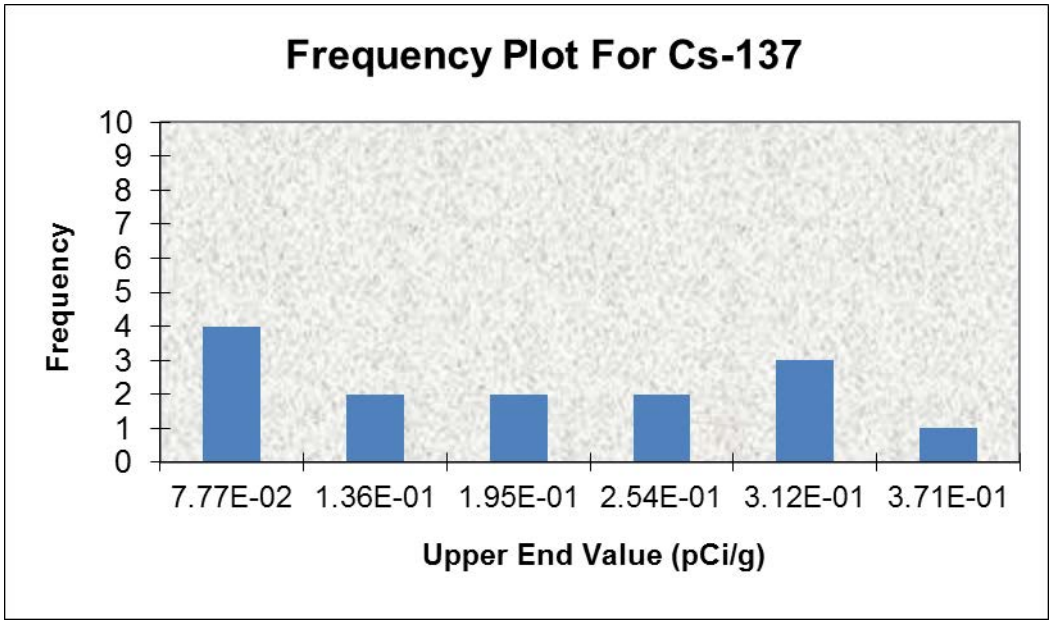
Survey Unit Name: Open Land - Adjacent of South Restricted Area, Lakeshore

Mean: 1.67E-01 pCi/g

Median: 1.53E-01 pCi/g

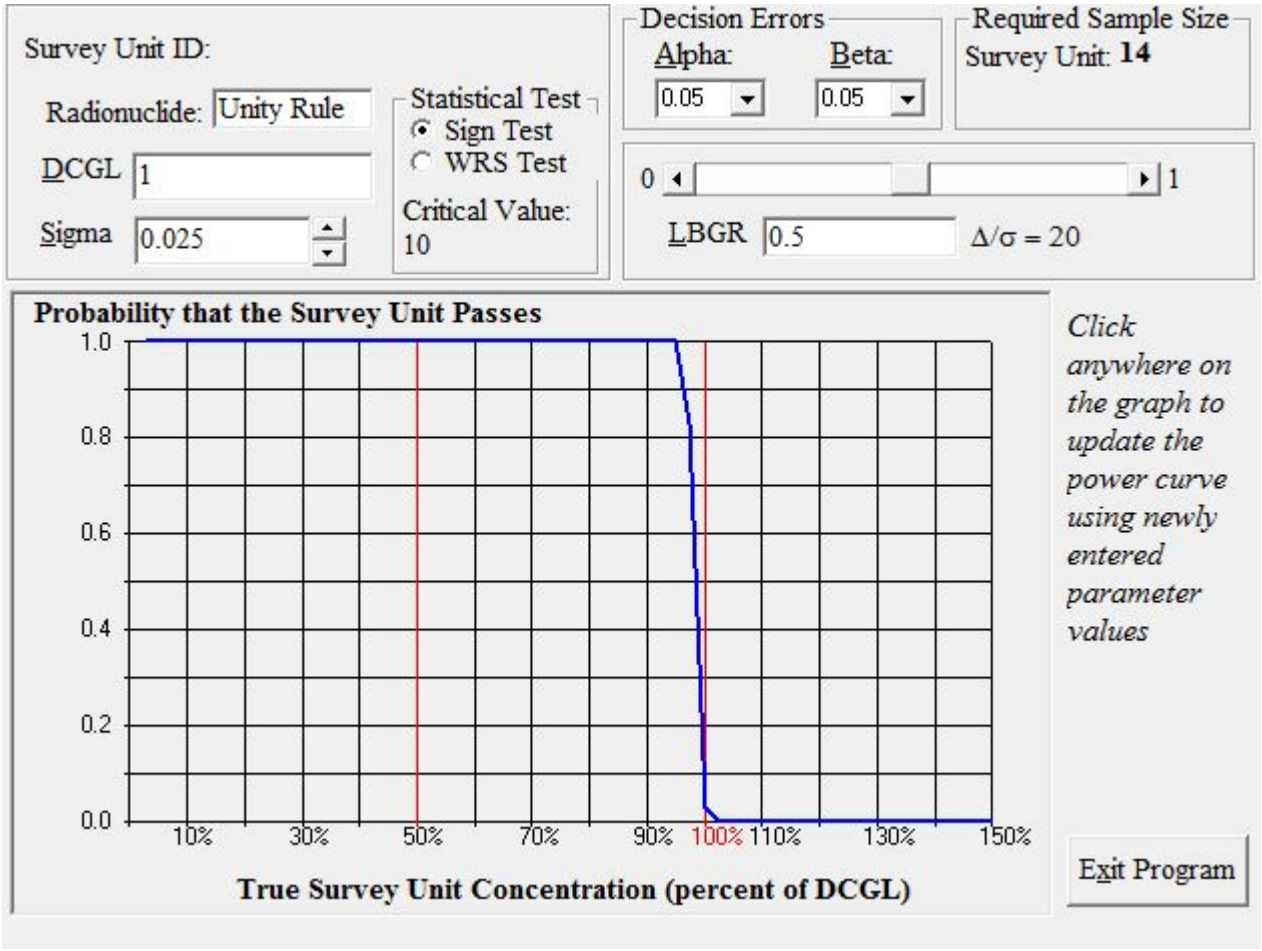
ST DEV: 0.11274952

Skew: 0.23158804



Upper Value	Observation Frequency	Observation %
7.77E-02	4	29%
1.36E-01	2	14%
1.95E-01	2	14%
2.54E-01	2	14%
3.12E-01	3	21%
3.71E-01	1	7%
TOTAL	14	

Retrospective Power Curve for Survey Unit 10220C



ATTACHMENT 6
SAMPLE ANALYTICAL REPORTS

Apex-Gamma

Analysis Report for 05-May-16-10004
L3-10220C-FRGS-001SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-May-16-10004
Sample Description	: L3-10220C-FRGS-001SS (DRIED)
Sample Type	: 1L 130G Soil Sample
Unit	:
Sample Point	:
Sample Size	: 1.437E+03 grams
Facility	: Default
Sample Taken On	: 5/2/2016 9:45:00AM
Acquisition Started	: 5/5/2016 9:15:18AM
Procedure	: 130G 1L Sand Sample
Operator	: JWelch
Detector Name	: P11314X2
Geometry	: 130G Sand
Live Time	: 1800.0 seconds
Real Time	: 1801.4 seconds
Dead Time	: 0.07 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 11/26/2012
Efficiency Calibration Description	:
Sample Number	: 14849

J.C. Welch 5-5-16

5/5/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 5/5/2016 9:45:26AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

5-5-16

DATA VALIDATED 5/5/16

Analysis Report for 05-May-16-10004

L3-10220C-FRGS-001SS (DRIED)

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
M	1	74.78	295 -	315	300.37	8.08E+01	25.79	2.72E+02	Pb214-XR Pb212-XR
m	2	77.06	295 -	315	309.48	1.25E+02	28.19	2.62E+02	Pb214-XR Pb212-XR
M	3	238.64	947 -	975	954.87	2.95E+02	36.42	1.66E+02	Pb-212
m	4	241.85	947 -	975	967.71	7.76E+01	21.01	1.36E+02	Pb-214
	5	270.10	1076 -	1085	1080.58	2.69E+01	21.66	8.01E+01	Ac-228
	6	295.08	1174 -	1189	1180.36	9.14E+01	33.64	1.27E+02	Pb-214 Eu-152
	7	338.44	1346 -	1359	1353.62	6.25E+01	27.90	1.09E+02	Ac-228
	8	351.84	1400 -	1414	1407.17	1.81E+02	34.43	9.25E+01	Pb-214 Bi-211
	9	583.04	2325 -	2338	2331.18	9.03E+01	24.06	4.53E+01	Tl-208
	10	609.09	2428 -	2443	2435.29	1.48E+02	29.00	4.77E+01	Bi-214
	11	661.69	2637 -	2651	2645.56	5.88E+01	20.46	4.03E+01	Cs-137
	12	727.17	2902 -	2915	2907.38	3.27E+01	16.53	3.27E+01	Bi-212
	13	768.13	3066 -	3076	3071.14	1.34E+01	11.99	2.32E+01	Bi-214
	14	911.20	3636 -	3651	3643.30	7.18E+01	20.73	3.05E+01	Ac-228
	15	969.17	3868 -	3883	3875.18	5.82E+01	19.74	3.36E+01	Ac-228
	16	1120.31	4473 -	4486	4479.80	2.10E+01	16.63	4.80E+01	Bi-214
	17	1460.76	5831 -	5855	5842.38	5.55E+02	48.19	1.81E+01	K-40
	18	1509.50	6032 -	6043	6037.51	8.17E+00	6.95	3.66E+00	Bi-214

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	1.00	1460.82	*	10.66	7.18E+00	8.81E-01	miss
Cs-137	1.00	661.66	*	85.10	5.59E-02	2.06E-02	miss
Tl-208	0.99	583.19	*	85.00	7.88E-02	2.30E-02	miss
Bi-212	0.99	39.86		1.06			
		727.33	*	6.67	4.22E-01	2.19E-01	miss
		785.37		1.10			

Analysis Report for 05-May-16-10004

L3-10220C-FRGS-001SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-212	0.99	1620.50		1.47			
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	2.72E-01	5.54E-02	miss
		300.09		3.30			
Pb212-XR	1.00	74.82	*	10.28	5.90E-01	2.24E-01	miss
		77.11	*	17.10	5.06E-01	1.54E-01	miss
		87.35		3.97			
		89.78		1.46			
Bi-214	0.99	609.32	*	45.49	2.49E-01	5.72E-02	miss
		768.36	*	4.89	2.45E-01	2.20E-01	miss
		806.18		1.26			
		934.06		3.11			
		1120.29	*	14.92	1.62E-01	1.29E-01	miss
		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	5.42E-01	4.63E-01	miss
		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	4.35E-01	1.37E-01	miss
		295.22	*	18.42	2.30E-01	9.23E-02	miss
		351.93	*	35.60	2.65E-01	6.58E-02	miss
		785.96		1.06			
Ac-228	0.99	129.07		2.42			
		209.25		3.89			
		270.24	*	3.46	3.40E-01	2.79E-01	miss
		328.00		2.95			
		338.32	*	11.27	2.82E-01	1.34E-01	miss
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20	*	25.80	2.79E-01	8.41E-02	miss
		964.77		4.99			
		968.97	*	15.80	3.85E-01	1.35E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10004

L3-10220C-FRGS-001SS (DRIED)

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	7.18E+00	8.81E-01	
	Cs-137	1.000	5.59E-02	2.06E-02	
	Tl-208	0.999	7.88E-02	2.30E-02	
X	Bi-211	0.964			
	Bi-212	0.999	4.22E-01	2.19E-01	
	Pb-212	1.000	2.72E-01	5.54E-02	
	Pb212-XR	1.000	5.33E-01	1.27E-01	
	Bi-214	0.998	2.39E-01	5.05E-02	
	Pb-214	0.999	2.77E-01	4.99E-02	
X	Pb214-XR	1.000			
	Ac-228	0.999	3.04E-01	6.14E-02	

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

Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10004

L3-10220C-FRGS-001SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/5/2016 9:45:26AM
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 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	7.18E+00	2.50E-01	2.50E-01	miss
+	Cr-51	320.08		9.91	-4.99E-02	1.38E-01	1.38E-01	free
+	Mn-54	834.85		99.98	-5.15E-04	2.03E-02	2.03E-02	miss
+	Co-58	810.76		99.45	-7.29E-03	1.60E-02	1.60E-02	miss
		1674.73		0.52	-1.90E-01		2.24E+00	miss
+	Co-60	1173.23		99.85	-3.29E-03	1.82E-02	2.39E-02	miss
		1332.49		99.98	3.68E-04		1.82E-02	miss
+	Nb-94	702.65		99.81	4.40E-03	1.46E-02	1.85E-02	miss
		871.09		99.89	-2.73E-03		1.46E-02	miss
+	Ag-108m	79.13		6.60	1.76E-01	1.33E-02	4.08E-01	miss
		433.94		90.50	-1.28E-03		1.67E-02	miss
		614.28		89.80	3.08E-03		2.14E-02	miss
		722.94		90.80	-5.69E-03		1.33E-02	miss
+	Sn-113	255.13		2.11	-7.28E-02	2.03E-02	6.29E-01	free
		391.70		64.97	-5.70E-03		2.03E-02	free
+	Cs-134	475.36		1.48	1.26E-02	1.62E-02	9.32E-01	miss
		563.25		8.34	5.23E-02		1.91E-01	miss
		569.33		15.37	-3.33E-02		8.63E-02	miss
		604.72		97.62	-5.83E-03		1.62E-02	miss

Analysis Report for 05-May-16-10004

L3-10220C-FRGS-001SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	-2.72E-03	1.62E-02	2.09E-02	miss
		801.95		8.69	4.90E-03		2.07E-01	miss
		1038.61		0.99	3.24E-01		2.01E+00	miss
		1167.97		1.79	2.04E-01		1.52E+00	miss
		1365.19		3.02	-2.99E-01		4.04E-01	miss
+	Cs-137	661.66	*	85.10	5.59E-02	2.37E-02	2.37E-02	miss
+	Eu-152	121.78		28.67	8.25E-04	5.01E-02	5.01E-02	miss
		244.70		7.61	-6.60E-02		1.73E-01	miss
		295.94		0.45	5.98E+00		5.25E+00	miss
		344.28		26.60	1.70E-03		5.02E-02	miss
		367.79		0.86	4.29E-01		1.65E+00	miss
		411.12		2.24	-2.41E-01		5.99E-01	miss
		443.96		2.83	1.91E-01		5.33E-01	miss
		488.68		0.42	3.58E-01		3.51E+00	miss
		563.99		0.49	5.02E-01		3.15E+00	miss
		586.26		0.46	-2.27E+00		2.94E+00	miss
		678.62		0.47	-3.19E-01		2.76E+00	miss
		688.67		0.86	-3.72E-01		1.61E+00	miss
		719.35		0.28	1.33E+00		6.53E+00	miss
		778.90		12.96	-4.83E-03		1.31E-01	miss
		810.45		0.32	-8.17E-01		5.02E+00	miss
		867.37		4.26	2.87E-02		4.57E-01	miss
		919.33		0.43	5.89E-01		3.74E+00	miss
		964.08		14.65	4.91E-02		1.47E-01	miss
		1085.87		10.24	4.47E-02		2.21E-01	miss
		1089.74		1.73	-1.17E-01		1.27E+00	miss
		1112.07		13.69	1.38E-02		1.45E-01	miss
		1212.95		1.43	4.24E-01		1.90E+00	miss
		1249.94		0.19	-2.92E-01		1.35E+01	miss
		1299.14		1.63	2.06E-01		1.41E+00	miss
		1408.01		21.07	5.09E-02		1.32E-01	miss
		1457.64		0.50	-3.70E+00		6.98E+00	miss
		1528.10		0.28	-6.51E-01		3.73E+00	miss
+	Eu-154	123.07		40.40	5.27E-03	3.49E-02	3.49E-02	miss
		247.93		6.89	-1.20E-01		1.99E-01	miss
		591.76		4.95	-1.35E-01		2.64E-01	miss
		692.42		1.78	-2.14E-01		8.83E-01	miss
		723.30		20.06	-9.58E-03		6.43E-02	miss
		756.80		4.52	-5.80E-03		4.39E-01	miss
		873.18		12.08	-1.75E-02		9.68E-02	miss
		996.29		10.48	-3.67E-02		1.43E-01	miss
		1004.76		18.01	-1.91E-02		8.93E-02	miss
		1274.43		34.80	-3.33E-02		4.31E-02	miss
		1596.48		1.80	-9.76E-02		9.87E-01	miss
+	Eu-155	45.30		1.31	-1.54E+00	7.51E-02	3.76E+00	miss
		60.01		1.22	6.34E-04		4.75E+00	miss
		86.55		30.70	2.20E-03		7.90E-02	miss
		105.31		21.10	9.78E-03		7.51E-02	miss
+	Tl-208	583.19	*	85.00	7.88E-02	2.35E-02	2.35E-02	miss
+	Bi-211	351.07	*	13.02	7.23E-01	1.52E-01	1.52E-01	miss
+	Pb-211	404.85		3.78	-1.46E-01	3.74E-01	3.74E-01	miss

Analysis Report for 05-May-16-10004

L3-10220C-FRGS-001SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	1.11E-01	3.74E-01	7.63E-01	miss
		832.01		3.52	8.03E-02		5.38E-01	miss
+	Bi-212	39.86		1.06	4.83E-01	2.88E-01	4.53E+00	miss
		727.33	*	6.67	4.22E-01		2.88E-01	miss
		785.37		1.10	-2.38E-01		1.43E+00	miss
		1620.50		1.47	4.32E-01		1.43E+00	miss
+	Pb-212	115.18		0.60	-4.20E-01	4.17E-02	2.43E+00	miss
		238.63	*	43.60	2.72E-01		4.17E-02	miss
		300.09		3.30	4.91E-01		5.75E-01	miss
+	Pb212-XR	74.32	*	10.28	5.90E-01	2.27E-01	4.16E-01	miss
		77.11	*	17.10	5.06E-01		2.27E-01	miss
		87.35		3.97	9.59E-02		6.04E-01	miss
		89.78		1.46	1.10E+00		1.63E+00	miss
+	Bi-214	609.32	*	45.49	2.49E-01	4.81E-02	4.81E-02	miss
		768.36	*	4.89	2.45E-01		3.34E-01	miss
		806.18		1.26	-1.90E-01		1.27E+00	miss
		934.06		3.11	3.82E-01		8.05E-01	miss
		1120.29	*	14.92	1.62E-01		1.97E-01	miss
		1155.21		1.63	1.84E-01		1.72E+00	miss
		1238.12		5.83	3.58E-01		6.01E-01	miss
		1280.98		1.43	-7.80E-02		1.39E+00	miss
		1377.67		3.99	1.21E-01		6.00E-01	miss
		1385.31		0.79	1.00E+00		2.36E+00	miss
		1401.52		1.33	1.44E-02		1.42E+00	miss
		1407.99		2.39	4.48E-01		1.16E+00	miss
		1509.21	*	2.13	5.42E-01		6.10E-01	miss
		1661.27		1.05	5.74E-01		1.91E+00	miss
		1729.59		2.88	6.00E-01		9.89E-01	miss
		1764.49		15.30	2.75E-01		2.89E-01	miss
		1847.43		2.03	4.53E-01		1.29E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99	*	7.25	4.35E-01	5.57E-02	2.30E-01	miss
		295.22	*	18.42	2.30E-01		1.21E-01	miss
		351.93	*	35.60	2.65E-01		5.57E-02	miss
		785.96		1.06	1.64E-01		1.61E+00	miss
+	Pb214-XR	74.82	*	5.80	1.05E+00	4.00E-01	7.37E-01	miss
		77.11	*	9.70	8.91E-01		4.00E-01	miss
		87.35		2.24	1.70E-01		1.07E+00	miss
		89.78		0.82	1.97E+00		2.89E+00	miss
+	Ra-226	186.21		3.64	3.81E-01	4.92E-01	4.92E-01	miss
+	Ac-228	129.07		2.42	1.22E-01	8.69E-02	6.14E-01	miss
		209.25		3.89	2.36E-01		4.04E-01	miss
		270.24	*	3.46	3.40E-01		4.29E-01	miss
		328.00		2.95	3.50E-01		5.83E-01	miss
		338.32	*	11.27	2.82E-01		1.83E-01	miss
		409.46		1.92	2.14E-01		8.00E-01	miss
		463.00		4.40	1.95E-01		4.23E-01	miss
		794.95		4.25	1.28E-01		4.94E-01	miss
		911.20	*	25.80	2.79E-01		8.69E-02	miss
		964.77		4.99	-5.81E-02		4.07E-01	miss
		968.97	*	15.80	3.85E-01		1.54E-01	miss

Analysis Report for 05-May-16-10004

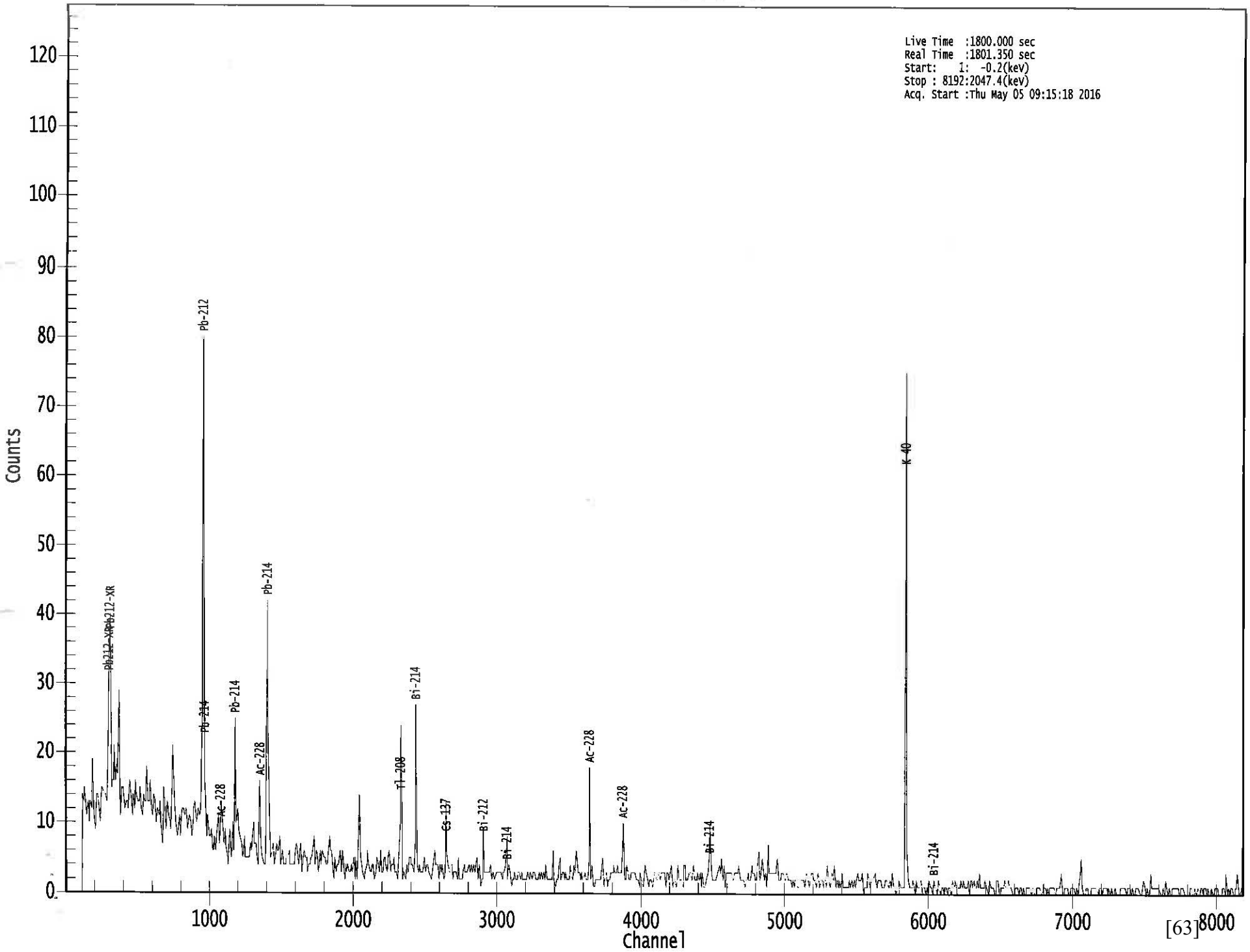
L3-10220C-FRGS-001SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20	3.22	3.25E-01	8.69E-02	7.95E-01	miss
+	Pa-231	27.36	10.30	0.00E+00	3.97E-02	3.97E-02	miss
		283.69	1.70	-2.81E-01		7.82E-01	miss
		300.07	2.47	6.56E-01		7.68E-01	miss
		302.65	2.20	-2.00E-01		6.64E-01	miss
		330.06	1.40	-6.14E-01		1.05E+00	miss
+	Th-234	92.38	2.13	1.20E+00	1.26E+00	1.26E+00	miss
		92.80	2.10	1.21E+00		1.28E+00	miss
		112.81	0.21	1.53E-01		8.08E+00	miss
+	U-235	143.76	10.96	-5.00E-02	3.10E-02	1.19E-01	miss
		163.33	5.08	3.04E-02		2.61E-01	miss
		185.71	57.20	2.45E-02		3.10E-02	miss
		202.11	1.08	-4.87E-01		1.13E+00	miss
		205.31	5.01	1.75E-02		2.78E-01	miss
+	Am-241	59.54	35.90	-2.24E-02	1.55E-01	1.55E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000014849.CNF



Apex-Gamma

Analysis Report for 02-Jun-16-10001
L3-10220C-FRGS-002SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 02-Jun-16-10001
Sample Description	: L3-10220C-FRGS-002SS (DRIED)
Sample Type	: Off Site Sample
Unit	:
Sample Point	:
Sample Size	: 1.311E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2016 2:30:00PM
Acquisition Started	: 6/2/2016 8:16:32AM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P11314X2
Geometry	: 130G Soil
Live Time	: 600.0 seconds
Real Time	: 600.5 seconds
Dead Time	: 0.08 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 6/28/2012
Efficiency Calibration Description	:
Sample Number	: 15049

6/2/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 8:26:40AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED
6/2/16

Analysis Report for 02-Jun-16-10001

L3-10220C-FRGS-002SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	185.84	740 -	750	743.94	2.15E+01	19.46	6.09E+01	U-235
								Ra-226
2	238.58	948 -	961	954.65	1.04E+02	27.90	6.59E+01	Pb-212
3	352.00	1400 -	1415	1407.81	1.11E+02	25.16	3.68E+01	Pb-214
								Bi-211
4	609.19	2428 -	2443	2435.68	1.06E+02	22.11	1.28E+01	Bi-214
5	661.65	2637 -	2652	2645.41	1.14E+02	23.05	1.61E+01	Cs-137
6	727.18	2903 -	2912	2907.41	8.13E+00	9.22	1.37E+01	Bi-212
7	968.98	3869 -	3880	3874.39	1.50E+01	9.59	8.00E+00	Ac-228
8	1119.95	4473 -	4484	4478.39	1.47E+01	9.97	1.05E+01	Bi-214
9	1460.71	5832 -	5852	5842.19	1.53E+02	25.32	5.81E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	6.45E+00	1.21E+00	miss
Cs-137	1.00	661.66	*	85.10	3.52E-01	8.27E-02	miss
Bi-211	0.94	351.07	*	13.02	1.43E+00	4.00E-01	miss
Bi-212	0.99	39.86		1.06			
		727.33	*	6.67	3.41E-01	3.89E-01	miss
		785.37		1.10			
		1620.50		1.47			
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	3.11E-01	9.72E-02	miss
		300.09		3.30			
Bi-214	0.99	609.32	*	45.49	5.76E-01	1.39E-01	miss
		768.36		4.89			
		806.18		1.26			
		934.06		3.11			
		1120.29	*	14.92	3.69E-01	2.51E-01	miss
		1155.21		1.63			
		1238.12		5.83			

Analysis Report for 02-Jun-16-10001

L3-10220C-FRGS-002SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
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	0.51	241.99		7.25			
		295.22		18.42			
		351.93	*	35.60	5.24E-01	1.46E-01	miss
		785.96		1.06			
Ra-226	0.99	186.21	*	3.64	6.74E-01	6.19E-01	miss
Ac-228	0.57	129.07		2.42			
		209.25		3.89			
		270.24		3.46			
		328.00		2.95			
		338.32		11.27			
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20		25.80			
		964.77		4.99			
		968.97	*	15.80	3.23E-01	2.08E-01	miss
		1588.20		3.22			
U-235	0.99	143.76		10.96			
		163.33		5.08			
		185.71	*	57.20	4.29E-02	3.94E-02	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

Analysis Report for 02-Jun-16-10001

L3-10220C-FRGS-002SS (DRIED)

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	6.45E+00	1.21E+00	
	Cs-137	1.000	3.52E-01	8.27E-02	
?	Bi-211	0.948	1.43E+00	4.00E-01	
	Bi-212	0.999	3.41E-01	3.89E-01	
	Pb-212	1.000	3.11E-01	9.72E-02	
	Bi-214	0.999	5.27E-01	1.22E-01	
?	Pb-214	0.513	5.24E-01	1.46E-01	
?	Ra-226	0.991	6.74E-01	6.19E-01	
	Ac-228	0.575	3.23E-01	2.08E-01	
?	U-235	0.999	4.29E-02	3.94E-02	

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

Errors quoted at 2.000sigma

Analysis Report for 02-Jun-16-10001

L3-10220C-FRGS-002SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 8:26:40AM
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 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	6.45E+00	4.86E-01	4.86E-01	miss
+	Cr-51	320.08		9.91	-3.57E-02	3.06E-01	3.06E-01	free
+	Mn-54	834.85		99.98	2.72E-03	4.11E-02	4.11E-02	miss
+	Co-58	810.76		99.45	-6.93E-03	4.00E-02	4.00E-02	miss
		1674.73		0.52	0.00E+00		2.37E+00	miss
+	Co-60	1173.23		99.85	3.32E-03	3.90E-02	4.65E-02	miss
		1332.49		99.98	6.01E-04		3.90E-02	miss
+	Nb-94	702.65		99.81	-1.67E-03	2.95E-02	2.95E-02	miss
		871.09		99.89	2.00E-02		5.27E-02	miss
+	Ag-108m	79.13		6.60	2.53E-01	3.25E-02	8.42E-01	miss
		433.94		90.50	-4.33E-04		3.25E-02	miss
		614.28		89.80	-4.08E-03		3.92E-02	miss
		722.94		90.80	-4.26E-03		3.30E-02	miss
+	Sn-113	255.13		2.11	-3.11E-01	5.80E-02	1.57E+00	free
		391.70		64.97	1.13E-02		5.80E-02	free
+	Cs-134	475.36		1.48	-6.09E-01	3.34E-02	2.01E+00	miss
		563.25		8.34	1.33E-01		5.16E-01	miss
		569.33		15.37	-5.80E-02		1.67E-01	miss
		604.72		97.62	2.04E-04		3.34E-02	miss

Analysis Report for 02-Jun-16-10001

L3-10220C-FRGS-002SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	1.18E-02	3.34E-02	4.95E-02	miss
		801.95		8.69	-6.36E-02		3.73E-01	miss
		1038.61		0.99	-6.65E-01		3.37E+00	miss
		1167.97		1.79	1.98E-01		2.84E+00	miss
		1365.19		3.02	4.76E-02		1.54E+00	miss
+	Cs-137	661.66	*	85.10	3.52E-01	5.25E-02	5.25E-02	miss
+	Eu-152	121.78		28.67	1.29E-02	8.21E-02	9.49E-02	miss
		244.70		7.61	4.88E-02		4.10E-01	miss
		295.94		0.45	9.82E+00		1.13E+01	miss
		344.28		26.60	3.00E-03		8.21E-02	miss
		367.79		0.86	-1.16E+00		3.37E+00	miss
		411.12		2.24	-1.86E-01		1.19E+00	miss
		443.96		2.83	5.32E-02		1.17E+00	miss
		488.68		0.42	1.86E+00		8.46E+00	miss
		563.99		0.49	-3.84E-01		8.36E+00	miss
		586.26		0.46	-4.08E+00		6.90E+00	miss
		678.62		0.47	9.31E-01		8.51E+00	miss
		688.67		0.86	2.52E+00		5.70E+00	miss
		719.35		0.28	3.18E+00		1.41E+01	miss
		778.90		12.96	-5.66E-02		2.10E-01	miss
		810.45		0.32	-5.00E+00		1.01E+01	miss
		867.37		4.26	0.00E+00		2.00E-01	miss
		919.33		0.43	8.95E-01		9.22E+00	miss
		964.08		14.65	1.23E-01		3.67E-01	miss
		1085.87		10.24	1.07E-01		3.86E-01	miss
		1089.74		1.73	-1.52E-01		1.56E+00	miss
		1112.07		13.69	-1.57E-01		2.53E-01	miss
		1212.95		1.43	3.95E-01		3.62E+00	miss
		1249.94		0.19	2.74E+00		2.79E+01	miss
		1299.14		1.63	1.03E+00		3.58E+00	miss
		1408.01		21.07	1.04E-01		2.72E-01	miss
		1457.64		0.50	-8.42E+00		1.26E+01	miss
		1528.10		0.28	4.95E+00		1.78E+01	miss
+	Eu-154	123.07		40.40	-2.07E-02	5.74E-02	5.74E-02	miss
		247.93		6.89	-3.51E-02		3.78E-01	miss
		591.76		4.95	3.45E-02		5.91E-01	miss
		692.42		1.78	-7.63E-02		2.00E+00	miss
		723.30		20.06	-4.41E-02		1.29E-01	miss
		756.80		4.52	8.36E-02		1.01E+00	miss
		873.18		12.08	-6.12E-02		2.82E-01	miss
		996.29		10.48	1.47E-02		3.56E-01	miss
		1004.76		18.01	-1.29E-02		2.33E-01	miss
		1274.43		34.80	5.35E-02		1.65E-01	miss
		1596.48		1.80	0.00E+00		7.26E-01	miss
+	Eu-155	45.30		1.31	-1.62E+00	1.63E-01	8.48E+00	miss
		60.01		1.22	-4.87E-01		1.04E+01	miss
		86.55		30.70	4.72E-02		1.86E-01	miss
		105.31		21.10	5.59E-02		1.63E-01	miss
+	Tl-208	583.19		85.00	1.12E-01	9.41E-02	9.41E-02	miss
+	Bi-211	351.07	*	13.02	1.43E+00	3.29E-01	3.29E-01	miss
+	Pb-211	404.85		3.78	6.32E-01	8.08E-01	1.14E+00	miss

Analysis Report for 02-Jun-16-10001

L3-10220C-FRGS-002SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	6.44E-01	8.08E-01	2.15E+00	miss
		832.01		3.52	-3.04E-01		8.08E-01	miss
+	Bi-212	39.86		1.06	-1.14E+00	6.13E-01	9.81E+00	miss
		727.33	*	6.67	3.41E-01		6.13E-01	miss
		785.37		1.10	-1.78E-01		3.21E+00	miss
		1620.50		1.47	-2.28E-01		3.07E+00	miss
+	Pb-212	115.18		0.60	9.88E-01	1.02E-01	4.94E+00	miss
		238.63	*	43.60	3.11E-01		1.02E-01	miss
		300.09		3.30	1.64E-01		1.01E+00	miss
+	Pb212-XR	74.82		10.28	7.04E-01	5.18E-01	8.91E-01	miss
		77.11		17.10	4.06E-01		5.18E-01	miss
		87.35		3.97	1.46E+00		1.53E+00	miss
		89.78		1.46	3.62E-02		3.06E+00	miss
+	Bi-214	609.32	*	45.49	5.76E-01	8.80E-02	8.80E-02	miss
		768.36		4.89	7.21E-01		1.30E+00	miss
		806.18		1.26	5.45E-01		3.11E+00	miss
		934.06		3.11	4.62E-01		1.69E+00	miss
		1120.29	*	14.92	3.69E-01		3.30E-01	miss
		1155.21		1.63	-1.40E-01		3.06E+00	miss
		1238.12		5.83	3.97E-01		1.33E+00	miss
		1280.98		1.43	6.10E-01		3.42E+00	miss
		1377.67		3.99	1.40E+00		2.23E+00	miss
		1385.31		0.79	-6.22E-01		5.05E+00	miss
		1401.52		1.33	2.40E+00		5.19E+00	miss
		1407.99		2.39	9.12E-01		2.39E+00	miss
		1509.21		2.13	-2.94E-01		2.01E+00	miss
		1661.27		1.05	-5.92E-02		3.49E+00	miss
		1729.59		2.88	1.78E-01		1.31E+00	miss
		1764.49		15.30	6.56E-01		7.99E-01	miss
		1847.43		2.03	4.84E-01		2.84E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	5.98E-01	1.20E-01	6.33E-01	miss
		295.22		18.42	3.65E-01		3.06E-01	miss
		351.93	*	35.60	5.24E-01		1.20E-01	miss
		785.96		1.06	8.80E-01		3.64E+00	miss
+	Pb214-XR	74.82		5.80	1.25E+00	9.14E-01	1.58E+00	miss
		77.11		9.70	7.16E-01		9.14E-01	miss
		87.35		2.24	2.59E+00		2.72E+00	miss
		89.78		0.82	6.44E-02		5.44E+00	miss
+	Ra-226	186.21	*	3.64	6.74E-01	9.65E-01	9.65E-01	miss
+	Ac-228	129.07		2.42	3.49E-01	2.58E-01	1.31E+00	miss
		209.25		3.89	1.94E-01		7.81E-01	miss
		270.24		3.46	3.16E-01		1.13E+00	miss
		328.00		2.95	3.38E-01		1.28E+00	miss
		338.32		11.27	2.22E-01		3.79E-01	miss
		409.46		1.92	-1.24E-01		1.91E+00	miss
		463.00		4.40	3.15E-01		1.12E+00	miss
		794.95		4.25	3.06E-01		1.05E+00	miss
		911.20		25.80	2.34E-01		3.22E-01	miss
		964.77		4.99	9.96E-02		8.90E-01	miss
		968.97	*	15.80	3.23E-01		2.58E-01	miss

Analysis Report for 02-Jun-16-10001

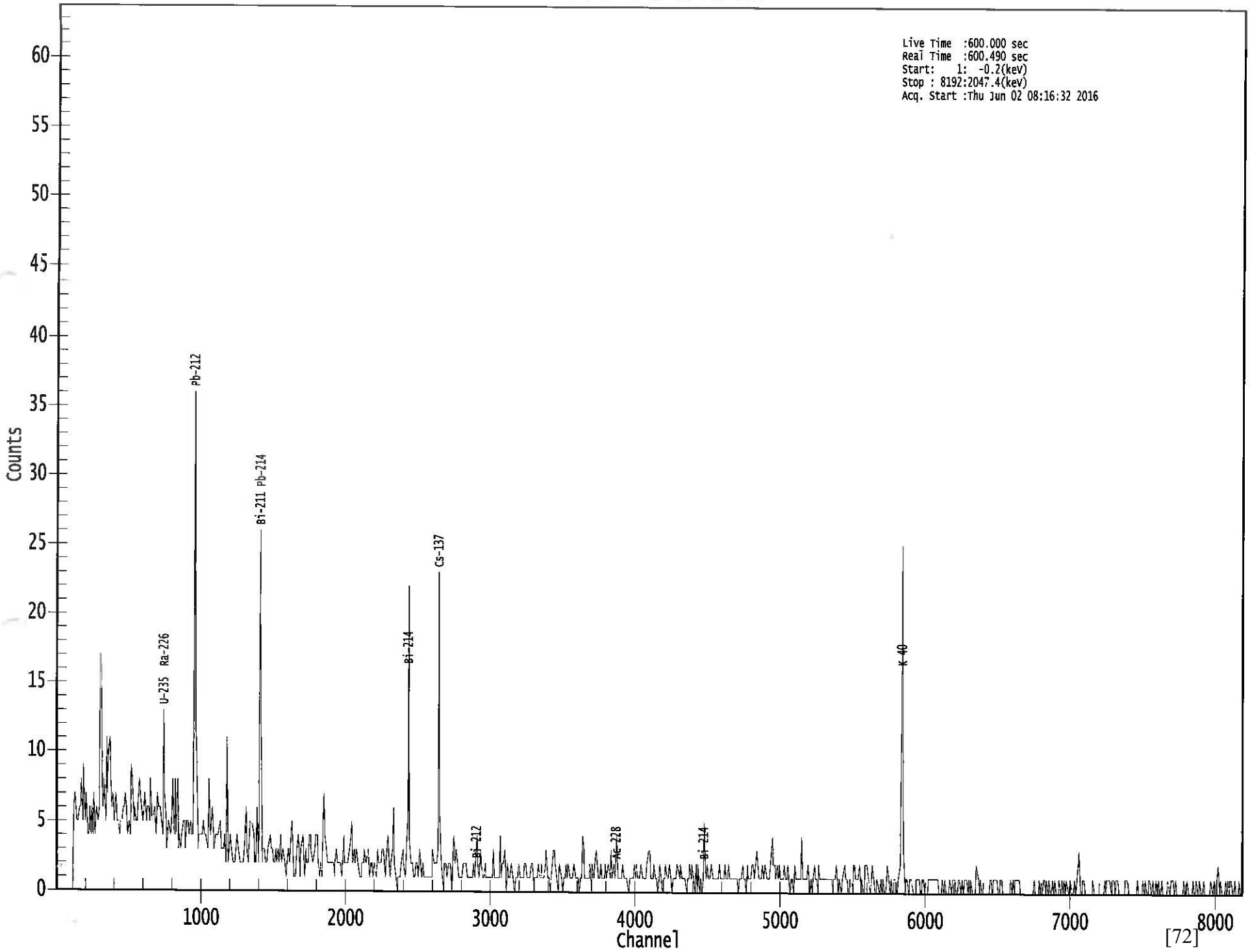
L3-10220C-FRGS-002SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20		3.22	4.36E-01	2.58E-01	1.79E+00	miss
+	Pa-231	27.36		10.30	0.00E+00	1.40E-01	1.40E-01	miss
		283.69		1.70	1.89E-01		1.93E+00	miss
		300.07		2.47	2.19E-01		1.34E+00	miss
		302.65		2.20	-1.20E-01		1.35E+00	miss
		330.06		1.40	-1.84E-01		2.46E+00	miss
+	Th-234	92.38		2.13	1.42E+00	3.00E+00	3.00E+00	miss
		92.80		2.10	1.95E+00		3.13E+00	miss
		112.81		0.21	4.12E+00		2.08E+01	miss
+	U-235	143.76		10.96	1.33E-02	6.14E-02	2.69E-01	miss
		163.33		5.08	2.00E-01		5.91E-01	miss
		185.71	*	57.20	4.29E-02		6.14E-02	miss
		202.11		1.08	5.10E-01		2.81E+00	miss
		205.31		5.01	2.00E-01		6.23E-01	miss
+	Am-241	59.54		35.90	-1.67E-01	3.33E-01	3.33E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000015049.CNF



Apex-Gamma

Analysis Report for 02-Jun-16-10002
L3-10220C-FRGS-003SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 02-Jun-16-10002
Sample Description	: L3-10220C-FRGS-003SS (DRIED)
Sample Type	: Off Site Sample
Unit	:
Sample Point	:
Sample Size	: 1.397E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2016 2:40:00PM
Acquisition Started	: 6/2/2016 8:16:39AM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P40818B
Geometry	: 130G Soil
Live Time	: 600.0 seconds
Real Time	: 601.0 seconds
Dead Time	: 0.17 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 1/5/2015
Efficiency Calibration Description	:
Sample Number	: 15050

6/2/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 8:27:21AM

Peak Analysis From Channel	: 120
Peak Analysis To Channel	: 8192
Tentative NID Library	: C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance	: 1.000FWHM

6-2-16

DATA VALIDATED 6/2/16

Analysis Report for 02-Jun-16-10002

L3-10220C-FRGS-003SS (DRIED)

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
M	1	74.86	296 -	312	300.53	2.97E+01	14.00	5.52E+01	Pb214-XR
									Pb212-XR
m	2	76.93	296 -	312	308.77	3.39E+01	14.33	4.64E+01	Pb214-XR
									Pb212-XR
	3	87.05	346 -	352	349.24	1.43E+01	14.81	3.73E+01	Pb214-XR
									Pb212-XR
									Eu-155
	4	238.57	948 -	960	954.79	1.02E+02	28.85	8.09E+01	Pb-212
	5	295.15	1174 -	1186	1180.92	4.57E+01	21.01	4.86E+01	Pb-214
									Eu-152
	6	338.62	1351 -	1358	1354.69	1.11E+01	12.62	3.17E+01	Ac-228
	7	351.85	1402 -	1414	1407.59	7.62E+01	21.26	3.16E+01	Pb-214
									Bi-211
	8	583.40	2328 -	2338	2333.36	3.07E+01	11.97	4.61E+00	Tl-208
	9	609.24	2431 -	2443	2436.70	5.27E+01	18.26	2.66E+01	Bi-214
	10	661.52	2640 -	2653	2645.79	3.21E+01	13.72	1.37E+01	Cs-137
	11	1460.57	5833 -	5853	5843.25	1.56E+02	25.23	2.90E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	6.83E+00	1.26E+00	miss
Cs-137	0.99	661.66	*	85.10	1.03E-01	4.58E-02	miss
Tl-208	0.99	583.19	*	85.00	9.05E-02	3.70E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	3.21E-01	1.05E-01	miss
		300.09		3.30			
Pb212-XR	0.99	74.82	*	10.28	1.30E+00	6.68E-01	miss
		77.11	*	17.10	7.95E-01	3.74E-01	miss
		87.35	*	3.97	8.70E-01	9.17E-01	miss
		89.78		1.46			
Bi-214	1.00	609.32	*	45.49	2.99E-01	1.10E-01	miss

Analysis Report for 02-Jun-16-10002

L3-10220C-FRGS-003SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	1.00	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	3.91E-01	1.90E-01	miss
		351.93	*	35.60	3.77E-01	1.21E-01	miss
		785.96		1.06			
Ac-228	0.99	129.07		2.42			
		209.25		3.89			
		270.24		3.46			
		328.00		2.95			
		338.32	*	11.27	1.70E-01	1.94E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

Analysis Report for 02-Jun-16-10002

L3-10220C-FRGS-003SS (DRIED)

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.996	6.83E+00	1.26E+00	
	Cs-137	0.999	1.03E-01	4.58E-02	
X	Eu-155	0.991			
	Tl-208	0.997	9.05E-02	3.70E-02	
X	Bi-211	0.963			
	Pb-212	1.000	3.21E-01	1.05E-01	
	Pb212-XR	0.998	9.10E-01	3.07E-01	
	Bi-214	1.000	2.99E-01	1.10E-01	
	Pb-214	1.000	3.81E-01	1.02E-01	
X	Pb214-XR	0.998			
	Ac-228	0.999	1.70E-01	1.94E-01	

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

Errors quoted at 2.000sigma

Analysis Report for 02-Jun-16-10002

L3-10220C-FRGS-003SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 8:27:21AM
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 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	6.83E+00	3.92E-01	3.92E-01	miss
+	Cr-51	320.08		9.91	5.87E-02	4.29E-01	4.29E-01	free
+	Mn-54	834.85		99.98	4.35E-03	4.28E-02	4.28E-02	miss
+	Co-58	810.76		99.45	5.42E-03	4.54E-02	4.54E-02	miss
		1674.73		0.52	0.00E+00		2.99E+00	miss
+	Co-60	1173.23		99.85	8.89E-03	5.26E-02	6.06E-02	miss
		1332.49		99.98	-4.54E-03		5.26E-02	miss
+	Nb-94	702.65		99.81	1.78E-02	4.31E-02	5.17E-02	miss
		871.09		99.89	-3.29E-03		4.31E-02	miss
+	Ag-108m	79.13		6.60	7.67E-01	3.39E-02	1.59E+00	miss
		433.94		90.50	5.16E-04		3.39E-02	miss
		614.28		89.80	4.05E-03		4.59E-02	miss
		722.94		90.80	1.97E-02		5.32E-02	miss
+	Sn-113	255.13		2.11	1.07E+00	5.85E-02	2.15E+00	free
		391.70		64.97	1.60E-03		5.85E-02	free
+	Cs-134	475.36		1.48	-6.84E-01	3.19E-02	2.36E+00	miss
		563.25		8.34	-6.22E-02		4.70E-01	miss
		569.33		15.37	-1.56E-02		2.93E-01	miss
		604.72		97.62	-1.78E-02		3.19E-02	miss

Analysis Report for 02-Jun-16-10002

L3-10220C-FRGS-003SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	1.47E-02	3.19E-02	5.48E-02	miss
		801.95		8.69	5.61E-02		5.09E-01	miss
		1038.61		0.99	-2.08E+00		2.78E+00	miss
		1167.97		1.79	-3.22E-01		2.96E+00	miss
		1365.19		3.02	-1.28E-01		1.09E+00	miss
+	Cs-137	661.66	*	85.10	1.03E-01	4.95E-02	4.95E-02	miss
+	Eu-152	121.78		28.67	-1.22E-02	1.36E-01	1.44E-01	miss
		244.70		7.61	2.04E-01		5.03E-01	miss
		295.94		0.45	-2.20E-01		1.30E+01	miss
		344.28		26.60	3.92E-03		1.36E-01	miss
		367.79		0.86	-1.95E+00		3.83E+00	miss
		411.12		2.24	7.11E-01		1.83E+00	miss
		443.96		2.83	-2.20E-01		9.63E-01	miss
		488.68		0.42	-3.13E+00		7.94E+00	miss
		563.99		0.49	2.80E+00		8.70E+00	miss
		586.26		0.46	-4.16E+00		8.69E+00	miss
		678.62		0.47	-3.17E+00		8.85E+00	miss
		688.67		0.86	8.18E-01		5.19E+00	miss
		719.35		0.28	1.67E+00		1.46E+01	miss
		778.90		12.96	-8.01E-02		3.09E-01	miss
		810.45		0.32	-6.10E-01		1.17E+01	miss
		867.37		4.26	1.74E-01		1.16E+00	miss
		919.33		0.43	1.07E+00		7.42E+00	miss
		964.08		14.65	5.49E-02		3.40E-01	miss
		1085.87		10.24	1.20E-01		5.26E-01	miss
		1089.74		1.73	-9.80E-01		2.06E+00	miss
		1112.07		13.69	-5.67E-02		3.05E-01	miss
		1212.95		1.43	6.59E-01		4.06E+00	miss
		1249.94		0.19	-1.27E+00		2.66E+01	miss
		1299.14		1.63	3.47E-01		3.73E+00	miss
		1408.01		21.07	2.78E-02		2.84E-01	miss
		1457.64		0.50	-5.99E+00		2.04E+01	miss
		1528.10		0.28	9.84E-01		1.27E+01	miss
+	Eu-154	123.07		40.40	-1.38E-02	9.74E-02	9.74E-02	miss
		247.93		6.89	6.79E-02		4.82E-01	miss
		591.76		4.95	2.05E-01		7.70E-01	miss
		692.42		1.78	1.99E-01		1.91E+00	miss
		723.30		20.06	9.50E-02		2.41E-01	miss
		756.80		4.52	1.84E-02		9.35E-01	miss
		873.18		12.08	6.37E-02		3.85E-01	miss
		996.29		10.48	1.78E-01		5.18E-01	miss
		1004.76		18.01	2.02E-02		1.48E-01	miss
		1274.43		34.80	2.04E-02		1.31E-01	miss
		1596.48		1.80	0.00E+00		7.57E-01	miss
+	Eu-155	45.30		1.31	-4.74E+00	1.86E-01	2.64E+01	miss
		60.01		1.22	4.22E+00		2.79E+01	miss
		86.55	*	30.70	1.13E-01		1.86E-01	miss
		105.31		21.10	4.06E-02		2.38E-01	miss
+	Tl-208	583.19	*	85.00	9.05E-02	3.00E-02	3.00E-02	miss
+	Bi-211	351.07	*	13.02	1.03E+00	3.07E-01	3.07E-01	miss
+	Pb-211	404.85		3.78	1.46E-01	9.74E-01	1.04E+00	miss

Analysis Report for 02-Jun-16-10002

L3-10220C-FRGS-003SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	2.25E-01	9.74E-01	2.08E+00	miss
		832.01		3.52	-3.92E-01		9.74E-01	miss
+	Bi-212	39.86		1.06	9.67E+00	9.30E-01	3.14E+01	miss
		727.33		6.67	4.25E-01		9.30E-01	miss
		785.37		1.10	-5.79E-02		3.34E+00	miss
		1620.50		1.47	1.07E+00		4.15E+00	miss
+	Pb-212	115.18		0.60	-1.46E+00	1.16E-01	6.50E+00	miss
		238.63	*	43.60	3.21E-01		1.16E-01	miss
		300.09		3.30	1.15E-02		1.21E+00	miss
+	Pb212-XR	74.82	*	10.28	1.30E+00	5.90E-01	1.19E+00	miss
		77.11	*	17.10	7.95E-01		5.90E-01	miss
		87.35	*	3.97	8.70E-01		1.44E+00	miss
		89.78		1.46	3.83E+00		5.18E+00	miss
+	Bi-214	609.32	*	45.49	2.99E-01	1.19E-01	1.19E-01	miss
		768.36		4.89	2.95E-01		1.03E+00	miss
		806.18		1.26	-3.70E-01		2.96E+00	miss
		934.06		3.11	6.11E-01		1.85E+00	miss
		1120.29		14.92	2.74E-01		5.41E-01	miss
		1155.21		1.63	-1.74E-02		2.92E+00	miss
		1238.12		5.83	8.16E-01		1.52E+00	miss
		1280.98		1.43	-4.24E-01		4.18E+00	miss
		1377.67		3.99	5.75E-01		1.58E+00	miss
		1385.31		0.79	1.03E+00		6.11E+00	miss
		1401.52		1.33	1.02E+00		3.67E+00	miss
		1407.99		2.39	2.45E-01		2.49E+00	miss
		1509.21		2.13	6.77E-01		2.43E+00	miss
		1661.27		1.05	9.27E-01		4.59E+00	miss
		1729.59		2.88	5.28E-01		2.23E+00	miss
		1764.49		15.30	3.17E-01		6.17E-01	miss
		1847.43		2.03	0.00E+00		7.46E-01	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	3.50E-01	1.12E-01	6.15E-01	miss
		295.22	*	18.42	3.91E-01		2.49E-01	miss
		351.93	*	35.60	3.77E-01		1.12E-01	miss
		785.96		1.06	6.11E-01		4.08E+00	miss
+	Pb214-XR	74.82	*	5.80	2.30E+00	1.04E+00	2.10E+00	miss
		77.11	*	9.70	1.40E+00		1.04E+00	miss
		87.35	*	2.24	1.54E+00		2.54E+00	miss
		89.78		0.82	6.82E+00		9.23E+00	miss
+	Ra-226	186.21		3.64	1.37E-01	9.92E-01	9.92E-01	miss
+	Ac-228	129.07		2.42	2.96E-01	3.10E-01	1.61E+00	miss
		209.25		3.89	-4.28E-01		7.47E-01	miss
		270.24		3.46	5.25E-01		1.16E+00	miss
		328.00		2.95	8.56E-01		1.53E+00	miss
		338.32	*	11.27	1.70E-01		3.10E-01	miss
		409.46		1.92	3.23E-01		2.12E+00	miss
		463.00		4.40	2.11E-01		9.46E-01	miss
		794.95		4.25	6.96E-01		1.32E+00	miss
		911.20		25.80	3.33E-01		3.65E-01	miss
		964.77		4.99	9.43E-02		9.27E-01	miss
		968.97		15.80	3.66E-01		5.27E-01	miss

Analysis Report for 02-Jun-16-10002

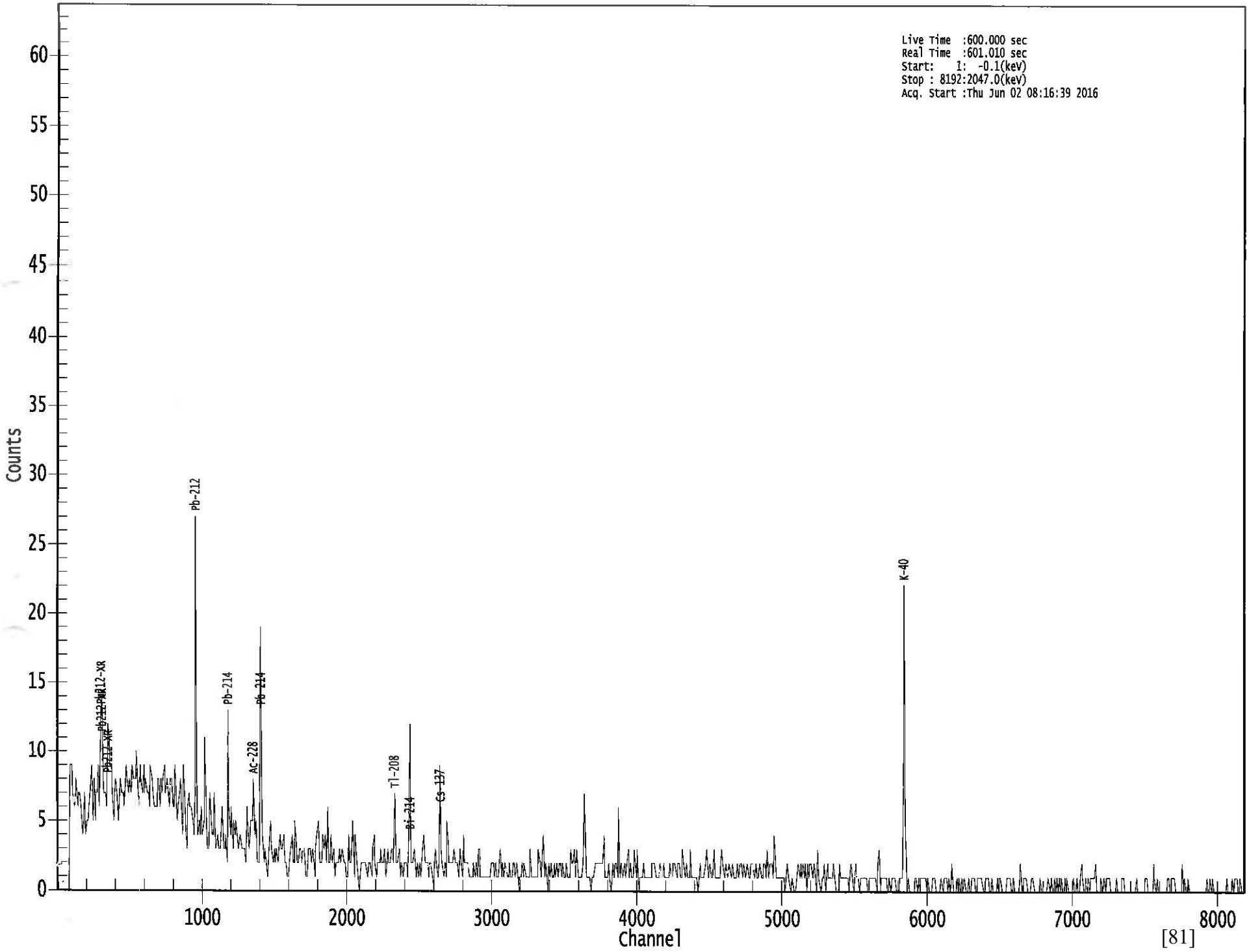
L3-10220C-FRGS-003SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20	3.22	2.13E-01	3.10E-01	1.67E+00	miss
+	Pa-231	27.36	10.30	5.02E-01	1.51E+00	3.16E+00	miss
		283.69	1.70	7.88E-01		2.51E+00	miss
		300.07	2.47	1.54E-02		1.61E+00	miss
		302.65	2.20	-4.18E-01		1.51E+00	miss
		330.06	1.40	-4.49E-01		2.50E+00	miss
+	Th-234	92.38	2.13	1.74E+00	4.30E+00	4.30E+00	miss
		92.80	2.10	2.09E+00		4.38E+00	miss
		112.81	0.21	2.10E+00		2.78E+01	miss
+	U-235	143.76	10.96	6.95E-03	7.11E-02	3.60E-01	miss
		163.33	5.08	1.21E-01		7.21E-01	miss
		185.71	57.20	3.83E-02		7.11E-02	miss
		202.11	1.08	-1.10E+00		2.71E+00	miss
		205.31	5.01	-5.55E-02		5.75E-01	miss
+	Am-241	59.54	35.90	-6.14E-02	9.40E-01	9.40E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000015050.CNF



Apex-Gamma

Analysis Report for 02-Jun-16-10003
L3-10220C-FRGS-004SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 02-Jun-16-10003
Sample Description	: L3-10220C-FRGS-004SS (DRIED)
Sample Type	: Off Site Sample
Unit	:
Sample Point	:
Sample Size	: 1.176E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2016 3:10:00PM
Acquisition Started	: 6/2/2016 8:39:33AM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P11314X2
Geometry	: 130G Soil
Live Time	: 600.0 seconds
Real Time	: 600.5 seconds
Dead Time	: 0.08 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 6/28/2012
Efficiency Calibration Description	:
Sample Number	: 15051

6/2/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 8:49:39AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED
6/2/16

Analysis Report for 02-Jun-16-10003

L3-10220C-FRGS-004SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	77.15	305 -	315	309.82	4.43E+01	25.34	8.15E+01	Pb214-XR Pb212-XR
2	238.61	949 -	961	954.77	7.80E+01	28.57	9.00E+01	Pb-212
3	295.22	1174 -	1186	1180.92	3.78E+01	19.40	4.24E+01	Pb-214 Eu-152
4	351.84	1401 -	1412	1407.16	7.28E+01	20.18	2.64E+01	Pb-214 Bi-211
5	583.23	2326 -	2337	2331.94	3.96E+01	13.40	4.80E+00	Tl-208
6	609.20	2430 -	2444	2435.73	7.54E+01	19.91	1.93E+01	Bi-214
7	661.61	2639 -	2653	2645.27	7.96E+01	18.23	2.86E+00	Cs-137
8	1460.56	5832 -	5851	5841.55	1.27E+02	22.54	0.00E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	5.97E+00	1.18E+00	miss
Cs-137	1.00	661.66	*	85.10	2.74E-01	7.09E-02	miss
Tl-208	1.00	583.19	*	85.00	1.25E-01	4.49E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	2.60E-01	1.04E-01	miss
		300.09		3.30			
Pb212-XR	1.00	74.82		10.28			
		77.11	*	17.10	6.75E-01	4.11E-01	miss
		87.35		3.97			
		89.78		1.46			
Bi-214	1.00	609.32	*	45.49	4.58E-01	1.33E-01	miss
		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 02-Jun-16-10003

L3-10220C-FRGS-004SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	1.00	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	3.43E-01	1.85E-01	miss
		351.93	*	35.60	3.85E-01	1.23E-01	miss
		785.96		1.06			
Pb214-XR	1.00	74.82		5.80			
		77.11	*	9.70	1.19E+00	7.32E-01	miss
		87.35		2.24			
		89.78		0.82			

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.996	5.97E+00	1.18E+00	
	Cs-137	1.000	2.74E-01	7.09E-02	
	Tl-208	1.000	1.25E-01	4.49E-02	
X	Bi-211	0.964			
	Pb-212	1.000	2.60E-01	1.04E-01	

Analysis Report for 02-Jun-16-10003

L3-10220C-FRGS-004SS (DRIED)

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
?	Pb212-XR	1.000	6.75E-01	4.11E-01	
	Bi-214	1.000	4.58E-01	1.33E-01	
	Pb-214	1.000	3.72E-01	1.02E-01	
?	Pb214-XR	1.000	1.19E+00	7.32E-01	

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

Errors quoted at 2.000sigma

Analysis Report for 02-Jun-16-10003

L3-10220C-FRGS-004SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 8:49:39AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.97E+00	1.27E-01	1.27E-01	miss
+	Cr-51	320.08		9.91	-1.89E-02	3.79E-01	3.79E-01	free
+	Mn-54	834.85		99.98	-1.84E-02	4.20E-02	4.20E-02	miss
+	Co-58	810.76		99.45	-6.19E-03	3.45E-02	3.45E-02	miss
		1674.73		0.52	0.00E+00		3.20E+00	miss
+	Co-60	1173.23		99.85	1.23E-02	5.19E-02	5.19E-02	miss
		1332.49		99.98	2.01E-02		6.15E-02	miss
+	Nb-94	702.65		99.81	-6.62E-03	4.00E-02	4.00E-02	miss
		871.09		99.89	-2.79E-03		4.23E-02	miss
+	Ag-108m	79.13		6.60	5.54E-01	3.63E-02	1.04E+00	miss
		433.94		90.50	3.87E-03		3.63E-02	miss
		614.28		89.80	-7.44E-04		4.06E-02	miss
		722.94		90.80	4.71E-03		4.11E-02	miss
+	Sn-113	255.13		2.11	-1.91E-01	4.99E-02	1.63E+00	free
		391.70		64.97	-1.52E-02		4.99E-02	free
+	Cs-134	475.36		1.48	6.19E-01	3.42E-02	2.65E+00	miss
		563.25		8.34	9.83E-02		4.47E-01	miss
		569.33		15.37	-3.99E-02		1.61E-01	miss
		604.72		97.62	-7.40E-03		3.42E-02	miss

Analysis Report for 02-Jun-16-10003

L3-10220C-FRGS-004SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	-5.48E-03	3.42E-02	5.13E-02	miss
		801.95		8.69	2.12E-01		5.46E-01	miss
		1038.61		0.99	-3.37E-01		2.98E+00	miss
		1167.97		1.79	6.69E-01		3.17E+00	miss
		1365.19		3.02	2.05E-01		1.48E+00	miss
+	Cs-137	661.66	*	85.10	2.74E-01	3.05E-02	3.05E-02	miss
+	Eu-152	121.78		28.67	2.60E-02	1.06E-01	1.06E-01	miss
		244.70		7.61	-1.78E-01		3.24E-01	miss
		295.94		0.45	9.37E-02		1.22E+01	miss
		344.28		26.60	-2.13E-02		1.16E-01	miss
		367.79		0.86	-2.26E+00		3.18E+00	miss
		411.12		2.24	-9.42E-02		1.57E+00	miss
		443.96		2.83	1.54E-01		1.37E+00	miss
		488.68		0.42	-4.42E+00		6.80E+00	miss
		563.99		0.49	1.93E-01		7.02E+00	miss
		586.26		0.46	-4.34E+00		7.05E+00	miss
		678.62		0.47	2.11E+00		9.49E+00	miss
		688.67		0.86	0.00E+00		2.58E+00	miss
		719.35		0.28	1.81E+00		1.34E+01	miss
		778.90		12.96	-6.73E-02		1.86E-01	miss
		810.45		0.32	8.14E-01		1.13E+01	miss
		867.37		4.26	-1.68E-01		9.91E-01	miss
		919.33		0.43	1.76E+00		9.22E+00	miss
		964.08		14.65	1.85E-01		4.30E-01	miss
		1085.87		10.24	3.99E-02		4.80E-01	miss
		1089.74		1.73	-3.72E-01		1.74E+00	miss
		1112.07		13.69	-2.38E-02		2.82E-01	miss
		1212.95		1.43	1.76E-01		3.32E+00	miss
		1249.94		0.19	1.37E+01		3.56E+01	miss
		1299.14		1.63	2.43E-01		2.08E+00	miss
		1408.01		21.07	6.68E-02		3.04E-01	miss
		1457.64		0.50	0.00E+00		1.50E+01	miss
		1528.10		0.28	-5.26E-01		1.36E+01	miss
+	Eu-154	123.07		40.40	-1.16E-02	6.60E-02	6.60E-02	miss
		247.93		6.89	-1.12E-02		4.74E-01	miss
		591.76		4.95	2.12E-01		9.15E-01	miss
		692.42		1.78	-1.31E+00		1.25E+00	miss
		723.30		20.06	4.53E-03		1.87E-01	miss
		756.80		4.52	1.30E-01		1.00E+00	miss
		873.18		12.08	-4.39E-02		3.51E-01	miss
		996.29		10.48	4.31E-02		3.98E-01	miss
		1004.76		18.01	-4.80E-03		2.33E-01	miss
		1274.43		34.80	3.73E-03		1.57E-01	miss
		1596.48		1.80	2.49E-01		3.22E+00	miss
+	Eu-155	45.30		1.31	-3.80E+00	1.78E-01	7.95E+00	miss
		60.01		1.22	-4.84E+00		1.06E+01	miss
		86.55		30.70	6.93E-02		1.79E-01	miss
		105.31		21.10	1.57E-02		1.78E-01	miss
+	Tl-208	583.19	*	85.00	1.25E-01	3.25E-02	3.25E-02	miss
+	Bi-211	351.07	*	13.02	1.05E+00	2.95E-01	2.95E-01	miss
+	Pb-211	404.85		3.78	-1.79E-01	7.22E-01	7.22E-01	miss

Analysis Report for 02-Jun-16-10003

L3-10220C-FRGS-004SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	-5.94E-01	7.22E-01	1.61E+00	miss
		832.01		3.52	5.38E-01		1.54E+00	miss
+	Bi-212	39.86		1.06	1.12E+00	7.79E-01	1.13E+01	miss
		727.33		6.67	1.68E-01		7.79E-01	miss
		785.37		1.10	1.49E-01		4.20E+00	miss
		1620.50		1.47	7.39E-01		3.43E+00	miss
+	Pb-212	115.18		0.60	2.65E+00	1.32E-01	6.16E+00	miss
		238.63	*	43.60	2.60E-01		1.32E-01	miss
		300.09		3.30	7.78E-01		1.23E+00	miss
+	Pb212-XR	74.82		10.28	4.66E-01	5.82E-01	8.89E-01	miss
		77.11	*	17.10	6.75E-01		5.82E-01	miss
		87.35		3.97	3.02E-01		1.42E+00	miss
		89.78		1.46	1.69E+00		3.66E+00	miss
+	Bi-214	609.32	*	45.49	4.58E-01	1.14E-01	1.14E-01	miss
		768.36		4.89	2.01E-01		1.05E+00	miss
		806.18		1.26	2.17E+00		4.61E+00	miss
		934.06		3.11	1.74E-01		1.43E+00	miss
		1120.29		14.92	2.78E-01		5.96E-01	miss
		1155.21		1.63	1.69E+00		4.72E+00	miss
		1238.12		5.83	4.65E-01		1.27E+00	miss
		1280.98		1.43	9.98E-01		4.16E+00	miss
		1377.67		3.99	5.47E-01		1.80E+00	miss
		1385.31		0.79	5.20E-01		5.64E+00	miss
		1401.52		1.33	1.46E+00		4.38E+00	miss
		1407.99		2.39	5.87E-01		2.67E+00	miss
		1509.21		2.13	7.58E-01		3.16E+00	miss
		1661.27		1.05	0.00E+00		1.43E+00	miss
		1729.59		2.88	1.98E-01		1.46E+00	miss
		1764.49		15.30	3.46E-01		6.87E-01	miss
		1847.43		2.03	5.40E-01		3.17E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	3.56E-01	1.08E-01	6.19E-01	miss
		295.22	*	18.42	3.43E-01		2.49E-01	miss
		351.93	*	35.60	3.85E-01		1.08E-01	miss
		785.96		1.06	1.24E+00		4.66E+00	miss
+	Pb214-XR	74.82		5.80	8.25E-01	1.03E+00	1.58E+00	miss
		77.11	*	9.70	1.19E+00		1.03E+00	miss
		87.35		2.24	5.35E-01		2.52E+00	miss
		89.78		0.82	3.02E+00		6.51E+00	miss
+	Ra-226	186.21		3.64	3.23E-01	9.55E-01	9.55E-01	miss
+	Ac-228	129.07		2.42	-2.39E-02	4.15E-01	1.29E+00	miss
		209.25		3.89	2.45E-01		9.04E-01	miss
		270.24		3.46	3.30E-01		1.14E+00	miss
		328.00		2.95	5.71E-02		1.15E+00	miss
		338.32		11.27	3.75E-01		4.85E-01	miss
		409.46		1.92	3.03E-01		2.20E+00	miss
		463.00		4.40	-1.17E-01		1.05E+00	miss
		794.95		4.25	-1.17E-01		1.02E+00	miss
		911.20		25.80	3.81E-01		4.15E-01	miss
		964.77		4.99	3.94E-01		1.26E+00	miss
		968.97		15.80	3.15E-01		4.97E-01	miss

Analysis Report for 02-Jun-16-10003

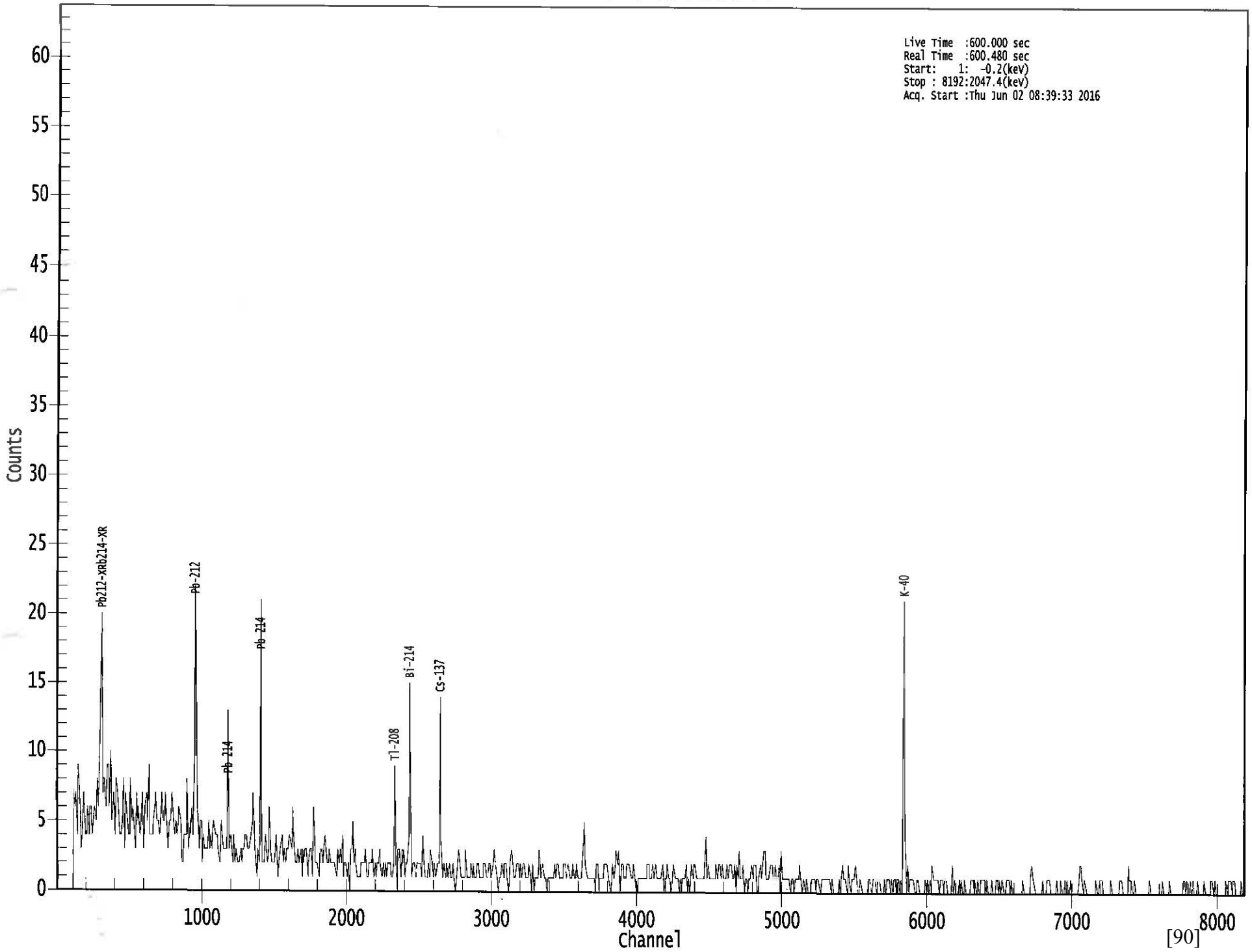
L3-10220C-FRGS-004SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20	3.22	4.98E-01	4.15E-01	1.79E+00	miss
+	Pa-231	27.36	10.30	0.00E+00	1.56E-01	1.56E-01	miss
		283.69	1.70	-1.11E-01		2.04E+00	miss
		300.07	2.47	1.04E+00		1.65E+00	miss
		302.65	2.20	1.50E-02		1.29E+00	miss
		330.06	1.40	-2.93E-01		2.15E+00	miss
+	Th-234	92.38	2.13	2.32E+00	3.58E+00	3.58E+00	miss
		92.80	2.10	2.77E+00		3.65E+00	miss
		112.81	0.21	7.95E+00		2.16E+01	miss
+	U-235	143.76	10.96	8.87E-02	5.66E-02	2.78E-01	miss
		163.33	5.08	1.57E-01		5.22E-01	miss
		185.71	57.20	-4.21E-03		5.66E-02	miss
		202.11	1.08	-6.19E-01		2.55E+00	miss
		205.31	5.01	-9.84E-02		5.38E-01	miss
+	Am-241	59.54	35.90	2.76E-02	4.14E-01	4.14E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000015051.CNF



[90]

Apex-Gamma

Analysis Report for 02-Jun-16-10004
L3-10220C-FRGS-005SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 02-Jun-16-10004
Sample Description	: L3-10220C-FRGS-005SS (DRIED)
Sample Type	: Off Site Sample
Unit	:
Sample Point	:
Sample Size	: 1.320E+03 grams
Facility	: Default
Sample Taken On	: 5/16/2016 3:25:00PM
Acquisition Started	: 6/2/2016 8:39:39AM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P40818B
Geometry	: 130G Soil
Live Time	: 600.0 seconds
Real Time	: 601.0 seconds
Dead Time	: 0.16 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 1/5/2015
Efficiency Calibration Description	:
Sample Number	: 15052

6/2/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 8:50:18AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED 6/2/16

Analysis Report for 02-Jun-16-10004

L3-10220C-FRGS-005SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	238.63	948 -	960	955.00	5.79E+01	26.95	9.42E+01	Pb-212
2	295.08	1176 -	1185	1180.65	2.97E+01	16.34	3.27E+01	Pb-214
								Eu-152
3	351.71	1400 -	1413	1407.01	3.98E+01	18.30	3.63E+01	Pb-214
								Bi-211
4	609.31	2430 -	2442	2436.98	5.01E+01	15.39	7.86E+00	Bi-214
5	661.52	2640 -	2652	2645.77	4.15E+01	15.38	1.69E+01	Cs-137
6	968.97	3870 -	3881	3875.65	9.38E+00	7.85	5.25E+00	Ac-228
7	1460.77	5835 -	5853	5844.03	1.34E+02	23.69	5.12E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	1.00	1460.82	*	10.66	6.25E+00	1.23E+00	miss
Cs-137	0.99	661.66	*	85.10	1.41E-01	5.50E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	1.93E-01	9.53E-02	miss
		300.09		3.30			
Bi-214	1.00	609.32	*	45.49	3.01E-01	9.93E-02	miss
		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			

Analysis Report for 02-Jun-16-10004

L3-10220C-FRGS-005SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	1.00	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	2.68E-01	1.54E-01	miss
		351.93	*	35.60	2.09E-01	1.01E-01	miss
		785.96		1.06			
Ac-228	1.00	129.07		2.42			
		209.25		3.89			
		270.24		3.46			
		328.00		2.95			
		338.32		11.27			
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20		25.80			
		964.77		4.99			
		968.97	*	15.80	2.22E-01	1.87E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	6.25E+00	1.23E+00	
	Cs-137	0.999	1.41E-01	5.50E-02	
X	Bi-211	0.976			
	Pb-212	1.000	1.93E-01	9.53E-02	

Analysis Report for 02-Jun-16-10004

L3-10220C-FRGS-005SS (DRIED)

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
Bi-214	1.000	3.01E-01	9.93E-02	
Pb-214	0.998	2.27E-01	8.47E-02	
Ac-228	1.000	2.22E-01	1.87E-01	

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

Errors quoted at 2.000sigma

Analysis Report for 02-Jun-16-10004

L3-10220C-FRGS-005SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 8:50:18AM
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 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	6.25E+00	4.98E-01	4.98E-01	miss
+	Cr-51	320.08		9.91	-8.67E-02	4.49E-01	4.49E-01	free
+	Mn-54	834.85		99.98	-7.02E-03	3.26E-02	3.26E-02	miss
+	Co-58	810.76		99.45	-1.05E-02	2.89E-02	2.89E-02	miss
		1674.73		0.52	0.00E+00		3.39E+00	miss
+	Co-60	1173.23		99.85	2.00E-02	5.01E-02	6.43E-02	miss
		1332.49		99.98	0.00E+00		5.01E-02	miss
+	Nb-94	702.65		99.81	-1.68E-02	2.80E-02	2.80E-02	miss
		871.09		99.89	1.44E-02		5.23E-02	miss
+	Ag-108m	79.13		6.60	-1.68E-01	3.13E-02	1.49E+00	miss
		433.94		90.50	1.24E-03		3.13E-02	miss
		614.28		89.80	8.57E-03		4.01E-02	miss
		722.94		90.80	-2.82E-03		3.64E-02	miss
+	Sn-113	255.13		2.11	-5.13E-01	5.15E-02	1.55E+00	free
		391.70		64.97	-1.12E-02		5.15E-02	free
+	Cs-134	475.36		1.48	6.28E-01	4.72E-02	2.98E+00	miss
		563.25		8.34	2.93E-01		5.50E-01	miss
		569.33		15.37	4.14E-03		2.26E-01	miss
		604.72		97.62	1.62E-02		4.72E-02	miss

Analysis Report for 02-Jun-16-10004

L3-10220C-FRGS-005SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	-6.35E-03	4.72E-02	5.10E-02	miss
		801.95		8.69	-1.07E-02		5.42E-01	miss
		1038.61		0.99	4.47E-02		4.33E+00	miss
		1167.97		1.79	7.38E-01		2.89E+00	miss
		1365.19		3.02	3.17E-01		1.47E+00	miss
+	Cs-137	661.66	*	85.10	1.41E-01	5.62E-02	5.62E-02	miss
+	Eu-152	121.78		28.67	-2.03E-02	1.31E-01	1.31E-01	miss
		244.70		7.61	-1.45E-01		3.67E-01	miss
		295.94		0.45	-1.64E+00		1.19E+01	miss
		344.28		26.60	3.52E-03		1.35E-01	miss
		367.79		0.86	-1.02E+00		3.90E+00	miss
		411.12		2.24	5.79E-01		1.93E+00	miss
		443.96		2.83	-2.15E-01		1.02E+00	miss
		488.68		0.42	-1.10E+00		7.35E+00	miss
		563.99		0.49	-1.74E+00		6.94E+00	miss
		586.26		0.46	-1.48E+00		9.67E+00	miss
		678.62		0.47	7.46E-01		8.81E+00	miss
		688.67		0.86	-6.36E-01		3.73E+00	miss
		719.35		0.28	1.22E+00		1.18E+01	miss
		778.90		12.96	3.08E-02		3.27E-01	miss
		810.45		0.32	-1.38E+00		9.61E+00	miss
		867.37		4.26	2.93E-01		1.23E+00	miss
		919.33		0.43	8.46E-01		1.02E+01	miss
		964.08		14.65	-2.55E-02		3.07E-01	miss
		1085.87		10.24	-5.37E-02		3.67E-01	miss
		1089.74		1.73	-8.71E-01		1.73E+00	miss
		1112.07		13.69	1.00E-02		3.23E-01	miss
		1212.95		1.43	4.98E-02		4.58E+00	miss
		1249.94		0.19	3.19E+00		2.82E+01	miss
		1299.14		1.63	-5.34E-02		3.02E+00	miss
		1408.01		21.07	-1.97E-02		1.69E-01	miss
		1457.64		0.50	-1.21E+01		1.48E+01	miss
		1528.10		0.28	0.00E+00		4.94E+00	miss
+	Eu-154	123.07		40.40	-8.13E-03	9.73E-02	9.73E-02	miss
		247.93		6.89	-6.21E-02		4.37E-01	miss
		591.76		4.95	-3.55E-01		5.85E-01	miss
		692.42		1.78	9.36E-03		2.38E+00	miss
		723.30		20.06	2.18E-02		1.85E-01	miss
		756.80		4.52	-2.58E-01		7.57E-01	miss
		873.18		12.08	-1.45E-02		3.48E-01	miss
		996.29		10.48	1.16E-01		4.79E-01	miss
		1004.76		18.01	-6.42E-02		1.99E-01	miss
		1274.43		34.80	-8.32E-03		1.20E-01	miss
		1596.48		1.80	-1.85E-01		2.76E+00	miss
+	Eu-155	45.30		1.31	-2.15E+00	2.30E-01	2.70E+01	miss
		60.01		1.22	9.82E+00		2.80E+01	miss
		86.55		30.70	-5.64E-02		2.30E-01	miss
		105.31		21.10	8.81E-02		2.60E-01	miss
+	Tl-208	583.19		85.00	6.26E-02	8.39E-02	8.39E-02	miss
+	Bi-211	351.07	*	13.02	5.70E-01	3.51E-01	3.51E-01	miss
+	Pb-211	404.85		3.78	-3.72E-01	9.09E-01	9.09E-01	miss

Analysis Report for 02-Jun-16-10004

L3-10220C-FRGS-005SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	-4.86E-01	9.09E-01	1.71E+00	miss
		832.01		3.52	0.00E+00		1.15E+00	miss
+	Bi-212	39.86		1.06	-8.85E-01	8.05E-01	2.41E+01	miss
		727.33		6.67	3.39E-01		8.05E-01	miss
		785.37		1.10	2.94E-02		3.86E+00	miss
		1620.50		1.47	0.00E+00		9.89E-01	miss
+	Pb-212	115.18		0.60	-6.19E-02	1.31E-01	7.47E+00	miss
		238.63	*	43.60	1.93E-01		1.31E-01	miss
		300.09		3.30	-1.92E-01		9.61E-01	miss
+	Pb212-XR	74.82		10.28	5.99E-01	8.00E-01	1.49E+00	miss
		77.11		17.10	3.44E-01		8.00E-01	miss
		87.35		3.97	1.17E+00		2.06E+00	miss
		89.78		1.46	1.18E+00		4.63E+00	miss
+	Bi-214	609.32	*	45.49	3.01E-01	7.60E-02	7.60E-02	miss
		768.36		4.89	2.90E-01		1.14E+00	miss
		806.18		1.26	1.35E+00		4.35E+00	miss
		934.06		3.11	-1.96E-01		1.09E+00	miss
		1120.29		14.92	2.00E-01		5.20E-01	miss
		1155.21		1.63	5.96E-01		3.38E+00	miss
		1238.12		5.83	-1.67E-01		1.06E+00	miss
		1280.98		1.43	-3.59E-01		2.31E+00	miss
		1377.67		3.99	3.44E-01		1.43E+00	miss
		1385.31		0.79	9.22E-01		7.21E+00	miss
		1401.52		1.33	2.45E-01		4.34E+00	miss
		1407.99		2.39	-1.73E-01		1.48E+00	miss
		1509.21		2.13	2.39E-01		2.22E+00	miss
		1661.27		1.05	5.23E-01		3.85E+00	miss
		1729.59		2.88	1.96E-01		1.45E+00	miss
		1764.49		15.30	3.38E-01		6.25E-01	miss
		1847.43		2.03	-7.30E-02		2.15E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	5.05E-01	1.28E-01	6.73E-01	miss
		295.22	*	18.42	2.68E-01		2.06E-01	miss
		351.93	*	35.60	2.09E-01		1.28E-01	miss
		785.96		1.06	1.74E-01		4.01E+00	miss
+	Pb214-XR	74.82		5.80	1.06E+00	1.41E+00	2.64E+00	miss
		77.11		9.70	6.06E-01		1.41E+00	miss
		87.35		2.24	2.07E+00		3.65E+00	miss
		89.78		0.82	2.11E+00		8.24E+00	miss
+	Ra-226	186.21		3.64	7.89E-01	1.23E+00	1.23E+00	miss
+	Ac-228	129.07		2.42	-4.17E-01	2.55E-01	1.42E+00	miss
		209.25		3.89	-2.14E-01		8.47E-01	miss
		270.24		3.46	6.09E-01		1.25E+00	miss
		328.00		2.95	6.84E-01		1.48E+00	miss
		338.32		11.27	3.58E-01		4.75E-01	miss
		409.46		1.92	3.84E-01		2.04E+00	miss
		463.00		4.40	6.30E-02		8.16E-01	miss
		794.95		4.25	3.52E-01		1.28E+00	miss
		911.20		25.80	1.04E-01		2.71E-01	miss
		964.77		4.99	2.37E-01		1.06E+00	miss
		968.97	*	15.80	2.22E-01		2.55E-01	miss

Analysis Report for 02-Jun-16-10004

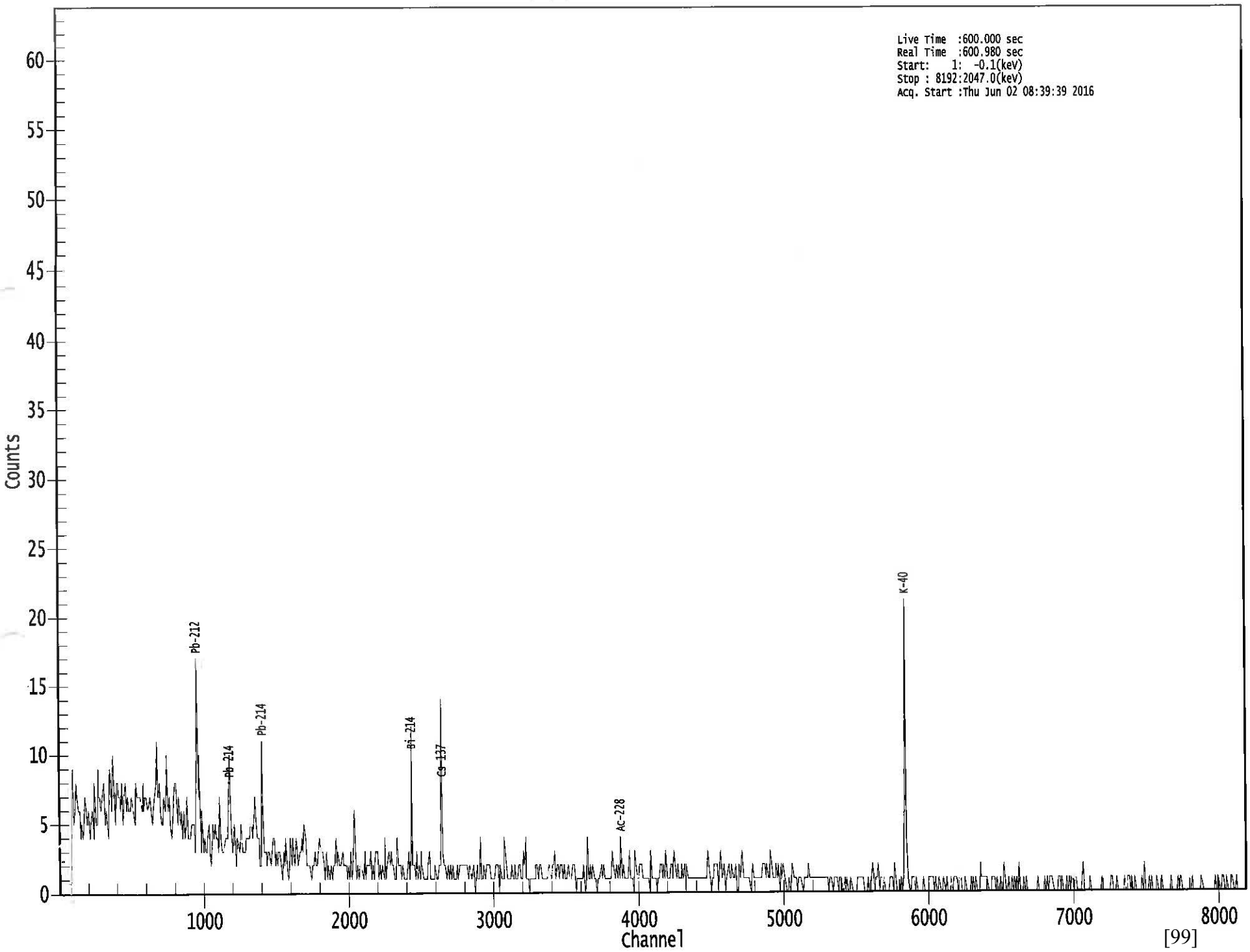
L3-10220C-FRGS-005SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20	3.22	4.18E-01	2.55E-01	1.77E+00	miss
+	Pa-231	27.36	10.30	9.10E-01	1.28E+00	3.42E+00	miss
		283.69	1.70	1.91E-01		1.80E+00	miss
		300.07	2.47	-2.56E-01		1.28E+00	miss
		302.65	2.20	7.96E-01		1.77E+00	miss
		330.06	1.40	1.17E-01		2.80E+00	miss
+	Th-234	92.38	2.13	3.23E+00	5.75E+00	5.75E+00	miss
		92.80	2.10	5.55E+00		6.25E+00	miss
		112.81	0.21	1.77E+00		3.44E+01	miss
+	U-235	143.76	10.96	4.55E-02	7.37E-02	3.27E-01	miss
		163.33	5.08	1.19E-01		6.87E-01	miss
		185.71	57.20	2.16E-02		7.37E-02	miss
		202.11	1.08	-7.51E-01		2.87E+00	miss
		205.31	5.01	1.29E-01		7.04E-01	miss
+	Am-241	59.54	35.90	8.55E-02	9.37E-01	9.37E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000015052.CNF



[99]

Apex-Gamma

Analysis Report for 02-Jun-16-10005
L3-10220C-FRGS-006SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 02-Jun-16-10005
Sample Description	: L3-10220C-FRGS-006SS (DRIED)
Sample Type	: Off Site Sample
Unit	:
Sample Point	:
Sample Size	: 1.111E+03 grams
Facility	: Default
Sample Taken On	: 5/16/2016 3:45:00PM
Acquisition Started	: 6/2/2016 9:11:04AM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P11314X2
Geometry	: 130G Soil
Live Time	: 600.0 seconds
Real Time	: 600.4 seconds
Dead Time	: 0.07 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 6/28/2012
Efficiency Calibration Description	:
Sample Number	: 15053

6/2/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 9:21:10AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED 6/6/16

Analysis Report for 02-Jun-16-10005

L3-10220C-FRGS-006SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	74.73	297 -	303	300.17	2.59E+01	17.45	4.62E+01	Pb214-XR Pb212-XR
2	238.61	948 -	961	954.78	9.36E+01	24.30	3.88E+01	Pb-212
3	295.23	1176 -	1187	1180.96	3.43E+01	17.22	3.14E+01	Pb-214 Eu-152
4	351.83	1401 -	1413	1407.12	5.55E+01	18.92	2.91E+01	Pb-214 Bi-211
5	583.16	2326 -	2337	2331.66	4.75E+01	14.85	6.96E+00	Tl-208
6	609.29	2427 -	2443	2436.08	5.31E+01	18.52	2.39E+01	Bi-214
7	661.50	2638 -	2651	2644.82	6.27E+01	18.00	1.66E+01	Cs-137
8	1460.64	5833 -	5850	5841.87	1.10E+02	21.24	2.68E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	5.45E+00	1.16E+00	miss
Cs-137	0.99	661.66	*	85.10	2.28E-01	7.11E-02	miss
Tl-208	1.00	583.19	*	85.00	1.59E-01	5.32E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	3.30E-01	1.01E-01	miss
		300.09		3.30			
Bi-214	1.00	609.32	*	45.49	3.42E-01	1.26E-01	miss
		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			

Analysis Report for 02-Jun-16-10005

L3-10220C-FRGS-006SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	1.00	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	3.30E-01	1.74E-01	miss
		351.93	*	35.60	3.10E-01	1.17E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.998	5.45E+00	1.16E+00	
	Cs-137	0.998	2.28E-01	7.11E-02	
	Tl-208	1.000	1.59E-01	5.32E-02	
X	Bi-211	0.965			
	Pb-212	1.000	3.30E-01	1.01E-01	
	Bi-214	1.000	3.42E-01	1.26E-01	
	Pb-214	1.000	3.16E-01	9.70E-02	

Analysis Report for 02-Jun-16-10005

L3-10220C-FRGS-006SS (DRIED)

? = 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 2.000sigma

Analysis Report for 02-Jun-16-10005

L3-10220C-FRGS-006SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 9:21:10AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
1	74.73	4.31519E-02	33.70	Tol.	Pb212-XR Pb214-XR

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.45E+00	4.25E-01	4.25E-01	miss
+	Cr-51	320.08		9.91	2.28E-01	5.39E-01	5.39E-01	free
+	Mn-54	834.85		99.98	-3.13E-03	3.49E-02	3.49E-02	miss
+	Co-58	810.76		99.45	5.61E-03	5.51E-02	5.51E-02	miss
		1674.73		0.52	-2.68E+00		9.86E+00	miss
+	Co-60	1173.23		99.85	1.53E-02	1.35E-02	6.00E-02	miss
		1332.49		99.98	0.00E+00		1.35E-02	miss
+	Nb-94	702.65		99.81	6.10E-03	4.56E-02	4.56E-02	miss
		871.09		99.89	2.24E-02		5.26E-02	miss
+	Ag-108m	79.13		6.60	-4.12E-01	3.36E-02	9.16E-01	miss
		433.94		90.50	-3.41E-04		3.60E-02	miss
		614.28		89.80	-2.19E-04		4.63E-02	miss
		722.94		90.80	-6.04E-03		3.36E-02	miss
+	Sn-113	255.13		2.11	-8.71E-01	6.90E-02	1.47E+00	free
		391.70		64.97	9.53E-03		6.90E-02	free
+	Cs-134	475.36		1.48	-6.44E-01	3.64E-02	1.82E+00	miss

Analysis Report for 02-Jun-16-10005

L3-10220C-FRGS-006SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	563.25		8.34	8.03E-02	3.64E-02	5.63E-01	miss
		569.33		15.37	-4.06E-02		1.99E-01	miss
		604.72		97.62	-6.97E-03		3.64E-02	miss
		795.86		85.46	1.30E-02		5.88E-02	miss
		801.95		8.69	-1.17E-01		3.83E-01	miss
		1038.61		0.99	-1.76E+00		4.00E+00	miss
		1167.97		1.79	2.11E-01		3.09E+00	miss
		1365.19		3.02	0.00E+00		4.59E-01	miss
+	Cs-137	661.66	*	85.10	2.28E-01	6.12E-02	6.12E-02	miss
+	Eu-152	121.78		28.67	4.57E-02	1.12E-01	1.12E-01	miss
		244.70		7.61	-1.73E-01		3.73E-01	miss
		295.94		0.45	1.35E+01		1.30E+01	miss
		344.28		26.60	4.78E-02		1.39E-01	miss
		367.79		0.86	8.20E-02		3.59E+00	miss
		411.12		2.24	7.91E-01		1.94E+00	miss
		443.96		2.83	-1.61E-01		1.17E+00	miss
		488.68		0.42	-1.42E+00		8.46E+00	miss
		563.99		0.49	2.63E+00		9.44E+00	miss
		586.26		0.46	-5.22E+00		6.69E+00	miss
		678.62		0.47	-5.80E-01		8.77E+00	miss
		688.67		0.86	1.06E+00		4.87E+00	miss
		719.35		0.28	-3.92E-01		1.41E+01	miss
		778.90		12.96	-7.35E-02		3.21E-01	miss
		810.45		0.32	-2.96E+00		1.19E+01	miss
		867.37		4.26	-2.04E-01		8.12E-01	miss
		919.33		0.43	-9.07E-01		8.42E+00	miss
		964.08		14.65	-5.01E-02		2.54E-01	miss
		1085.87		10.24	-8.16E-02		5.08E-01	miss
		1089.74		1.73	7.17E-02		3.01E+00	miss
		1112.07		13.69	-1.70E-01		3.86E-01	miss
		1212.95		1.43	4.67E-02		3.03E+00	miss
		1249.94		0.19	-4.67E+00		2.71E+01	miss
		1299.14		1.63	3.00E-01		2.21E+00	miss
		1408.01		21.07	4.90E-02		2.28E-01	miss
		1457.64		0.50	0.00E+00		1.67E+01	miss
		1528.10		0.28	0.00E+00		5.28E+00	miss
+	Eu-154	123.07		40.40	-1.72E-02	7.19E-02	7.19E-02	miss
		247.93		6.89	2.24E-02		4.16E-01	miss
		591.76		4.95	1.45E-01		8.21E-01	miss
		692.42		1.78	5.71E-01		2.36E+00	miss
		723.30		20.06	1.78E-02		1.98E-01	miss
		756.80		4.52	1.25E-02		6.99E-01	miss
		873.18		12.08	-1.40E-01		2.28E-01	miss
		996.29		10.48	4.89E-02		4.70E-01	miss
		1004.76		18.01	2.67E-02		2.47E-01	miss
		1274.43		34.80	4.65E-02		1.66E-01	miss
		1596.48		1.80	0.00E+00		8.58E-01	miss
+	Eu-155	45.30		1.31	-2.96E+00	1.76E-01	8.07E+00	miss
		60.01		1.22	1.79E+00		1.07E+01	miss
		86.55		30.70	-7.93E-03		1.76E-01	miss
		105.31		21.10	3.89E-02		1.89E-01	miss

Analysis Report for 02-Jun-16-10005

L3-10220C-FRGS-006SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Tl-208	583.19	*	85.00	1.59E-01	3.94E-02	3.94E-02	miss
+	Bi-211	351.07	*	13.02	8.48E-01	3.35E-01	3.35E-01	miss
+	Pb-211	404.85		3.78	-9.33E-02	7.55E-01	8.75E-01	miss
		427.09		1.76	6.28E-01		2.36E+00	miss
		832.01		3.52	-1.71E-01		7.55E-01	miss
+	Bi-212	39.86		1.06	-3.44E+00	9.32E-01	9.43E+00	miss
		727.33		6.67	3.34E-01		9.32E-01	miss
		785.37		1.10	5.26E-01		4.74E+00	miss
		1620.50		1.47	3.91E-01		2.87E+00	miss
+	Pb-212	115.18		0.60	4.61E+00	9.47E-02	7.13E+00	miss
		238.63	*	43.60	3.30E-01		9.47E-02	miss
		300.09		3.30	1.29E-01		1.06E+00	miss
+	Pb212-XR	74.82		10.28	7.58E-01	6.41E-01	1.03E+00	miss
		77.11		17.10	6.79E-01		6.41E-01	miss
		87.35		3.97	5.81E-01		1.42E+00	miss
		89.78		1.46	9.71E-01		3.72E+00	miss
+	Bi-214	609.32	*	45.49	3.42E-01	1.39E-01	1.39E-01	miss
		768.36		4.89	1.50E-01		1.05E+00	miss
		806.18		1.26	1.03E-01		3.67E+00	miss
		934.06		3.11	5.25E-01		1.78E+00	miss
		1120.29		14.92	4.57E-01		6.80E-01	miss
		1155.21		1.63	7.95E-01		3.61E+00	miss
		1238.12		5.83	1.80E-01		1.06E+00	miss
		1280.98		1.43	-3.84E-01		3.12E+00	miss
		1377.67		3.99	5.09E-01		1.53E+00	miss
		1385.31		0.79	3.85E+00		9.05E+00	miss
		1401.52		1.33	6.07E-01		4.16E+00	miss
		1407.99		2.39	4.31E-01		2.00E+00	miss
		1509.21		2.13	-7.29E-01		1.88E+00	miss
		1661.27		1.05	4.89E-01		4.11E+00	miss
		1729.59		2.88	1.05E+00		2.75E+00	miss
		1764.49		15.30	2.38E-01		6.02E-01	miss
		1847.43		2.03	6.23E-01		3.36E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	3.46E-01	1.23E-01	6.03E-01	miss
		295.22	*	18.42	3.30E-01		2.26E-01	miss
		351.93	*	35.60	3.10E-01		1.23E-01	miss
		785.96		1.06	3.46E-01		4.63E+00	miss
+	Pb214-XR	74.82		5.80	1.34E+00	1.13E+00	1.83E+00	miss
		77.11		9.70	1.20E+00		1.13E+00	miss
		87.35		2.24	1.03E+00		2.52E+00	miss
		89.78		0.82	1.73E+00		6.62E+00	miss
+	Ra-226	186.21		3.64	9.30E-01	1.19E+00	1.19E+00	miss
+	Ac-228	129.07		2.42	6.11E-01	3.18E-01	1.57E+00	miss
		209.25		3.89	2.91E-01		8.26E-01	miss
		270.24		3.46	4.56E-01		1.18E+00	miss
		328.00		2.95	4.35E-01		1.45E+00	miss
		338.32		11.27	3.40E-01		4.85E-01	miss
		409.46		1.92	2.43E-01		2.33E+00	miss
		463.00		4.40	1.11E-01		9.58E-01	miss

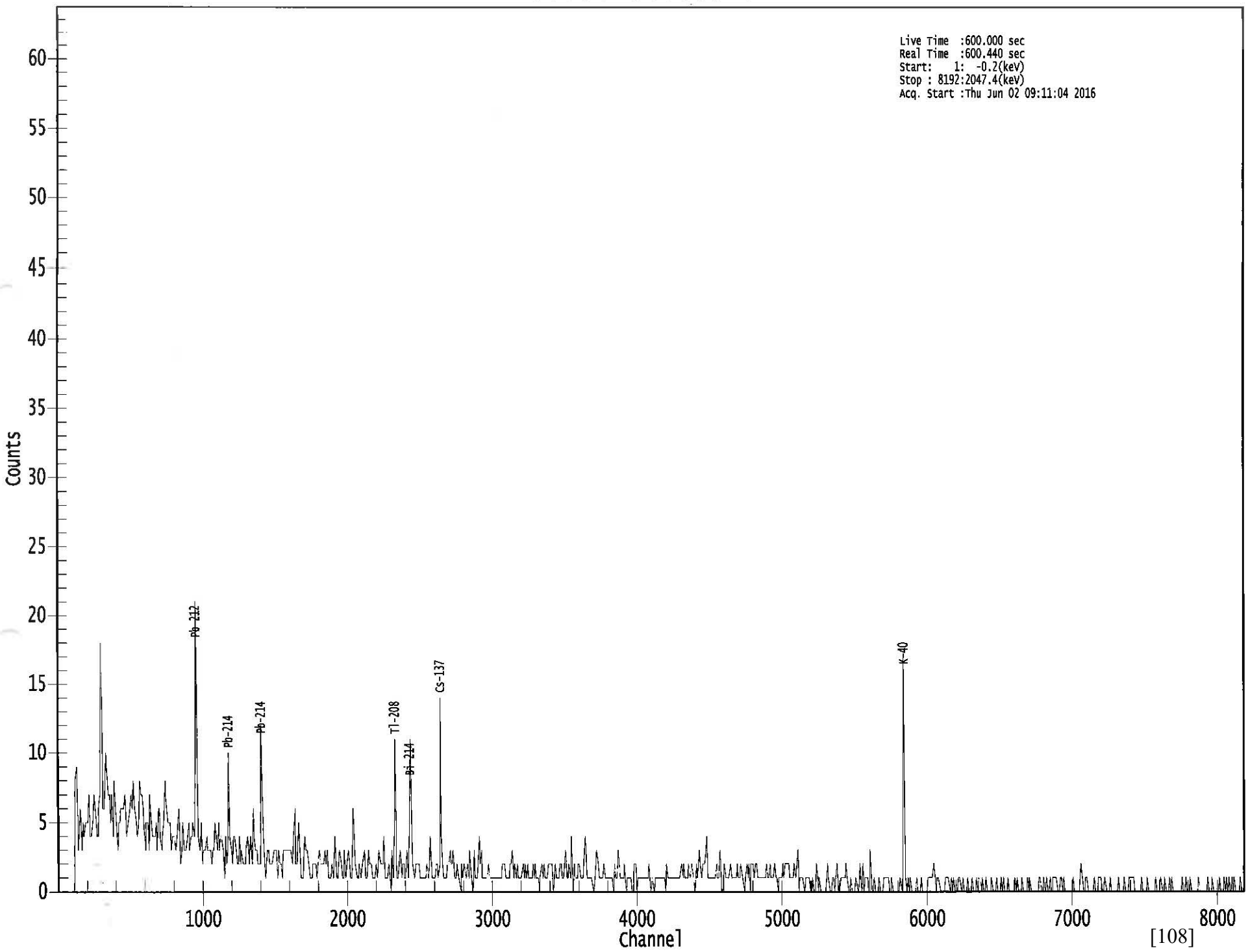
Analysis Report for 02-Jun-16-10005

L3-10220C-FRGS-006SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	794.95	4.25	3.81E-01	3.18E-01	1.31E+00	miss
		911.20	25.80	1.29E-01		3.18E-01	miss
		964.77	4.99	-2.80E-01		8.63E-01	miss
		968.97	15.80	4.71E-01		6.23E-01	miss
		1588.20	3.22	5.27E-01		1.89E+00	miss
+	Pa-231	27.36	10.30	0.00E+00	1.65E-01	1.65E-01	miss
		283.69	1.70	-2.60E-01		1.91E+00	miss
		300.07	2.47	1.73E-01		1.41E+00	miss
		302.65	2.20	2.86E-01		1.48E+00	miss
		330.06	1.40	9.90E-01		2.82E+00	miss
+	Th-234	92.38	2.13	2.38E+00	3.80E+00	3.94E+00	miss
		92.80	2.10	2.11E+00		3.80E+00	miss
		112.81	0.21	2.26E+00		2.79E+01	miss
+	U-235	143.76	10.96	1.89E-02	6.91E-02	3.00E-01	miss
		163.33	5.08	5.19E-02		5.53E-01	miss
		185.71	57.20	2.21E-02		6.91E-02	miss
		202.11	1.08	-5.86E-01		2.07E+00	miss
		205.31	5.01	-6.75E-02		5.13E-01	miss
+	Am-241	59.54	35.90	-4.55E-02	3.63E-01	3.63E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.


0000015053.CNF
Live Time :600.000 sec
Real Time :600.440 sec
Start: 1: -0.2(keV)
Stop : 8192:2047.4(keV)
Acq. Start :Thu Jun 02 09:11:04 2016
Counts
Channel
Pb-212
Pb-214
Pb-214
Tl-208
Bi-214
Cs-137
K-40

[108]

Apex-Gamma

Analysis Report for 02-Jun-16-10006

L3-10220C-FRGS-007SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 02-Jun-16-10006
Sample Description	: L3-10220C-FRGS-007SS (DRIED)
Sample Type	: Off Site Sample
Unit	:
Sample Point	:
Sample Size	: 1.243E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2016 4:00:00PM
Acquisition Started	: 6/2/2016 9:11:11AM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P40818B
Geometry	: 130G Soil
Live Time	: 600.0 seconds
Real Time	: 600.9 seconds
Dead Time	: 0.15 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 1/5/2015
Efficiency Calibration Description	:
Sample Number	: 15054

6/2/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 9:21:50AM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB

Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED 6/2/16

Analysis Report for 02-Jun-16-10006

L3-10220C-FRGS-007SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	186.03	740 -	749	744.79	1.74E+01	21.08	8.13E+01	Ra-226 U-235
2	238.59	947 -	962	954.84	6.84E+01	28.45	8.72E+01	Pb-212
3	338.48	1349 -	1360	1354.12	2.22E+01	15.46	3.36E+01	Ac-228
4	351.78	1401 -	1414	1407.30	4.54E+01	20.81	5.13E+01	Pb-214 Bi-211
5	609.21	2432 -	2443	2436.57	2.92E+01	13.77	1.56E+01	Bi-214
6	661.69	2642 -	2652	2646.45	2.44E+01	13.11	1.92E+01	Cs-137
7	968.94	3870 -	3881	3875.52	1.70E+01	9.17	4.00E+00	Ac-228
8	1460.71	5833 -	5853	5843.79	1.20E+02	22.96	9.02E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	5.95E+00	1.25E+00	miss
Cs-137	1.00	661.66	*	85.10	8.82E-02	4.85E-02	miss
Bi-211	0.97	351.07	*	13.02	6.90E-01	3.35E-01	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	2.43E-01	1.08E-01	miss
		300.09		3.30			
Bi-214	1.00	609.32	*	45.49	1.86E-01	9.07E-02	miss
		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			

Analysis Report for 02-Jun-16-10006

L3-10220C-FRGS-007SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	1.00	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	2.52E-01	1.23E-01	miss
		785.96		1.06			
Ra-226	0.99	186.21	*	3.64	6.57E-01	8.05E-01	miss
Ac-228	0.57	129.07		2.42			
		209.25		3.89			
		270.24		3.46			
		328.00		2.95			
		338.32	*	11.27	3.81E-01	2.72E-01	miss
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20		25.80			
		964.77		4.99			
		968.97	*	15.80	4.28E-01	2.34E-01	miss
		1588.20		3.22			
U-235	0.99	143.76		10.96			
		163.33		5.08			
		185.71	*	57.20	4.18E-02	5.12E-02	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

Analysis Report for 02-Jun-16-10006

L3-10220C-FRGS-007SS (DRIED)

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	5.95E+00	1.25E+00	
	Cs-137	1.000	8.82E-02	4.85E-02	
?	Bi-211	0.970	6.90E-01	3.35E-01	
	Pb-212	1.000	2.43E-01	1.08E-01	
	Bi-214	1.000	1.86E-01	9.07E-02	
?	Pb-214	0.999	2.52E-01	1.23E-01	
?	Ra-226	0.998	6.57E-01	8.05E-01	
	Ac-228	0.573	4.08E-01	1.77E-01	
?	U-235	0.996	4.18E-02	5.12E-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 2.000sigma

Analysis Report for 02-Jun-16-10006

L3-10220C-FRGS-007SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 9:21:50AM
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 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.95E+00	6.80E-01	6.80E-01	miss
+	Cr-51	320.08		9.91	1.64E-01	4.97E-01	4.97E-01	free
+	Mn-54	834.85		99.98	-2.51E-02	3.41E-02	3.41E-02	miss
+	Co-58	810.76		99.45	8.22E-03	4.19E-02	4.19E-02	miss
		1674.73		0.52	3.11E-01		9.15E+00	miss
+	Co-60	1173.23		99.85	2.68E-02	6.81E-02	6.81E-02	miss
		1332.49		99.98	2.93E-02		8.21E-02	miss
+	Nb-94	702.65		99.81	9.61E-03	1.00E-02	4.52E-02	miss
		871.09		99.89	0.00E+00		1.00E-02	miss
+	Ag-108m	79.13		6.60	3.04E-01	2.73E-02	1.61E+00	miss
		433.94		90.50	-2.49E-02		2.73E-02	miss
		614.28		89.80	1.09E-02		5.16E-02	miss
		722.94		90.80	2.28E-02		6.51E-02	miss
+	Sn-113	255.13		2.11	-6.76E-03	4.92E-02	1.82E+00	free
		391.70		64.97	-8.61E-03		4.92E-02	free
+	Cs-134	475.36		1.48	-2.51E-01	3.91E-02	2.65E+00	miss
		563.25		8.34	3.27E-01		6.27E-01	miss
		569.33		15.37	-2.91E-02		2.38E-01	miss
		604.72		97.62	-8.36E-03		3.91E-02	miss

Analysis Report for 02-Jun-16-10006

L3-10220C-FRGS-007SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	5.47E-03	3.91E-02	5.38E-02	miss
		801.95		8.69	-8.12E-02		5.72E-01	miss
		1038.61		0.99	9.55E-01		5.10E+00	miss
		1167.97		1.79	7.25E-02		3.05E+00	miss
		1365.19		3.02	5.38E-01		2.01E+00	miss
+	Cs-137	661.66	*	85.10	8.82E-02	6.10E-02	6.10E-02	miss
+	Eu-152	121.78		28.67	9.13E-02	6.59E-02	1.64E-01	miss
		244.70		7.61	-6.04E-02		4.76E-01	miss
		295.94		0.45	5.37E+00		1.20E+01	miss
		344.28		26.60	-3.11E-02		1.10E-01	miss
		367.79		0.86	-8.55E-01		3.96E+00	miss
		411.12		2.24	1.05E+00		2.11E+00	miss
		443.96		2.83	2.33E-01		1.50E+00	miss
		488.68		0.42	-2.30E+00		6.40E+00	miss
		563.99		0.49	5.75E+00		1.06E+01	miss
		586.26		0.46	-2.53E+00		9.25E+00	miss
		678.62		0.47	2.78E+00		8.69E+00	miss
		688.67		0.86	1.20E+00		5.19E+00	miss
		719.35		0.28	-6.48E-02		1.26E+01	miss
		778.90		12.96	2.10E-02		3.18E-01	miss
		810.45		0.32	1.83E-01		1.02E+01	miss
		867.37		4.26	4.28E-01		1.22E+00	miss
		919.33		0.43	-1.50E+00		8.34E+00	miss
		964.08		14.65	1.61E-01		4.07E-01	miss
		1085.87		10.24	-7.39E-02		4.52E-01	miss
		1089.74		1.73	-1.14E+00		1.83E+00	miss
		1112.07		13.69	6.37E-02		5.06E-01	miss
		1212.95		1.43	-2.08E-01		3.89E+00	miss
		1249.94		0.19	2.73E+00		2.68E+01	miss
		1299.14		1.63	8.29E-01		3.57E+00	miss
		1408.01		21.07	0.00E+00		6.59E-02	miss
		1457.64		0.50	-7.78E+00		1.74E+01	miss
		1528.10		0.28	3.87E+00		1.80E+01	miss
+	Eu-154	123.07		40.40	5.95E-02	1.01E-01	1.18E-01	miss
		247.93		6.89	2.11E-01		5.88E-01	miss
		591.76		4.95	-4.61E-02		9.14E-01	miss
		692.42		1.78	1.98E-02		2.52E+00	miss
		723.30		20.06	7.28E-02		2.84E-01	miss
		756.80		4.52	-5.28E-02		8.95E-01	miss
		873.18		12.08	2.56E-02		2.85E-01	miss
		996.29		10.48	4.52E-02		4.17E-01	miss
		1004.76		18.01	-1.89E-02		1.67E-01	miss
		1274.43		34.80	-5.10E-02		1.01E-01	miss
		1596.48		1.80	0.00E+00		8.51E-01	miss
+	Eu-155	45.30		1.31	7.48E-01	2.27E-01	2.97E+01	miss
		60.01		1.22	-1.07E+01		2.61E+01	miss
		86.55		30.70	2.10E-03		2.27E-01	miss
		105.31		21.10	-5.02E-02		2.56E-01	miss
+	Tl-208	583.19		85.00	7.77E-02	8.91E-02	8.91E-02	miss
+	Bi-211	351.07	*	13.02	6.90E-01	4.38E-01	4.38E-01	miss
+	Pb-211	404.85		3.78	-3.54E-01	8.69E-01	8.69E-01	miss

Analysis Report for 02-Jun-16-10006

L3-10220C-FRGS-007SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	2.19E-01	8.69E-01	2.05E+00	miss
		832.01		3.52	5.13E-01		1.61E+00	miss
+	Bi-212	39.86		1.06	2.78E+00	8.18E-01	2.75E+01	miss
		727.33		6.67	1.20E-01		8.18E-01	miss
		785.37		1.10	3.57E-01		4.70E+00	miss
		1620.50		1.47	2.43E-01		2.86E+00	miss
+	Pb-212	115.18		0.60	-4.69E-02	1.45E-01	7.57E+00	miss
		238.63	*	43.60	2.43E-01		1.45E-01	miss
		300.09		3.30	4.02E-01		1.36E+00	miss
+	Pb212-XR	74.82		10.28	3.91E-01	8.40E-01	1.28E+00	miss
		77.11		17.10	4.55E-01		8.40E-01	miss
		87.35		3.97	9.80E-01		2.14E+00	miss
		89.78		1.46	1.87E-01		5.06E+00	miss
+	Bi-214	609.32	*	45.49	1.86E-01	1.07E-01	1.07E-01	miss
		768.36		4.89	1.88E-01		1.04E+00	miss
		806.18		1.26	9.25E-01		3.91E+00	miss
		934.06		3.11	6.45E-01		1.88E+00	miss
		1120.29		14.92	2.35E-01		5.90E-01	miss
		1155.21		1.63	-5.34E-01		2.94E+00	miss
		1238.12		5.83	7.33E-01		1.45E+00	miss
		1280.98		1.43	-1.76E+00		2.45E+00	miss
		1377.67		3.99	6.46E-01		1.78E+00	miss
		1385.31		0.79	-8.20E-01		4.69E+00	miss
		1401.52		1.33	0.00E+00		1.04E+00	miss
		1407.99		2.39	0.00E+00		5.79E-01	miss
		1509.21		2.13	5.07E-01		2.35E+00	miss
		1661.27		1.05	1.11E+00		5.16E+00	miss
		1729.59		2.88	2.09E-01		1.53E+00	miss
		1764.49		15.30	2.39E-01		5.62E-01	miss
		1847.43		2.03	2.32E-01		2.88E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	3.44E-01	1.60E-01	7.15E-01	miss
		295.22		18.42	3.17E-01		3.23E-01	miss
		351.93	*	35.60	2.52E-01		1.60E-01	miss
		785.96		1.06	1.32E-01		4.88E+00	miss
+	Pb214-XR	74.82		5.80	6.93E-01	1.48E+00	2.27E+00	miss
		77.11		9.70	8.02E-01		1.48E+00	miss
		87.35		2.24	1.74E+00		3.79E+00	miss
		89.78		0.82	3.34E-01		9.01E+00	miss
+	Ra-226	186.21	*	3.64	6.57E-01	1.31E+00	1.31E+00	miss
+	Ac-228	129.07		2.42	-1.12E-01	2.34E-01	1.71E+00	miss
		209.25		3.89	4.79E-01		1.07E+00	miss
		270.24		3.46	3.50E-01		1.19E+00	miss
		328.00		2.95	2.69E-01		1.37E+00	miss
		338.32	*	11.27	3.81E-01		3.92E-01	miss
		409.46		1.92	2.30E-02		2.08E+00	miss
		463.00		4.40	3.02E-02		1.06E+00	miss
		794.95		4.25	3.50E-01		1.23E+00	miss
		911.20		25.80	1.90E-01		3.15E-01	miss
		964.77		4.99	4.11E-01		1.19E+00	miss
		968.97	*	15.80	4.28E-01		2.34E-01	miss

Analysis Report for 02-Jun-16-10006

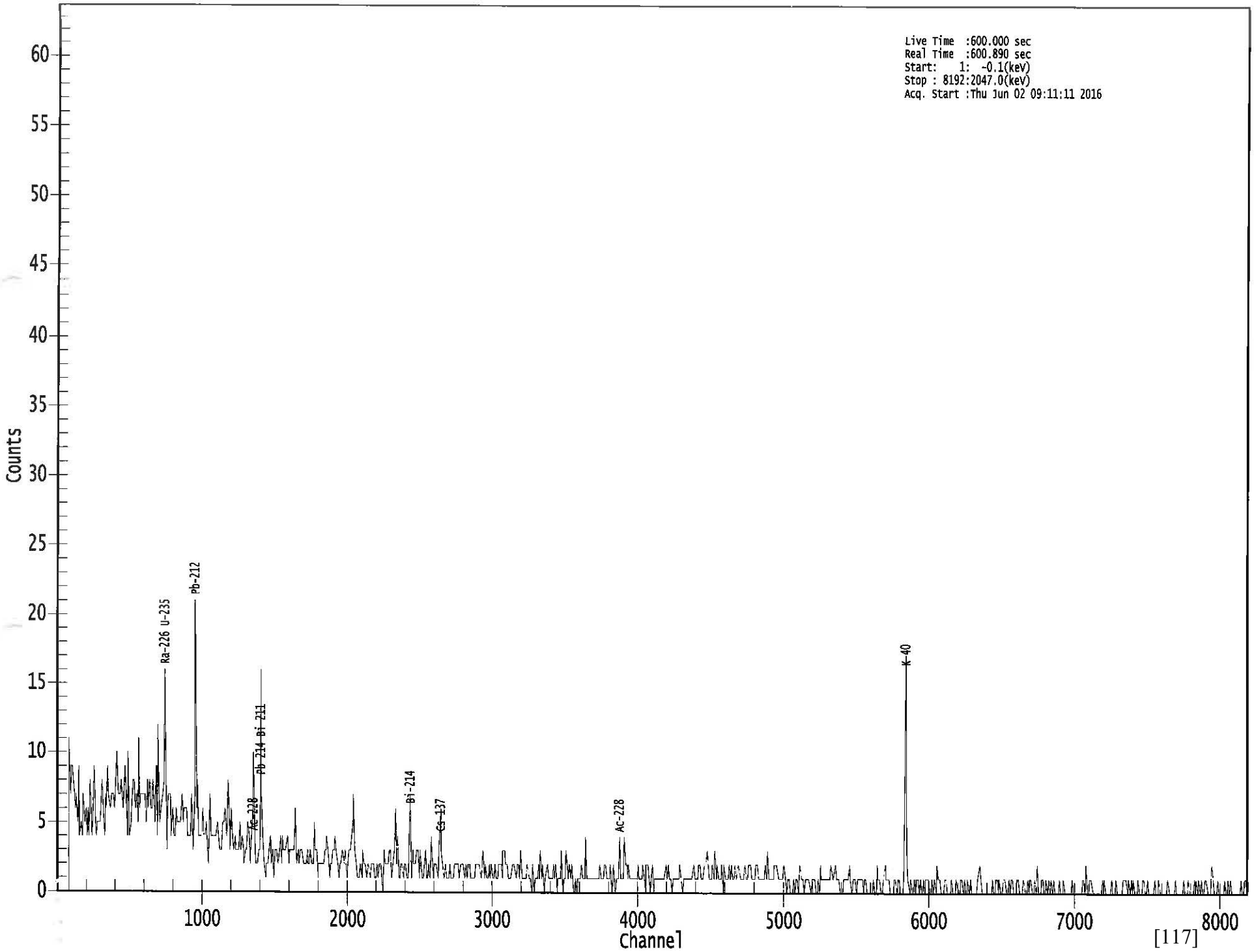
L3-10220C-FRGS-007SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20		3.22	1.05E+00	2.34E-01	2.46E+00	miss
+	Pa-231	27.36		10.30	-1.15E+00	1.77E+00	2.92E+00	miss
		283.69		1.70	-2.64E-01		1.77E+00	miss
		300.07		2.47	5.37E-01		1.81E+00	miss
		302.65		2.20	-4.45E-02		1.79E+00	miss
		330.06		1.40	-6.60E-01		2.65E+00	miss
+	Th-234	92.38		2.13	-1.24E+00	4.13E+00	4.13E+00	miss
		92.80		2.10	-7.95E-01		4.22E+00	miss
		112.81		0.21	-2.79E+00		2.63E+01	miss
+	U-235	143.76		10.96	-3.43E-02	8.32E-02	3.17E-01	miss
		163.33		5.08	-1.13E-01		6.52E-01	miss
		185.71	*	57.20	4.18E-02		8.32E-02	miss
		202.11		1.08	3.54E-01		3.19E+00	miss
		205.31		5.01	2.29E-01		7.21E-01	miss
+	Am-241	59.54		35.90	-2.21E-01	9.30E-01	9.30E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000015054.CNF



Apex-Gamma

Analysis Report for 05-May-16-10005
L3-10220C-FRGS-008SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-May-16-10005
Sample Description	: L3-10220C-FRGS-008SS (DRIED)
Sample Type	: 1L 130G Soil Sample
Unit	:
Sample Point	:
Sample Size	: 1.514E+03 grams
Facility	: Default
Sample Taken On	: 5/2/2016 1:40:00PM
Acquisition Started	: 5/5/2016 9:15:31AM
Procedure	: 130G 1L Sand Sample
Operator	: JWelch
Detector Name	: P40818B
Geometry	: 130G Sand
Live Time	: 1800.0 seconds
Real Time	: 1802.9 seconds
Dead Time	: 0.16 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 1/5/2015
Efficiency Calibration Description	:
Sample Number	: 14850

5-5-16

5/4/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 5/5/2016 9:46:10AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

5-5-16

DATA VALIDATED
6/2/16

Analysis Report for 05-May-16-10005

L3-10220C-FRGS-008SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	77.02	306 -	315	309.16	7.48E+01	37.99	2.12E+02	Pb214-XR Pb212-XR
2	87.34	344 -	353	350.39	5.36E+01	38.20	2.29E+02	Pb214-XR Pb212-XR Cd-109 Eu-155
3	185.86	737 -	750	744.12	4.09E+01	41.86	2.84E+02	U-235 Ra-226
4	238.56	946 -	960	954.73	2.76E+02	54.95	3.33E+02	Pb-212
5	295.19	1175 -	1186	1181.11	9.20E+01	31.19	1.20E+02	Pb-214 Eu-152
6	338.20	1347 -	1358	1353.00	3.49E+01	24.16	1.00E+02	Ac-228
7	351.84	1401 -	1416	1407.56	2.05E+02	37.86	1.18E+02	Pb-214 Bi-211
8	583.04	2324 -	2341	2331.92	1.16E+02	27.35	5.04E+01	Tl-208
9	609.30	2430 -	2443	2436.93	1.16E+02	25.65	4.05E+01	Bi-214
10	661.51	2640 -	2653	2645.75	4.10E+01	18.82	4.01E+01	Cs-137
11	846.41	3381 -	3390	3385.30	1.29E+01	12.04	2.42E+01	~~Mn-56~~ N/A per
12	911.18	3636 -	3651	3644.42	5.99E+01	19.99	3.43E+01	Ac-228
13	969.04	3869 -	3883	3875.92	2.39E+01	16.92	4.22E+01	Ac-228
14	1460.48	5831 -	5854	5842.89	4.37E+02	42.86	1.69E+01	K-40

JTW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	5.95E+00	7.80E-01	miss
Cs-137	0.99	661.66	*	85.10	4.10E-02	1.95E-02	miss
Tl-208	0.99	583.19	*	85.00	1.06E-01	2.82E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	2.73E-01	6.99E-02	miss
		300.09		3.30			
Pb212-XR	1.00	74.82		10.28			

Analysis Report for 05-May-16-10005

L3-10220C-FRGS-008SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Pb212-XR	1.00	77.11	*	17.10	5.22E-01	2.86E-01	miss
		87.35	*	3.97	9.77E-01	7.24E-01	miss
		89.78		1.46			
Bi-214	1.00	609.32	*	45.49	2.05E-01	5.16E-02	miss
		768.36		4.89			
		806.18		1.26			
		934.06		3.11			
		1120.29		14.92			
		1155.21		1.63			
		1238.12		5.83			
		1280.98		1.43			
		1377.67		3.99			
		1385.31		0.79			
		1401.52		1.33			
		1407.99		2.39			
		1509.21		2.13			
		1661.27		1.05			
		1729.59		2.88			
		1764.49		15.30			
		1847.43		2.03			
		2118.51		1.16			
Pb-214	1.00	241.99		7.25			
		295.22	*	18.42	2.46E-01	9.21E-02	miss
		351.93	*	35.60	3.17E-01	7.74E-02	miss
		785.96		1.06			
Ra-226	0.99	186.21	*	3.64	4.29E-01	4.46E-01	miss
Ac-228	1.00	129.07		2.42			
		209.25		3.89			
		270.24		3.46			
		328.00		2.95			
		338.32	*	11.27	1.66E-01	1.18E-01	miss
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20	*	25.80	2.45E-01	8.44E-02	miss
		964.77		4.99			
		968.97	*	15.80	1.66E-01	1.19E-01	miss
		1588.20		3.22			
U-235	0.99	143.76		10.96			
		163.33		5.08			
		185.71	*	57.20	2.73E-02	2.84E-02	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10005

L3-10220C-FRGS-008SS (DRIED)

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.993	5.95E+00	7.80E-01	
X	Cd-109	0.971			
	Cs-137	0.999	4.10E-02	1.95E-02	
	Tl-208	0.999	1.06E-01	2.82E-02	
X	Bi-211	0.964			
	Pb-212	1.000	2.73E-01	6.99E-02	
	Pb212-XR	1.000	5.84E-01	2.66E-01	
	Bi-214	1.000	2.05E-01	5.16E-02	
	Pb-214	1.000	2.87E-01	5.93E-02	
X	Pb214-XR	1.000			
?	Ra-226	0.993	4.29E-01	4.46E-01	
	Ac-228	1.000	2.05E-01	5.95E-02	
?	U-235	0.999	2.73E-02	2.84E-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 2.000sigma

Analysis Report for 05-May-16-10005

L3-10220C-FRGS-008SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/5/2016 9:46:10AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
11	846.41	7.17037E-03	46.65	Sum	

NQAF
JDW
5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.95E+00	2.51E-01	2.51E-01	miss
+	Cr-51	320.08		9.91	4.31E-02	1.86E-01	1.86E-01	free
+	Mn-54	834.85		99.98	2.85E-03	2.13E-02	2.13E-02	miss
+	Co-58	810.76		99.45	1.26E-04	1.90E-02	1.90E-02	miss
		1674.73		0.52	1.00E+00		4.20E+00	miss
+	Co-60	1173.23		99.85	4.12E-03	2.27E-02	2.27E-02	miss
		1332.49		99.98	3.49E-03		2.36E-02	miss
+	Nb-94	702.65		99.81	9.03E-03	1.62E-02	2.04E-02	miss
		871.09		99.89	-9.55E-03		1.62E-02	miss
+	Ag-108m	79.13		6.60	-2.25E-01	1.66E-02	6.81E-01	miss
		433.94		90.50	-9.01E-03		1.66E-02	miss
		614.28		89.80	1.30E-03		2.07E-02	miss
		722.94		90.80	4.81E-03		2.58E-02	miss
+	Sn-113	255.13		2.11	-2.81E-02	2.23E-02	7.91E-01	free
		391.70		64.97	-8.31E-03		2.23E-02	free
+	Cs-134	475.36		1.48	-3.68E-01	1.93E-02	1.06E+00	miss
		563.25		8.34	2.57E-02		2.06E-01	miss
		569.33		15.37	1.57E-02		1.20E-01	miss

Analysis Report for 05-May-16-10005

L3-10220C-FRGS-008SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	604.72		97.62	-1.66E-03	1.93E-02	1.93E-02	miss
		795.86		85.46	-5.76E-03		1.97E-02	miss
		801.95		8.69	4.50E-02		2.24E-01	miss
		1038.61		0.99	1.58E-01		1.85E+00	miss
		1167.97		1.79	-2.49E-03		1.31E+00	miss
		1365.19		3.02	1.10E-01		7.28E-01	miss
+	Cs-137	661.66	*	85.10	4.10E-02	2.54E-02	2.54E-02	miss
+	Eu-152	121.78		28.67	2.33E-02	5.92E-02	7.16E-02	miss
		244.70		7.61	3.48E-02		2.31E-01	miss
		295.94		0.45	-2.02E-01		6.00E+00	miss
		344.28		26.60	-1.30E-02		5.92E-02	miss
		367.79		0.86	-3.45E-01		1.71E+00	miss
		411.12		2.24	-2.72E-01		6.01E-01	miss
		443.96		2.83	2.13E-02		5.73E-01	miss
		488.68		0.42	-1.05E+00		2.99E+00	miss
		563.99		0.49	-7.19E-01		3.57E+00	miss
		586.26		0.46	8.97E-03		4.01E+00	miss
		678.62		0.47	-1.96E+00		2.75E+00	miss
		688.67		0.86	-8.14E-01		1.92E+00	miss
		719.35		0.28	-9.26E-01		6.28E+00	miss
		778.90		12.96	4.25E-02		1.43E-01	miss
		810.45		0.32	3.68E-01		5.50E+00	miss
		867.37		4.26	3.99E-02		3.99E-01	miss
		919.33		0.43	1.48E-01		3.73E+00	miss
		964.08		14.65	3.51E-02		1.87E-01	miss
		1085.87		10.24	2.48E-02		2.18E-01	miss
		1089.74		1.73	-3.83E-02		1.20E+00	miss
		1112.07		13.69	-2.32E-02		1.60E-01	miss
		1212.95		1.43	1.19E-01		1.96E+00	miss
		1249.94		0.19	1.11E+00		1.47E+01	miss
		1299.14		1.63	2.15E-01		1.49E+00	miss
		1408.01		21.07	2.85E-02		1.22E-01	miss
		1457.64		0.50	-1.65E+00		1.01E+01	miss
		1528.10		0.28	2.03E-01		5.75E+00	miss
+	Eu-154	123.07		40.40	-3.43E-03	4.61E-02	4.61E-02	miss
		247.93		6.89	7.73E-03		2.48E-01	miss
		591.76		4.95	2.16E-02		3.58E-01	miss
		692.42		1.78	1.47E-01		1.16E+00	miss
		723.30		20.06	1.95E-03		1.17E-01	miss
		756.80		4.52	-2.04E-01		4.01E-01	miss
		873.18		12.08	3.41E-02		1.65E-01	miss
		996.29		10.48	-7.88E-02		1.51E-01	miss
		1004.76		18.01	-1.37E-02		9.40E-02	miss
		1274.43		34.80	7.79E-03		6.59E-02	miss
		1596.48		1.80	-2.17E-02		9.33E-01	miss
+	Eu-155	45.30		1.31	-2.78E+00	1.17E-01	1.13E+01	miss
		60.01		1.22	6.80E-02		1.19E+01	miss
		86.55		30.70	5.78E-02		1.29E-01	miss
		105.31		21.10	1.90E-02		1.17E-01	miss
+	Tl-208	583.19	*	85.00	1.06E-01	2.80E-02	2.80E-02	miss
+	Bi-211	351.07	*	13.02	8.66E-01	1.83E-01	1.83E-01	miss

Analysis Report for 05-May-16-10005

L3-10220C-FRGS-008SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Pb-211	404.85		3.78	4.81E-02	4.39E-01	4.39E-01	miss
		427.09		1.76	-2.73E-01		8.42E-01	miss
		832.01		3.52	-2.35E-02		5.83E-01	miss
+	Bi-212	39.86		1.06	-2.88E+00	4.26E-01	1.24E+01	miss
		727.33		6.67	2.49E-01		4.26E-01	miss
		785.37		1.10	5.87E-01		1.94E+00	miss
		1620.50		1.47	2.23E-01		1.15E+00	miss
+	Pb-212	115.18		0.60	-5.11E-01	7.36E-02	3.53E+00	miss
		238.63	*	43.60	2.73E-01		7.36E-02	miss
		300.09		3.30	1.02E-01		5.41E-01	miss
+	Pb212-XR	74.82		10.28	2.05E-01	4.07E-01	6.42E-01	miss
		77.11	*	17.10	5.22E-01		4.07E-01	miss
		87.35	*	3.97	9.77E-01		1.11E+00	miss
		89.78		1.46	4.83E-01		2.32E+00	miss
+	Bi-214	609.32	*	45.49	2.05E-01	4.54E-02	4.54E-02	miss
		768.36		4.89	1.35E-01		4.52E-01	miss
		806.18		1.26	3.84E-01		1.64E+00	miss
		934.06		3.11	1.16E-01		6.95E-01	miss
		1120.29		14.92	2.18E-01		2.58E-01	miss
		1155.21		1.63	4.68E-01		1.70E+00	miss
		1238.12		5.83	3.05E-01		6.15E-01	miss
		1280.98		1.43	4.25E-01		1.91E+00	miss
		1377.67		3.99	6.64E-02		5.81E-01	miss
		1385.31		0.79	2.91E-01		2.64E+00	miss
		1401.52		1.33	-3.78E-01		1.14E+00	miss
		1407.99		2.39	2.51E-01		1.07E+00	miss
		1509.21		2.13	1.82E-01		1.11E+00	miss
		1661.27		1.05	1.53E-01		1.13E+00	miss
		1729.59		2.88	3.04E-01		8.64E-01	miss
		1764.49		15.30	2.94E-01		3.14E-01	miss
		1847.43		2.03	3.63E-01		1.36E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	2.19E-01	6.71E-02	3.24E-01	miss
		295.22	*	18.42	2.46E-01		1.15E-01	miss
		351.93	*	35.60	3.17E-01		6.71E-02	miss
		785.96		1.06	3.19E-01		1.97E+00	miss
+	Pb214-XR	74.82		5.80	3.64E-01	7.18E-01	1.14E+00	miss
		77.11	*	9.70	9.21E-01		7.18E-01	miss
		87.35	*	2.24	1.73E+00		1.96E+00	miss
		89.78		0.82	8.60E-01		4.12E+00	miss
+	Ra-226	186.21	*	3.64	4.29E-01	7.18E-01	7.18E-01	miss
+	Ac-228	129.07		2.42	-8.87E-03	9.62E-02	8.00E-01	miss
		209.25		3.89	6.31E-01		5.26E-01	miss
		270.24		3.46	5.50E-01		6.49E-01	miss
		328.00		2.95	2.85E-01		6.75E-01	miss
		338.32	*	11.27	1.66E-01		1.78E-01	miss
		409.46		1.92	1.66E-01		8.13E-01	miss
		463.00		4.40	2.91E-01		4.98E-01	miss
		794.95		4.25	-1.40E-02		4.55E-01	miss
		911.20	*	25.80	2.45E-01		9.62E-02	miss
		964.77		4.99	2.10E-01		5.71E-01	miss

Analysis Report for 05-May-16-10005

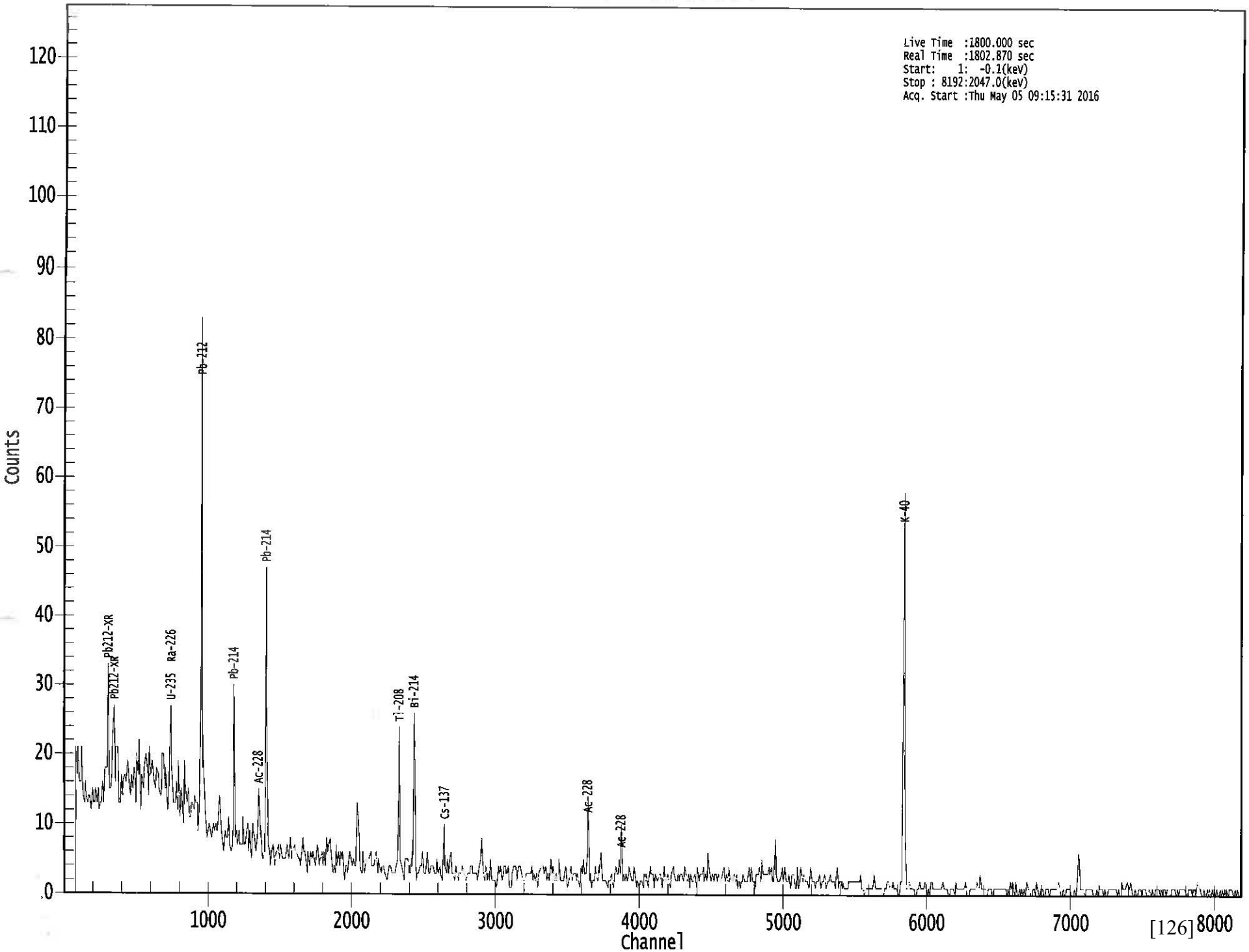
L3-10220C-FRGS-008SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	968.97	*	15.80	1.66E-01	9.62E-02	1.77E-01	miss
		1588.20		3.22	1.68E-01		6.79E-01	miss
+	Pa-231	27.36		10.30	1.39E-01	7.23E-01	1.38E+00	miss
		283.69		1.70	2.47E-01		1.06E+00	miss
		300.07		2.47	1.36E-01		7.23E-01	miss
		302.65		2.20	-6.89E-02		7.38E-01	miss
		330.06		1.40	-4.19E-02		1.28E+00	miss
+	Th-234	92.38		2.13	6.96E-01	1.72E+00	1.72E+00	miss
		92.80		2.10	1.47E+00		1.80E+00	miss
		112.31		0.21	2.61E-01		1.07E+01	miss
+	U-235	143.76		10.96	-2.75E-03	4.57E-02	1.67E-01	miss
		163.33		5.08	2.00E-02		3.38E-01	miss
		185.71	*	57.20	2.73E-02		4.57E-02	miss
		202.11		1.08	-9.41E-01		1.22E+00	miss
		205.31		5.01	4.22E-02		3.10E-01	miss
+	Am-241	59.54		35.90	9.45E-02	4.28E-01	4.28E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000014850.CNF



Apex-Gamma

Analysis Report for 05-May-16-10007
L3-10220C-FRGS-009SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-May-16-10007
Sample Description	: L3-10220C-FRGS-009SS (DRIED)
Sample Type	: 1L 130G Soil Sample
Unit	:
Sample Point	:
Sample Size	: 1.325E+03 grams
Facility	: Default
Sample Taken On	: 5/2/2016 2:00:00PM
Acquisition Started	: 5/5/2016 9:55:00AM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P11314X2
Geometry	: 130G Soil
Live Time	: 1800.0 seconds
Real Time	: 1801.2 seconds
Dead Time	: 0.07 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 6/28/2012
Efficiency Calibration Description	:
Sample Number	: 14852

5-5-16

5/5/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 5/5/2016 10:25:31AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

5-5-16

DATA VALIDATED
6/2/16

Analysis Report for 05-May-16-10007

L3-10220C-FRGS-009SS (DRIED)

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
M	1	74.77	294 -	315	300.33	5.54E+01	21.97	2.14E+02	Pb214-XR
									Pb212-XR
m	2	77.04	294 -	315	309.40	9.76E+01	27.15	2.40E+02	Pb214-XR
									Pb212-XR
	3	238.62	947 -	960	954.79	2.77E+02	49.15	2.38E+02	Pb-212
	4	295.10	1174 -	1188	1180.45	8.67E+01	34.92	1.51E+02	Pb-214
									Eu-152
	5	338.36	1346 -	1361	1353.30	5.50E+01	26.88	9.60E+01	Ac-228
	6	351.95	1399 -	1416	1407.59	2.02E+02	37.81	1.09E+02	Pb-214
									Bi-211
	7	510.56	2033 -	2047	2041.45	3.24E+01	24.45	8.73E+01	..... AN H-51
	8	583.06	2325 -	2337	2331.22	7.24E+01	24.32	6.51E+01	Tl-208
	9	609.16	2428 -	2444	2435.56	1.48E+02	28.34	3.92E+01	Bi-214
	10	661.47	2638 -	2655	2644.69	3.06E+02	39.44	6.15E+01	Cs-137
	11	727.18	2902 -	2912	2907.42	2.36E+01	15.38	3.69E+01	Bi-212
	12	860.46	3435 -	3445	3440.39	1.85E+01	10.78	1.10E+01	..... Tl-208
	13	911.06	3634 -	3650	3642.76	6.41E+01	18.79	1.98E+01	Ac-228
	14	968.97	3867 -	3882	3874.38	3.88E+01	17.57	3.24E+01	Ac-228
	15	1460.78	5832 -	5853	5842.45	3.91E+02	41.36	2.85E+01	K-40
	16	1764.50	7052 -	7066	7058.67	3.20E+01	11.68	2.09E+00	Bi-214

JDW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	1.00	1460.82	*	10.66	5.43E+00	7.44E-01	miss
Cs-137	0.99	661.66	*	85.10	3.12E-01	5.49E-02	miss
Tl-208	0.99	583.19	*	85.00	6.77E-02	2.41E-02	miss
Bi-212	0.99	39.86		1.06			
		727.33	*	6.67	3.26E-01	2.16E-01	miss
		785.37		1.10			
		1620.50		1.47			
Pb-212	1.00	115.18		0.60			

Analysis Report for 05-May-16-10007

L3-10220C-FRGS-009SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Pb-212	1.00	238.63	*	43.60	2.73E-01	6.55E-02	miss
		300.09		3.30			
Pb212-XR	1.00	74.82	*	10.28	4.54E-01	2.03E-01	miss
		77.11	*	17.10	4.42E-01	1.53E-01	miss
		87.35		3.97			
		89.78		1.46			
Bi-214	0.79	609.32	*	45.49	2.67E-01	6.03E-02	miss
		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	3.58E-01	1.34E-01	miss
		1847.43		2.03			
		2118.51		1.16			
Pb-214	1.00	241.99		7.25			
		295.22	*	18.42	2.33E-01	1.01E-01	miss
		351.93	*	35.60	3.16E-01	7.79E-02	miss
		785.96		1.06			
Ac-228	1.00	129.07		2.42			
		209.25		3.89			
		270.24		3.46			
		328.00		2.95			
		338.32	*	11.27	2.65E-01	1.36E-01	miss
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20	*	25.80	2.67E-01	8.17E-02	miss
		964.77		4.99			
		968.97	*	15.80	2.75E-01	1.27E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

Analysis Report for 05-May-16-10007

L3-10220C-FRGS-009SS (DRIED)

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	5.43E+00	7.44E-01	
	Cs-137	0.998	3.12E-01	5.49E-02	
	Tl-208	0.999	6.77E-02	2.41E-02	
X	Bi-211	0.954			
	Bi-212	0.999	3.26E-01	2.16E-01	
	Pb-212	1.000	2.73E-01	6.55E-02	
	Pb212-XR	1.000	4.46E-01	1.22E-01	
	Bi-214	0.798	2.82E-01	5.50E-02	
	Pb-214	1.000	2.85E-01	6.17E-02	
X	Pb214-XR	1.000			
	Ac-228	1.000	2.69E-01	6.14E-02	

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

Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10007

L3-10220C-FRGS-009SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/5/2016 10:25:31AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
7	510.56	1.79854E-02	37.76		Ac H-511
12	860.46	1.02778E-02	29.13		Tl-208

JPW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.43E+00	3.15E-01	3.15E-01	miss
+	Cr-51	320.08		9.91	2.03E-02	1.73E-01	1.73E-01	free
+	Mn-54	834.85		99.98	6.45E-03	1.98E-02	1.98E-02	miss
+	Co-58	810.76		99.45	-1.71E-04	1.71E-02	1.71E-02	miss
		1674.73		0.52	4.09E-02		2.41E+00	miss
+	Co-60	1173.23		99.85	-3.52E-04	2.08E-02	2.64E-02	miss
		1332.49		99.98	7.91E-04		2.08E-02	miss
+	Nb-94	702.65		99.81	9.84E-04	1.87E-02	1.87E-02	miss
		871.09		99.89	4.59E-03		2.10E-02	miss
+	Ag-108m	79.13		6.60	2.13E-01	1.44E-02	4.83E-01	miss
		433.94		90.50	-9.64E-03		1.44E-02	miss
		614.28		89.80	-1.23E-03		1.79E-02	miss
		722.94		90.80	-1.73E-03		1.97E-02	miss
+	Sn-113	255.13		2.11	1.35E-01	2.45E-02	7.71E-01	free
		391.70		64.97	5.51E-03		2.45E-02	free
+	Cs-134	475.36		1.48	1.96E-01	1.97E-02	1.24E+00	miss

Analysis Report for 05-May-16-10007

L3-10220C-FRGS-009SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	563.25		8.34	-3.29E-02	1.97E-02	1.76E-01	miss
		569.33		15.37	-2.26E-02		9.24E-02	miss
		604.72		97.62	2.45E-03		1.97E-02	miss
		795.86		85.46	6.68E-03		2.58E-02	miss
		801.95		8.69	-6.16E-02		1.98E-01	miss
		1038.61		0.99	2.26E-01		1.79E+00	miss
		1167.97		1.79	1.70E-01		1.24E+00	miss
		1365.19		3.02	1.00E-01		6.60E-01	miss
+	Cs-137	661.66	*	85.10	3.12E-01	3.32E-02	3.32E-02	miss
+	Eu-152	121.78		28.67	7.10E-03	5.39E-02	5.39E-02	miss
		244.70		7.61	-2.56E-02		1.84E-01	miss
		295.94		0.45	4.85E+00		5.65E+00	miss
		344.28		26.60	-7.05E-04		5.90E-02	miss
		367.79		0.86	4.78E-01		1.70E+00	miss
		411.12		2.24	-3.18E-01		6.40E-01	miss
		443.96		2.83	-7.68E-02		5.34E-01	miss
		488.68		0.42	9.89E-02		4.19E+00	miss
		563.99		0.49	-5.84E-02		3.08E+00	miss
		586.26		0.46	-8.87E-01		4.34E+00	miss
		678.62		0.47	5.89E-01		3.87E+00	miss
		688.67		0.86	1.11E-01		1.80E+00	miss
		719.35		0.28	1.62E+00		6.61E+00	miss
		778.90		12.96	-2.44E-02		1.24E-01	miss
		810.45		0.32	-4.04E+00		3.33E+00	miss
		867.37		4.26	-9.35E-02		4.06E-01	miss
		919.33		0.43	1.13E+00		4.59E+00	miss
		964.08		14.65	3.82E-02		1.67E-01	miss
		1085.87		10.24	-2.89E-03		1.77E-01	miss
		1089.74		1.73	5.27E-01		1.36E+00	miss
		1112.07		13.69	-3.17E-02		1.63E-01	miss
		1212.95		1.43	-7.32E-01		1.45E+00	miss
		1249.94		0.19	-2.22E+00		1.17E+01	miss
		1299.14		1.63	-4.90E-01		1.00E+00	miss
		1408.01		21.07	4.89E-02		1.14E-01	miss
		1457.64		0.50	-6.94E+00		6.10E+00	miss
		1528.10		0.28	-9.33E-01		5.06E+00	miss
+	Eu-154	123.07		40.40	5.64E-04	3.64E-02	3.64E-02	miss
		247.93		6.89	1.02E-01		2.48E-01	miss
		591.76		4.95	-8.92E-03		3.46E-01	miss
		692.42		1.78	1.93E-01		9.12E-01	miss
		723.30		20.06	9.60E-03		9.78E-02	miss
		756.80		4.52	4.65E-02		4.22E-01	miss
		873.18		12.08	-6.72E-03		1.63E-01	miss
		996.29		10.48	-7.45E-02		1.43E-01	miss
		1004.76		18.01	-1.46E-03		1.01E-01	miss
		1274.43		34.80	-1.45E-03		7.00E-02	miss
		1596.48		1.80	-5.52E-02		6.50E-01	miss
+	Eu-155	45.30		1.31	-1.45E+00	8.02E-02	4.17E+00	miss
		60.01		1.22	7.98E-01		5.56E+00	miss
		86.55		30.70	1.26E-02		9.47E-02	miss
		105.31		21.10	1.05E-02		8.02E-02	miss

Analysis Report for 05-May-16-10007

L3-10220C-FRGS-009SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Tl-208	583.19	*	85.00	6.77E-02	2.92E-02	2.92E-02	miss
+	Bi-211	351.07	*	13.02	8.65E-01	1.87E-01	1.87E-01	miss
+	Pb-211	404.85		3.78	-2.51E-02	3.92E-01	3.92E-01	miss
		427.09		1.76	1.19E-01		8.73E-01	miss
		832.01		3.52	-1.15E-01		4.31E-01	miss
+	Bi-212	39.86		1.06	6.96E-02	3.09E-01	5.28E+00	miss
		727.33	*	6.67	3.26E-01		3.09E-01	miss
		785.37		1.10	4.54E-01		1.83E+00	miss
		1620.50		1.47	4.10E-02		1.01E+00	miss
+	Pb-212	115.18		0.60	6.25E-01	6.12E-02	2.65E+00	miss
		238.63	*	43.60	2.73E-01		6.12E-02	miss
		300.09		3.30	2.96E-01		5.50E-01	miss
+	Pb212-XR	74.82	*	10.28	4.54E-01	2.43E-01	4.17E-01	miss
		77.11	*	17.10	4.42E-01		2.43E-01	miss
		87.35		3.97	9.22E-01		7.90E-01	miss
		89.78		1.46	8.00E-01		1.81E+00	miss
+	Bi-214	609.32	*	45.49	2.67E-01	4.77E-02	4.77E-02	miss
		768.36		4.89	3.72E-01		5.51E-01	miss
		806.18		1.26	-8.74E-01		1.17E+00	miss
		934.06		3.11	4.89E-02		4.97E-01	miss
		1120.29		14.92	1.34E-01		2.22E-01	miss
		1155.21		1.63	4.40E-01		1.60E+00	miss
		1238.12		5.83	1.89E-01		5.31E-01	miss
		1280.98		1.43	5.72E-01		1.77E+00	miss
		1377.67		3.99	3.01E-01		7.37E-01	miss
		1385.31		0.79	6.45E-01		2.53E+00	miss
		1401.52		1.33	4.63E-02		1.52E+00	miss
		1407.99		2.39	4.30E-01		1.00E+00	miss
		1509.21		2.13	3.77E-01		1.19E+00	miss
		1661.27		1.05	-2.15E-01		1.45E+00	miss
		1729.59		2.88	6.39E-01		1.14E+00	miss
		1764.49	*	15.30	3.58E-01		8.47E-02	miss
		1847.43		2.03	3.49E-01		1.05E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	1.83E-01	6.83E-02	2.73E-01	miss
		295.22	*	18.42	2.33E-01		1.38E-01	miss
		351.93	*	35.60	3.16E-01		6.83E-02	miss
		785.96		1.06	8.69E-01		1.95E+00	miss
+	Pb214-XR	74.82	*	5.80	8.04E-01	4.29E-01	7.39E-01	miss
		77.11	*	9.70	7.79E-01		4.29E-01	miss
		87.35		2.24	1.63E+00		1.40E+00	miss
		89.78		0.82	1.42E+00		3.22E+00	miss
+	Ra-226	186.21		3.64	5.69E-01	5.44E-01	5.44E-01	miss
+	Ac-228	129.07		2.42	7.97E-02	7.88E-02	6.93E-01	miss
		209.25		3.89	2.19E-01		4.29E-01	miss
		270.24		3.46	3.18E-01		5.69E-01	miss
		328.00		2.95	2.48E-01		5.98E-01	miss
		338.32	*	11.27	2.65E-01		1.90E-01	miss
		409.46		1.92	1.94E-01		8.55E-01	miss
		463.00		4.40	2.17E-01		4.53E-01	miss

Analysis Report for 05-May-16-10007

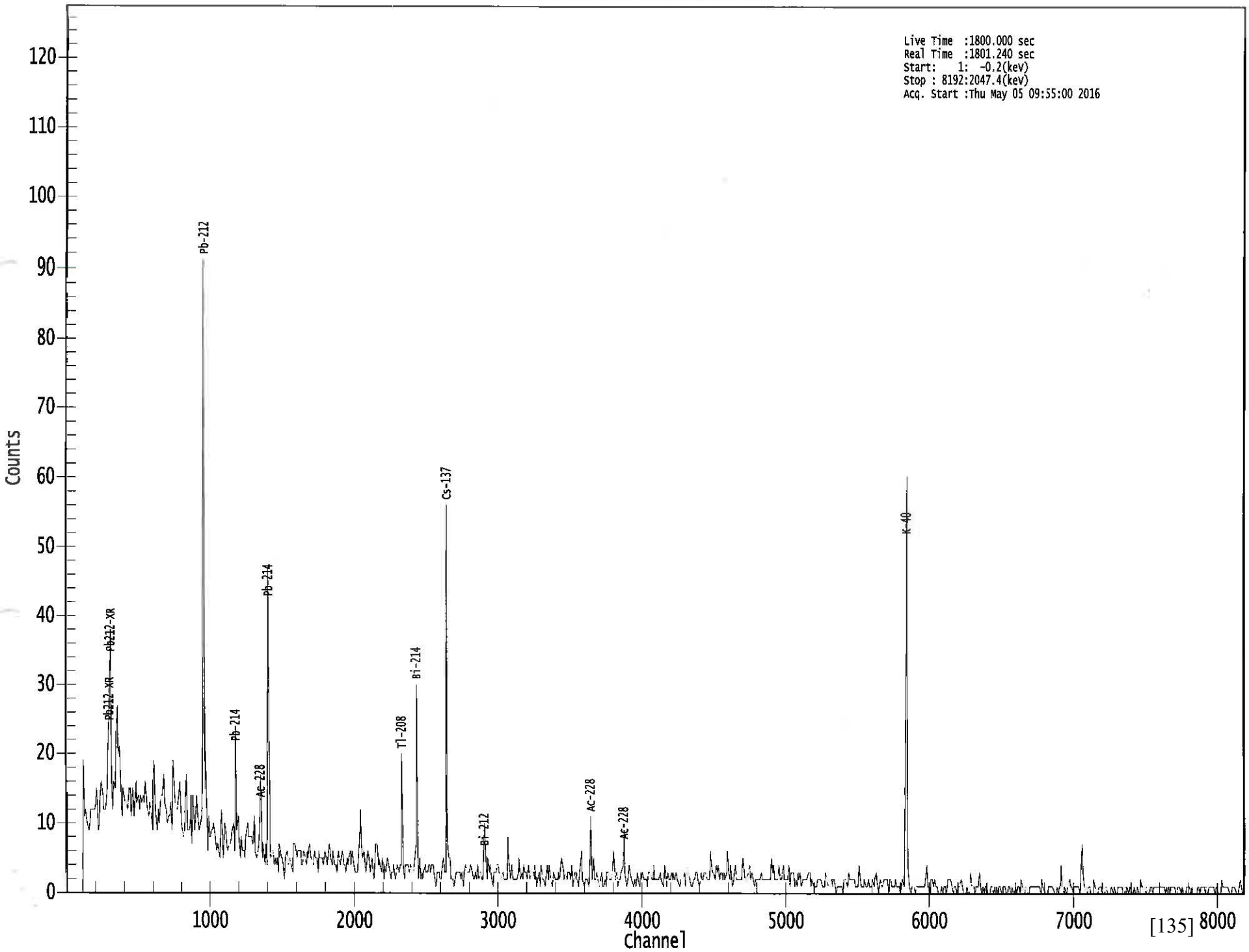
L3-10220C-FRGS-009SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	794.95		4.25	1.42E-01	7.88E-02	5.04E-01	miss
		911.20	*	25.80	2.67E-01		7.88E-02	miss
		964.77		4.99	1.72E-01		5.03E-01	miss
		968.97	*	15.80	2.75E-01		1.64E-01	miss
		1588.20		3.22	3.44E-01		8.18E-01	miss
+	Pa-231	27.36		10.30	0.00E+00	4.63E-02	4.63E-02	miss
		283.69		1.70	-2.53E-01		8.23E-01	miss
		300.07		2.47	3.96E-01		7.35E-01	miss
		302.65		2.20	-2.47E-01		5.72E-01	miss
		330.06		1.40	-2.54E-02		1.02E+00	miss
+	Th-234	92.38		2.13	8.68E-01	1.32E+00	1.32E+00	miss
		92.80		2.10	1.31E+00		1.35E+00	miss
		112.81		0.21	-1.29E+00		8.26E+00	miss
+	U-235	143.76		10.96	3.78E-02	3.37E-02	1.32E-01	miss
		163.33		5.08	1.94E-01		2.94E-01	miss
		185.71		57.20	2.99E-02		3.37E-02	miss
		202.11		1.08	9.03E-02		1.21E+00	miss
		205.31		5.01	1.07E-02		2.66E-01	miss
+	Am-241	59.54		35.90	-3.75E-02	1.90E-01	1.90E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000014852.CNF



Apex-Gamma

Analysis Report for 05-May-16-10008
L3-10220C-FRGS-010SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-May-16-10008
Sample Description	: L3-10220C-FRGS-010SS (DRIED)
Sample Type	: 1L 130G Soil Sample
Unit	:
Sample Point	:
Sample Size	: 9.600E+02 grams
Facility	: Default
Sample Taken On	: 5/2/2016 1:20:00PM
Acquisition Started	: 5/5/2016 10:38:42AM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P11314X2
Geometry	: 130G Soil
Live Time	: 1800.0 seconds
Real Time	: 1801.3 seconds
Dead Time	: 0.07 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 6/28/2012
Efficiency Calibration Description	:
Sample Number	: 14853

J.C. Welch 5-5-16
5-5-16

PEAK WITH NID REPORT

Peak Analysis Performed on : 5/5/2016 11:08:50AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

5-5-16

DATA VALIDATED
6/2/16

Analysis Report for 05-May-16-10008

L3-10220C-FRGS-010SS (DRIED)

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
M	1	74.75	295 -	315	300.25	5.48E+01	21.17	1.91E+02	Pb214-XR
									Pb212-XR
m	2	77.08	295 -	315	309.53	1.10E+02	26.34	1.77E+02	Pb214-XR
									Pb212-XR
	3	186.08	737 -	748	744.92	3.31E+01	29.14	1.42E+02	Ra-226
									U-235
M	4	238.66	951 -	972	954.97	2.00E+02	31.10	1.01E+02	Pb-212
m	5	241.79	951 -	972	967.48	4.99E+01	18.79	1.29E+02	Pb-214
	6	295.17	1177 -	1187	1180.72	6.45E+01	23.66	6.31E+01	Pb-214
									Eu-152
	7	338.29	1346 -	1357	1353.02	4.60E+01	21.38	6.21E+01	Ac-228
	8	351.88	1399 -	1414	1407.31	1.49E+02	31.01	7.04E+01	Pb-214
									Bi-211
	9	510.33	2034 -	2045	2040.51	3.36E+01	22.58	8.28E+01	..... ANH-511
	10	583.07	2324 -	2338	2331.30	6.01E+01	20.80	3.77E+01	Tl-208
	11	609.19	2429 -	2442	2435.68	1.25E+02	26.29	3.94E+01	Bi-214
	12	661.60	2640 -	2653	2645.20	2.08E+02	31.91	4.26E+01	Cs-137
	13	911.34	3636 -	3650	3643.87	4.65E+01	17.28	2.50E+01	Ac-228
	14	1460.89	5832 -	5853	5842.90	3.02E+02	35.64	1.23E+01	K-40

JPW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	1.00	1460.82	*	10.66	5.79E+00	8.49E-01	miss
Cs-137	1.00	661.66	*	85.10	2.92E-01	5.69E-02	miss
Tl-208	0.99	583.19	*	85.00	7.76E-02	2.84E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	2.72E-01	6.10E-02	miss
		300.09		3.30			
Bi-214	0.79	609.32	*	45.49	3.11E-01	7.52E-02	miss
		768.36		4.89			
		806.18		1.26			

Analysis Report for 05-May-16-10008

L3-10220C-FRGS-010SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	0.79	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	4.12E-01	1.68E-01	miss
		295.22	*	18.42	2.39E-01	9.57E-02	miss
		351.93	*	35.60	3.21E-01	8.44E-02	miss
		785.96		1.06			
Pb214-XR	1.00	74.82	*	5.80	1.10E+00	4.91E-01	miss
		77.11	*	9.70	1.21E+00	3.98E-01	miss
		87.35		2.24			
		89.78		0.82			
Ra-226	0.99	186.21	*	3.64	4.73E-01	4.22E-01	miss
Ac-228	0.74	129.07		2.42			
		209.25		3.89			
		270.24		3.46			
		328.00		2.95			
		338.32	*	11.27	3.05E-01	1.50E-01	miss
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20	*	25.80	2.68E-01	1.02E-01	miss
		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	3.01E-02	2.69E-02	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10008

L3-10220C-FRGS-010SS (DRIED)

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	5.79E+00	8.49E-01	
	Cs-137	1.000	2.92E-01	5.69E-02	
	Tl-208	0.999	7.76E-02	2.84E-02	
X	Bi-211	0.960			
	Pb-212	1.000	2.72E-01	6.10E-02	
X	Pb212-XR	1.000			
	Bi-214	0.798	3.11E-01	7.52E-02	
	Pb-214	1.000	3.01E-01	5.93E-02	
	Pb214-XR	1.000	1.17E+00	3.09E-01	
?	Ra-226	0.999	4.73E-01	4.22E-01	
	Ac-228	0.745	2.79E-01	8.45E-02	
?	U-235	0.994	3.01E-02	2.69E-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 2.000sigma

Analysis Report for 05-May-16-10008

L3-10220C-FRGS-010SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/5/2016 11:08:50AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
9	510.33	1.86800E-02	33.58		ANH-511

JPW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.79E+00	3.02E-01	3.02E-01	miss
+	Cr-51	320.08		9.91	-5.44E-03	1.96E-01	1.96E-01	free
+	Mn-54	834.85		99.98	-5.66E-03	2.11E-02	2.11E-02	miss
+	Co-58	810.76		99.45	6.06E-03	2.36E-02	2.36E-02	miss
		1674.73		0.52	-2.82E-01		3.32E+00	miss
+	Co-60	1173.23		99.85	-1.17E-02	2.11E-02	2.11E-02	miss
		1332.49		99.98	5.46E-04		2.29E-02	miss
+	Nb-94	702.65		99.81	3.32E-03	2.26E-02	2.26E-02	miss
		871.09		99.89	6.48E-03		2.51E-02	miss
+	Ag-108m	79.13		6.60	-1.18E-01	2.01E-02	4.94E-01	miss
		433.94		90.50	-9.86E-04		2.04E-02	miss
		614.28		89.80	-1.01E-02		2.01E-02	miss
		722.94		90.80	-2.33E-04		2.33E-02	miss
+	Sn-113	255.13		2.11	7.29E-02	3.26E-02	9.71E-01	free
		391.70		64.97	-7.72E-03		3.26E-02	free
+	Cs-134	475.36		1.48	-1.03E+00	2.65E-02	1.30E+00	miss
		563.25		8.34	6.67E-02		2.42E-01	miss
		569.33		15.37	-9.14E-03		1.41E-01	miss

Analysis Report for 05-May-16-10008

L3-10220C-FRGS-010SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	604.72		97.62	3.12E-03	2.65E-02	2.65E-02	miss
		795.86		85.46	1.48E-02		3.38E-02	miss
		801.95		8.69	-6.39E-02		2.36E-01	miss
		1038.61		0.99	1.24E+00		3.09E+00	miss
		1167.97		1.79	-2.80E-01		1.63E+00	miss
		1365.19		3.02	-3.23E-02		6.00E-01	miss
+	Cs-137	661.66	*	85.10	2.92E-01	3.54E-02	3.54E-02	miss
+	Eu-152	121.78		28.67	1.69E-02	6.23E-02	6.48E-02	miss
		244.70		7.61	1.27E-01		2.82E-01	miss
		295.94		0.45	8.27E+00		6.97E+00	miss
		344.28		26.60	-1.95E-02		6.23E-02	miss
		367.79		0.86	-3.44E-01		2.21E+00	miss
		411.12		2.24	5.48E-02		9.62E-01	miss
		443.96		2.83	-3.14E-01		5.58E-01	miss
		488.68		0.42	9.64E-01		5.05E+00	miss
		563.99		0.49	-6.82E-01		3.46E+00	miss
		586.26		0.46	-2.64E+00		3.80E+00	miss
		678.62		0.47	-7.73E-01		4.09E+00	miss
		688.67		0.86	-1.96E-01		2.38E+00	miss
		719.35		0.28	0.00E+00		8.22E+00	miss
		778.90		12.96	3.65E-02		1.87E-01	miss
		810.45		0.32	1.23E+00		6.77E+00	miss
		867.37		4.26	-1.12E-02		5.05E-01	miss
		919.33		0.43	-1.57E+00		4.92E+00	miss
		964.08		14.65	6.50E-02		2.31E-01	miss
		1085.87		10.24	2.33E-02		2.58E-01	miss
		1089.74		1.73	-3.04E-01		1.53E+00	miss
		1112.07		13.69	-4.60E-02		1.33E-01	miss
		1212.95		1.43	-4.49E-01		1.77E+00	miss
		1249.94		0.19	-2.10E+00		1.27E+01	miss
		1299.14		1.63	-8.25E-02		1.39E+00	miss
		1408.01		21.07	1.33E-02		1.33E-01	miss
		1457.64		0.50	-1.06E+01		8.66E+00	miss
		1528.10		0.28	2.20E+00		9.03E+00	miss
+	Eu-154	123.07		40.40	5.72E-03	4.45E-02	4.45E-02	miss
		247.93		6.89	-1.38E-01		2.08E-01	miss
		591.76		4.95	-1.69E-02		4.90E-01	miss
		692.42		1.78	1.85E-01		1.21E+00	miss
		723.30		20.06	-1.34E-02		9.50E-02	miss
		756.80		4.52	1.18E-01		5.82E-01	miss
		873.18		12.08	-5.52E-02		1.89E-01	miss
		996.29		10.48	2.89E-02		2.12E-01	miss
		1004.76		18.01	3.82E-02		1.32E-01	miss
		1274.43		34.80	2.81E-02		8.87E-02	miss
		1596.48		1.80	-7.93E-02		1.60E+00	miss
+	Eu-155	45.30		1.31	-2.17E+00	1.12E-01	4.65E+00	miss
		60.01		1.22	-5.26E-01		6.32E+00	miss
		86.55		30.70	3.00E-03		1.14E-01	miss
		105.31		21.10	2.33E-02		1.12E-01	miss
+	Tl-208	583.19	*	85.00	7.76E-02	3.29E-02	3.29E-02	miss
+	Bi-211	351.07	*	13.02	8.78E-01	2.02E-01	2.02E-01	miss

Analysis Report for 05-May-16-10008

L3-10220C-FRGS-010SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Pb-211	404.85		3.78	9.00E-03	5.52E-01	5.52E-01	miss
		427.09		1.76	2.00E-01		1.20E+00	miss
		832.01		3.52	7.13E-02		6.90E-01	miss
+	Bi-212	39.86		1.06	3.54E+00	4.68E-01	7.28E+00	miss
		727.33		6.67	2.80E-01		4.68E-01	miss
		785.37		1.10	6.90E-01		2.37E+00	miss
		1620.50		1.47	-3.02E-01		1.40E+00	miss
+	Pb-212	115.18		0.60	1.52E+00	4.86E-02	3.45E+00	miss
		238.63	*	43.60	2.72E-01		4.86E-02	miss
		300.09		3.30	3.20E-01		6.95E-01	miss
+	Pb212-XR	74.82	*	10.28	6.20E-01	2.90E-01	5.45E-01	miss
		77.11	*	17.10	6.88E-01		2.90E-01	miss
		87.35		3.97	6.68E-01		8.96E-01	miss
		89.78		1.46	1.15E+00		2.03E+00	miss
+	Bi-214	609.32	*	45.49	3.11E-01	6.30E-02	6.30E-02	miss
		768.36		4.89	-3.80E-02		5.76E-01	miss
		806.18		1.26	-7.38E-01		1.42E+00	miss
		934.06		3.11	1.22E-01		8.10E-01	miss
		1120.29		14.92	1.68E-01		2.96E-01	miss
		1155.21		1.63	4.63E-01		2.07E+00	miss
		1238.12		5.83	3.35E-01		7.79E-01	miss
		1280.98		1.43	-1.16E-01		1.56E+00	miss
		1377.67		3.99	4.91E-01		9.87E-01	miss
		1385.31		0.79	-6.81E-01		2.98E+00	miss
		1401.52		1.33	1.70E-01		1.60E+00	miss
		1407.99		2.39	1.17E-01		1.17E+00	miss
		1509.21		2.13	1.62E-01		1.18E+00	miss
		1661.27		1.05	1.35E-01		2.32E+00	miss
		1729.59		2.88	1.32E-01		1.06E+00	miss
		1764.49		15.30	2.80E-01		3.64E-01	miss
		1847.43		2.03	4.06E-01		1.70E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99	*	7.25	4.12E-01	7.38E-02	3.31E-01	miss
		295.22	*	18.42	2.39E-01		1.16E-01	miss
		351.93	*	35.60	3.21E-01		7.38E-02	miss
		785.96		1.06	4.59E-01		2.38E+00	miss
+	Pb214-XR	74.82	*	5.80	1.10E+00	5.12E-01	9.66E-01	miss
		77.11	*	9.70	1.21E+00		5.12E-01	miss
		87.35		2.24	1.18E+00		1.59E+00	miss
		89.78		0.82	2.05E+00		3.61E+00	miss
+	Ra-226	186.21	*	3.64	4.73E-01	6.66E-01	6.66E-01	miss
+	Ac-228	129.07		2.42	1.05E-01	1.16E-01	8.11E-01	miss
		209.25		3.89	4.09E-01		5.79E-01	miss
		270.24		3.46	4.64E-01		7.16E-01	miss
		328.00		2.95	4.78E-01		8.08E-01	miss
		338.32	*	11.27	3.05E-01		1.99E-01	miss
		409.46		1.92	-9.52E-02		1.00E+00	miss
		463.00		4.40	8.91E-02		5.80E-01	miss
		794.95		4.25	2.00E-01		6.78E-01	miss
		911.20	*	25.80	2.68E-01		1.16E-01	miss
		964.77		4.99	2.01E-01		7.27E-01	miss

Analysis Report for 05-May-16-10008

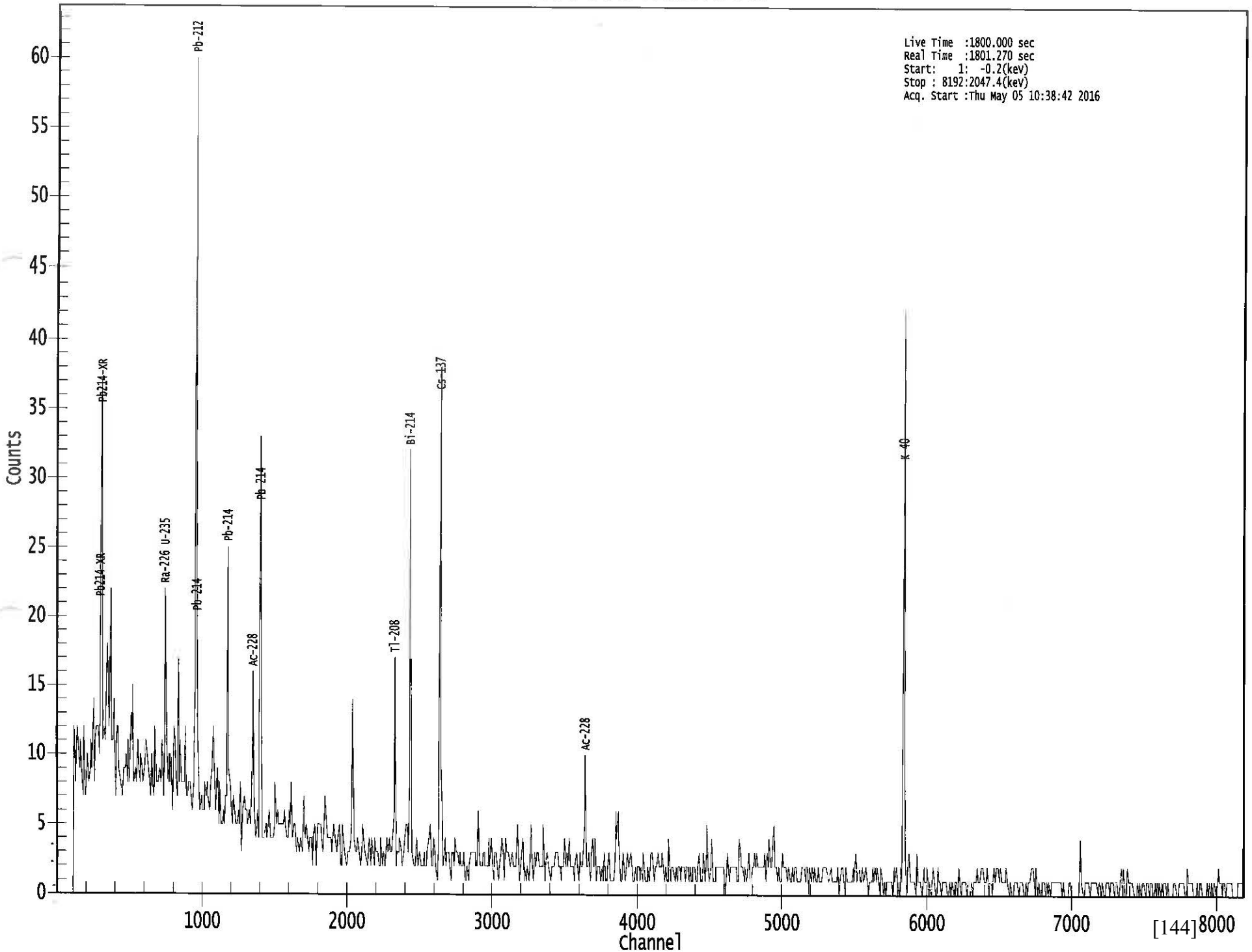
L3-10220C-FRGS-010SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	968.97		15.80	2.74E-01	1.16E-01	2.96E-01	miss
		1588.20		3.22	2.15E-01		8.14E-01	miss
+	Pa-231	27.36		10.30	0.00E+00	6.39E-02	6.39E-02	miss
		283.69		1.70	5.87E-02		1.15E+00	miss
		300.07		2.47	4.28E-01		9.29E-01	miss
		302.65		2.20	-2.78E-01		8.20E-01	miss
		330.06		1.40	-8.74E-01		1.02E+00	miss
+	Th-234	92.38		2.13	1.41E+00	1.73E+00	1.73E+00	miss
		92.80		2.10	1.81E+00		1.78E+00	miss
		112.81		0.21	-1.60E+00		9.03E+00	miss
+	U-235	143.76		10.96	4.61E-02	4.24E-02	1.62E-01	miss
		163.33		5.08	-3.59E-02		2.99E-01	miss
		185.71	*	57.20	3.01E-02		4.24E-02	miss
		202.11		1.08	-6.56E-01		1.50E+00	miss
		205.31		5.01	-8.84E-02		3.08E-01	miss
+	Am-241	59.54		35.90	1.06E-01	2.47E-01	2.47E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000014853.CNF



Apex-Gamma

Analysis Report for 05-May-16-10011

L3-10220C-FRGS-011SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-May-16-10011
Sample Description	: L3-10220C-FRGS-011SS (DRIED)
Sample Type	: 1L 130G Soil Sample
Unit	:
Sample Point	:
Sample Size	: 1.303E+03 grams
Facility	: Default
Sample Taken On	: 5/2/2016 1:05:00PM
Acquisition Started	: 5/5/2016 12:04:43PM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P11314X2
Geometry	: 130G Soil
Live Time	: 1800.0 seconds
Real Time	: 1801.3 seconds
Dead Time	: 0.07 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 6/28/2012
Efficiency Calibration Description	:
Sample Number	: 14856

5-5-16

5/7/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 5/5/2016 12:34:53PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB

Peak Match Tolerance : 1.000FWHM

5-5-16

DATA VALIDATED

6/2/16

Analysis Report for 05-May-16-10011

L3-10220C-FRGS-011SS (DRIED)

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
M	1	74.69	294 -	315	300.00	7.70E+01	24.91	2.62E+02	Pb214-XR
									Pb212-XR
m	2	76.89	294 -	315	308.77	1.01E+02	27.48	2.50E+02	Pb214-XR
									Pb212-XR
	3	109.37	435 -	442	438.52	2.03E+01	22.30	8.75E+01	..... NO PF
	4	185.96	739 -	752	744.44	7.58E+01	37.04	1.92E+02	U-235
									Ra-226
	5	209.30	832 -	844	837.68	3.88E+01	31.87	1.63E+02	Ac-228
M	6	238.66	948 -	976	954.95	2.89E+02	36.72	1.70E+02	Pb-212
m	7	241.93	948 -	976	968.04	5.93E+01	18.94	1.14E+02	Pb-214
	8	295.20	1175 -	1186	1180.86	5.94E+01	29.23	1.23E+02	Pb-214
									Eu-152
	9	338.26	1347 -	1360	1352.90	4.01E+01	25.71	1.04E+02	Ac-228
	10	351.95	1400 -	1414	1407.60	2.07E+02	36.99	1.08E+02	Pb-214
									Bi-211
	11	583.17	2323 -	2340	2331.69	1.22E+02	27.76	5.05E+01	Tl-208
	12	609.17	2429 -	2443	2435.62	1.39E+02	27.64	4.12E+01	Bi-214
	13	661.60	2637 -	2654	2645.22	1.59E+02	29.92	5.12E+01	Cs-137
	14	911.28	3635 -	3650	3643.63	5.61E+01	17.56	1.78E+01	Ac-228
	15	968.88	3868 -	3882	3873.99	4.41E+01	16.07	1.78E+01	Ac-228
	16	1119.97	4472 -	4484	4478.45	3.42E+01	16.11	3.16E+01	Bi-214
	17	1460.89	5832 -	5853	5842.91	3.82E+02	39.87	1.22E+01	K-40
	18	1764.34	7052 -	7065	7058.05	3.10E+01	12.58	8.03E+00	Bi-214

JOW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	1.00	1460.82	*	10.66	5.40E+00	7.33E-01	miss
Cs-137	1.00	661.66	*	85.10	1.65E-01	3.68E-02	miss
Tl-208	1.00	583.19	*	85.00	1.16E-01	2.98E-02	miss
Bi-211	0.95	351.07	*	13.02	9.00E-01	2.17E-01	miss
Pb-212	1.00	115.18		0.60			

Analysis Report for 05-May-16-10011

L3-10220C-FRGS-011SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Pb-212	1.00	238.63	*	43.60	2.90E-01	5.95E-02	miss
		300.09		3.30			
Pb212-XR	0.99	74.82	*	10.28	6.44E-01	2.47E-01	miss
		77.11	*	17.10	4.68E-01	1.60E-01	miss
		87.35		3.97			
		89.78		1.46			
Bi-214	0.99	609.32	*	45.49	2.55E-01	5.91E-02	miss
		768.36		4.89			
		806.18		1.26			
		934.06		3.11			
		1120.29	*	14.92	2.87E-01	1.37E-01	miss
		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	3.53E-01	1.46E-01	miss
		1847.43		2.03			
		2118.51		1.16			
Pb-214	1.00	241.99	*	7.25	3.61E-01	1.29E-01	miss
		295.22	*	18.42	1.62E-01	8.40E-02	miss
		351.93	*	35.60	3.29E-01	7.90E-02	miss
		785.96		1.06			
Ra-226	0.99	186.21	*	3.64	7.96E-01	4.10E-01	miss
Ac-228	1.00	129.07		2.42			
		209.25	*	3.89	4.06E-01	3.40E-01	miss
		270.24		3.46			
		328.00		2.95			
		338.32	*	11.27	1.96E-01	1.30E-01	miss
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20	*	25.80	2.38E-01	7.72E-02	miss
		964.77		4.99			
		968.97	*	15.80	3.18E-01	1.19E-01	miss
		1588.20		3.22			
U-235	0.99	143.76		10.96			
		163.33		5.08			
		185.71	*	57.20	5.07E-02	2.61E-02	miss
		202.11		1.08			
		205.31		5.01			

Analysis Report for 05-May-16-10011

L3-10220C-FRGS-011SS (DRIED)

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	5.40E+00	7.33E-01	
	Cs-137	1.000	1.65E-01	3.68E-02	
	Tl-208	1.000	1.16E-01	2.98E-02	
	Bi-211	0.953	2.94E-01	2.89E-01	
	Pb-212	1.000	2.90E-01	5.95E-02	
	Pb212-XR	0.998	5.20E-01	1.34E-01	
	Bi-214	0.998	2.71E-01	5.09E-02	
	Pb-214	1.000	2.22E-01	7.04E-02	
X	Pb214-XR	0.998			
?	Ra-226	0.996	7.96E-01	4.10E-01	
	Ac-228	1.000	2.53E-01	5.72E-02	
?	U-235	0.997	5.07E-02	2.61E-02	

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

Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10011

L3-10220C-FRGS-011SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/5/2016 12:34:53PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
3	109.37	1.12587E-02	55.02		

NQPF

JDW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.40E+00	2.21E-01	2.21E-01	miss
+	Cr-51	320.08		9.91	-8.36E-02	1.53E-01	1.53E-01	free
+	Mn-54	834.85		99.98	3.32E-03	2.02E-02	2.02E-02	miss
+	Co-58	810.76		99.45	8.71E-05	2.10E-02	2.10E-02	miss
		1674.73		0.52	1.66E-01		2.45E+00	miss
+	Co-60	1173.23		99.85	4.13E-03	1.84E-02	2.68E-02	miss
		1332.49		99.98	1.81E-03		1.84E-02	miss
+	Nb-94	702.65		99.81	1.01E-03	1.92E-02	1.96E-02	miss
		871.09		99.89	1.94E-03		1.92E-02	miss
+	Ag-108m	79.13		6.60	2.74E-02	1.55E-02	4.48E-01	miss
		433.94		90.50	-3.22E-03		1.55E-02	miss
		614.28		89.80	-4.95E-03		1.99E-02	miss
		722.94		90.80	-1.08E-02		1.72E-02	miss
+	Sn-113	255.13		2.11	-2.34E-01	2.30E-02	7.16E-01	free
		391.70		64.97	-6.12E-04		2.30E-02	free
+	Cs-134	475.36		1.48	2.09E-01	1.54E-02	1.14E+00	miss
		563.25		8.34	-3.00E-02		1.97E-01	miss
		569.33		15.37	3.32E-02		1.19E-01	miss

Analysis Report for 05-May-16-10011

L3-10220C-FRGS-011SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	604.72		97.62	-6.51E-03	1.54E-02	1.54E-02	miss
		795.86		85.46	6.88E-04		2.56E-02	miss
		801.95		8.69	4.32E-02		2.33E-01	miss
		1038.61		0.99	-5.06E-01		2.01E+00	miss
		1167.97		1.79	2.39E-01		1.26E+00	miss
		1365.19		3.02	-8.16E-02		4.42E-01	miss
+	Cs-137	661.66	*	85.10	1.65E-01	3.01E-02	3.01E-02	miss
+	Eu-152	121.78		28.67	6.07E-04	5.12E-02	5.16E-02	miss
		244.70		7.61	-6.13E-02		1.90E-01	miss
		295.94		0.45	8.87E-01		5.75E+00	miss
		344.28		26.60	-3.00E-05		5.73E-02	miss
		367.79		0.86	-4.00E-01		1.45E+00	miss
		411.12		2.24	-3.01E-01		5.87E-01	miss
		443.96		2.83	3.39E-01		6.85E-01	miss
		488.68		0.42	-3.08E-01		3.63E+00	miss
		563.99		0.49	-3.54E-01		3.33E+00	miss
		586.26		0.46	-4.42E-01		3.55E+00	miss
		678.62		0.47	-9.65E-01		3.57E+00	miss
		688.67		0.86	4.69E-01		2.18E+00	miss
		719.35		0.28	2.88E-01		6.06E+00	miss
		778.90		12.96	1.26E-03		1.38E-01	miss
		810.45		0.32	1.84E+00		6.88E+00	miss
		867.37		4.26	-1.33E-01		3.93E-01	miss
		919.33		0.43	1.38E+00		4.48E+00	miss
		964.08		14.65	8.48E-02		1.82E-01	miss
		1085.87		10.24	1.20E-02		2.09E-01	miss
		1089.74		1.73	-1.02E+00		6.61E-01	miss
		1112.07		13.69	-7.69E-02		1.20E-01	miss
		1212.95		1.43	-1.03E+00		1.54E+00	miss
		1249.94		0.19	-1.49E+00		1.24E+01	miss
		1299.14		1.63	-1.22E-02		1.28E+00	miss
		1408.01		21.07	-2.29E-02		5.12E-02	miss
		1457.64		0.50	-2.67E+00		6.38E+00	miss
		1528.10		0.28	1.27E+00		5.96E+00	miss
+	Eu-154	123.07		40.40	-2.58E-02	3.34E-02	3.34E-02	miss
		247.93		6.89	-8.03E-03		2.21E-01	miss
		591.76		4.95	2.08E-01		3.79E-01	miss
		692.42		1.78	5.28E-02		8.91E-01	miss
		723.30		20.06	-1.37E-02		8.46E-02	miss
		756.80		4.52	-4.27E-03		3.72E-01	miss
		873.18		12.08	5.14E-02		1.59E-01	miss
		996.29		10.48	2.36E-02		1.76E-01	miss
		1004.76		18.01	-1.45E-02		1.08E-01	miss
		1274.43		34.80	7.81E-03		7.89E-02	miss
		1596.48		1.80	-6.18E-02		1.08E+00	miss
+	Eu-155	45.30		1.31	1.55E+00	8.82E-02	4.69E+00	miss
		60.01		1.22	6.49E-01		5.49E+00	miss
		86.55		30.70	2.32E-02		8.82E-02	miss
		105.31		21.10	5.12E-02		9.36E-02	miss
+	Tl-208	583.19	*	85.00	1.16E-01	2.89E-02	2.89E-02	miss
+	Bi-211	351.07	*	13.02	9.00E-01	1.78E-01	1.78E-01	miss

Analysis Report for 05-May-16-10011

L3-10220C-FRGS-011SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Pb-211	404.85		3.78	2.17E-02	4.67E-01	4.67E-01	miss
		427.09		1.76	-1.75E-01		8.49E-01	miss
		832.01		3.52	-5.59E-02		5.08E-01	miss
+	Bi-212	39.86		1.06	2.24E+00	4.36E-01	6.13E+00	miss
		727.33		6.67	2.97E-01		4.36E-01	miss
		785.37		1.10	-5.08E-01		1.63E+00	miss
		1620.50		1.47	-3.82E-01		1.03E+00	miss
+	Pb-212	115.18		0.60	-6.13E-01	4.57E-02	2.63E+00	miss
		238.63	*	43.60	2.90E-01		4.57E-02	miss
		300.09		3.30	3.88E-01		6.02E-01	miss
+	Pb212-XR	74.82	*	10.28	6.44E-01	2.53E-01	4.68E-01	miss
		77.11	*	17.10	4.68E-01		2.53E-01	miss
		87.35		3.97	3.68E-01		6.80E-01	miss
		89.78		1.46	7.28E-01		1.70E+00	miss
+	Bi-214	609.32	*	45.49	2.55E-01	4.82E-02	4.82E-02	miss
		768.36		4.89	2.11E-01		5.07E-01	miss
		806.18		1.26	-3.51E-01		1.44E+00	miss
		934.06		3.11	1.96E-01		7.42E-01	miss
		1120.29	*	14.92	2.87E-01		1.76E-01	miss
		1155.21		1.63	5.35E-01		1.84E+00	miss
		1238.12		5.83	3.41E-01		6.07E-01	miss
		1280.98		1.43	2.73E-01		1.92E+00	miss
		1377.67		3.99	3.07E-01		6.56E-01	miss
		1385.31		0.79	3.91E-01		2.19E+00	miss
		1401.52		1.33	2.22E-01		1.74E+00	miss
		1407.99		2.39	-2.01E-01		4.50E-01	miss
		1509.21		2.13	-5.96E-02		8.72E-01	miss
		1661.27		1.05	2.19E-01		1.71E+00	miss
		1729.59		2.88	4.26E-01		9.94E-01	miss
		1764.49	*	15.30	3.53E-01		1.41E-01	miss
		1847.43		2.03	2.77E-01		1.06E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99	*	7.25	3.61E-01	6.51E-02	2.30E-01	miss
		295.22	*	18.42	1.62E-01		1.19E-01	miss
		351.93	*	35.60	3.29E-01		6.51E-02	miss
		785.96		1.06	2.96E-01		1.93E+00	miss
+	Pb214-XR	74.82	*	5.80	1.14E+00	4.47E-01	8.29E-01	miss
		77.11	*	9.70	8.25E-01		4.47E-01	miss
		87.35		2.24	6.52E-01		1.21E+00	miss
		89.78		0.82	1.30E+00		3.04E+00	miss
+	Ra-226	186.21	*	3.64	7.96E-01	5.93E-01	5.93E-01	miss
+	Ac-228	129.07		2.42	1.35E-01	7.54E-02	6.84E-01	miss
		209.25	*	3.89	4.06E-01		5.34E-01	miss
		270.24		3.46	2.78E-01		5.40E-01	miss
		328.00		2.95	4.84E-01		6.58E-01	miss
		338.32	*	11.27	1.96E-01		1.93E-01	miss
		409.46		1.92	2.06E-01		8.69E-01	miss
		463.00		4.40	1.29E-01		4.34E-01	miss
		794.95		4.25	3.34E-01		5.63E-01	miss
		911.20	*	25.80	2.38E-01		7.54E-02	miss
		964.77		4.99	2.22E-01		5.36E-01	miss

Analysis Report for 05-May-16-10011

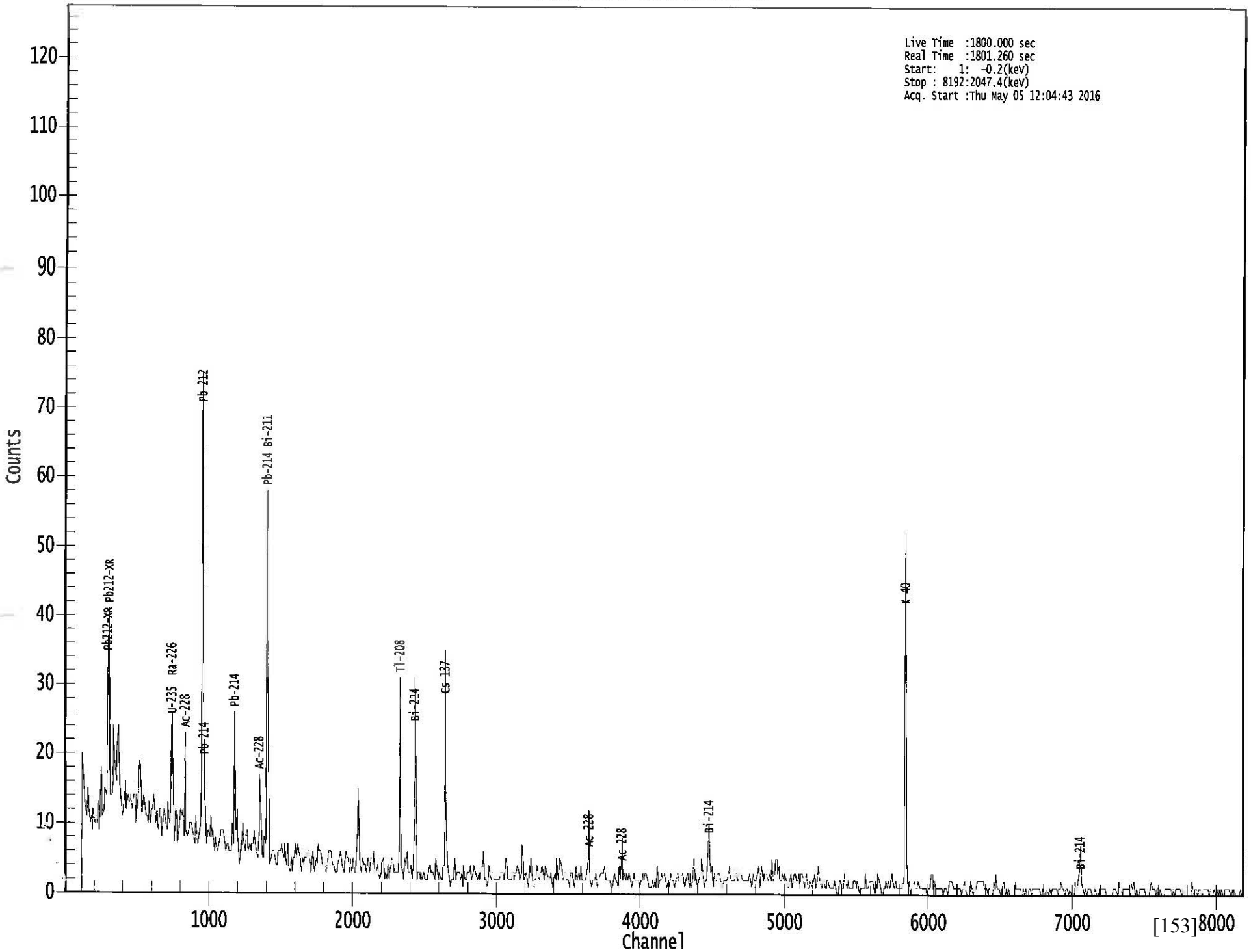
L3-10220C-FRGS-011SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	968.97	*	15.80	3.18E-01	7.54E-02	1.27E-01	miss
		1588.20		3.22	3.09E-01		7.50E-01	miss
+	Pa-231	27.36		10.30	0.00E+00	4.71E-02	4.71E-02	miss
		283.69		1.70	2.80E-01		9.37E-01	miss
		300.07		2.47	5.18E-01		8.05E-01	miss
		302.65		2.20	-1.46E-01		6.25E-01	miss
		330.06		1.40	-5.26E-01		1.11E+00	miss
+	Th-234	92.38		2.13	1.66E+00	1.44E+00	1.44E+00	miss
		92.80		2.10	2.01E+00		1.50E+00	miss
		112.81		0.21	-5.15E+00		8.10E+00	miss
+	U-235	143.76		10.96	-3.28E-02	3.77E-02	1.13E-01	miss
		163.33		5.08	4.68E-02		2.60E-01	miss
		185.71	*	57.20	5.07E-02		3.77E-02	miss
		202.11		1.08	-2.42E-01		1.28E+00	miss
		205.31		5.01	-1.48E-02		2.81E-01	miss
+	Am-241	59.54		35.90	-5.84E-02	1.82E-01	1.82E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000014856.CNF



Apex-Gamma

Analysis Report for 05-May-16-10012
L3-10220C-FRGS-012SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-May-16-10012
Sample Description	: L3-10220C-FRGS-012SS (DRIED)
Sample Type	: 1L 130G Soil Sample
Unit	:
Sample Point	:
Sample Size	: 1.534E+03 grams
Facility	: Default
Sample Taken On	: 5/2/2016 12:45:00PM
Acquisition Started	: 5/5/2016 12:05:08PM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P40818B
Geometry	: 130G Soil
Live Time	: 1800.0 seconds
Real Time	: 1802.8 seconds
Dead Time	: 0.16 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 1/5/2015
Efficiency Calibration Description	:
Sample Number	: 14857

5/5/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 5/5/2016 12:35:36PM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

5-5-16

DATA VALIDATED
6/2/16

Analysis Report for 05-May-16-10012

L3-10220C-FRGS-012SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	77.19	307 -	314	309.82	3.84E+01	33.06	1.93E+02	Pb214-XR Pb212-XR
2	185.83	740 -	747	743.99	2.35E+01	29.81	1.93E+02	U-235 Ra-226
3	238.50	948 -	972	954.52	2.49E+02	73.44	4.98E+02	Pb-212
4	295.17	1172 -	1189	1181.00	9.54E+01	41.09	1.99E+02	Pb-214 Eu-152
5	351.74	1400 -	1416	1407.14	1.61E+02	35.58	1.15E+02	Pb-214 Bi-211
6	510.51	2037 -	2049	2041.92	4.66E+01	24.11	8.28E+01	..... ANH-511
7	583.09	2325 -	2338	2332.12	8.52E+01	25.25	6.16E+01	Tl-208
8	609.23	2427 -	2445	2436.68	1.37E+02	28.52	4.56E+01	Bi-214
9	661.59	2638 -	2655	2646.07	2.30E+02	35.03	6.07E+01	Cs-137
10	911.11	3638 -	3651	3644.15	4.94E+01	17.15	2.13E+01	Ac-228
11	964.20	3851 -	3862	3856.55	1.20E+01	12.01	2.40E+01	Eu-152 Ac-228
12	1460.58	5831 -	5854	5843.30	4.79E+02	44.40	1.03E+01	K-40

JPW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	6.39E+00	8.11E-01	miss
Cs-137	1.00	661.66	*	85.10	2.24E-01	4.35E-02	miss
Tl-208	0.99	583.19	*	85.00	7.63E-02	2.44E-02	miss
Pb-212	0.99	115.18		0.60			
		238.63	*	43.60	2.39E-01	8.02E-02	miss
		300.09		3.30			
Pb212-XR	1.00	74.82		10.28			
		77.11	*	17.10	2.70E-01	2.39E-01	miss
		87.35		3.97			
		89.78		1.46			
Bi-214	1.00	609.32	*	45.49	2.36E-01	5.68E-02	miss

Analysis Report for 05-May-16-10012

L3-10220C-FRGS-012SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	1.00	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	2.48E-01	1.14E-01	miss
		351.93	*	35.60	2.41E-01	6.59E-02	miss
		785.96		1.06			
Pb214-XR	1.00	74.82		5.80			
		77.11	*	9.70	4.75E-01	4.24E-01	miss
		87.35		2.24			
		89.78		0.82			
Ra-226	0.99	186.21	*	3.64	2.40E-01	3.07E-01	miss
Ac-228	0.48	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	1.97E-01	7.05E-02	miss
		964.77	*	4.99	2.57E-01	2.59E-01	miss
		968.97		15.80			
		1588.20		3.22			
U-235	0.99	143.76		10.96			
		163.33		5.08			
		185.71	*	57.20	1.53E-02	1.95E-02	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10012

L3-10220C-FRGS-012SS (DRIED)

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.997	6.39E+00	8.11E-01	
	Cs-137	1.000	2.24E-01	4.35E-02	
	Tl-208	0.999	7.63E-02	2.44E-02	
X	Bi-211	0.973			
	Pb-212	0.999	2.39E-01	8.02E-02	
?	Pb212-XR	1.000	2.70E-01	2.39E-01	
	Bi-214	1.000	2.36E-01	5.68E-02	
	Pb-214	0.999	2.43E-01	5.70E-02	
?	Pb214-XR	1.000	4.75E-01	4.24E-01	
?	Ra-226	0.991	2.40E-01	3.07E-01	
	Ac-228	0.481	2.01E-01	6.81E-02	
?	U-235	0.999	1.53E-02	1.95E-02	

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

Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10012

L3-10220C-FRGS-012SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/5/2016 12:35:36PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
6	510.51	2.59003E-02	25.86		

ANH-511

JPW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	6.39E+00	2.00E-01	2.00E-01	miss
+	Cr-51	320.08		9.91	-7.63E-03	1.72E-01	1.72E-01	free
+	Mn-54	834.85		99.98	1.22E-02	2.34E-02	2.34E-02	miss
+	Co-58	810.76		99.45	1.08E-02	1.98E-02	1.98E-02	miss
		1674.73		0.52	6.68E-01		3.77E+00	miss
+	Co-60	1173.23		99.85	6.22E-03	2.11E-02	2.60E-02	miss
		1332.49		99.98	4.22E-03		2.11E-02	miss
+	Nb-94	702.65		99.81	-1.59E-03	1.57E-02	1.57E-02	miss
		871.09		99.89	-8.53E-03		1.58E-02	miss
+	Ag-108m	79.13		6.60	3.07E-01	1.99E-02	7.29E-01	miss
		433.94		90.50	9.43E-03		1.99E-02	miss
		614.28		89.80	7.90E-03		2.06E-02	miss
		722.94		90.80	6.67E-03		2.12E-02	miss
+	Sn-113	255.13		2.11	4.97E-01	2.63E-02	8.87E-01	free
		391.70		64.97	-7.76E-03		2.63E-02	free
+	Cs-134	475.36		1.48	1.97E-01	1.84E-02	1.19E+00	miss
		563.25		8.34	-9.68E-03		2.05E-01	miss
		569.33		15.37	-2.73E-02		1.22E-01	miss

Analysis Report for 05-May-16-10012

L3-10220C-FRGS-012SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	604.72		97.62	1.33E-03	1.84E-02	1.84E-02	miss
		795.86		85.46	1.59E-02		3.10E-02	miss
		801.95		8.69	6.00E-02		2.05E-01	miss
		1038.61		0.99	5.77E-01		2.36E+00	miss
		1167.97		1.79	-4.57E-01		1.19E+00	miss
		1365.19		3.02	1.99E-01		7.12E-01	miss
+	Cs-137	661.66	*	85.10	2.24E-01	3.08E-02	3.08E-02	miss
+	Eu-152	121.78		28.67	-1.36E-02	6.55E-02	6.55E-02	miss
		244.70		7.61	2.30E-02		2.40E-01	miss
		295.94		0.45	6.19E+00		5.83E+00	miss
		344.28		26.60	3.94E-03		6.73E-02	miss
		367.79		0.86	-3.93E-01		1.66E+00	miss
		411.12		2.24	-6.41E-02		7.30E-01	miss
		443.96		2.83	-4.60E-02		5.68E-01	miss
		488.68		0.42	2.41E-01		3.60E+00	miss
		563.99		0.49	-4.54E-01		3.48E+00	miss
		586.26		0.46	-9.96E-01		3.82E+00	miss
		678.62		0.47	1.52E+00		3.91E+00	miss
		688.67		0.86	-2.53E-01		2.00E+00	miss
		719.35		0.28	-9.74E-02		6.33E+00	miss
		778.90		12.96	-4.11E-02		1.34E-01	miss
		810.45		0.32	1.38E+00		5.57E+00	miss
		867.37		4.26	4.86E-02		4.70E-01	miss
		919.33		0.43	-2.83E-01		3.42E+00	miss
		964.08		14.65	1.02E-01		1.86E-01	miss
		1085.87		10.24	7.39E-02		2.28E-01	miss
		1089.74		1.73	7.03E-02		1.26E+00	miss
		1112.07		13.69	3.97E-02		1.73E-01	miss
		1212.95		1.43	6.24E-03		1.76E+00	miss
		1249.94		0.19	-5.57E-01		1.39E+01	miss
		1299.14		1.63	1.23E+00		1.84E+00	miss
		1408.01		21.07	-7.62E-03		1.04E-01	miss
		1457.64		0.50	-3.13E+00		9.28E+00	miss
		1528.10		0.28	-4.48E-01		3.84E+00	miss
+	Eu-154	123.07		40.40	-3.57E-03	4.72E-02	4.72E-02	miss
		247.93		6.89	-1.42E-01		2.19E-01	miss
		591.76		4.95	8.64E-02		3.22E-01	miss
		692.42		1.78	-8.02E-02		9.38E-01	miss
		723.30		20.06	1.71E-03		9.10E-02	miss
		756.80		4.52	-6.86E-02		3.78E-01	miss
		873.18		12.08	1.26E-02		1.76E-01	miss
		996.29		10.48	9.87E-03		1.97E-01	miss
		1004.76		18.01	1.73E-02		1.15E-01	miss
		1274.43		34.80	1.22E-02		6.71E-02	miss
		1596.48		1.80	2.07E-01		1.02E+00	miss
+	Eu-155	45.30		1.31	-4.83E+00	1.14E-01	1.24E+01	miss
		60.01		1.22	-2.97E-01		1.22E+01	miss
		86.55		30.70	1.66E-02		1.22E-01	miss
		105.31		21.10	2.08E-02		1.14E-01	miss
+	Tl-208	583.19	*	85.00	7.63E-02	2.78E-02	2.78E-02	miss
+	Bi-211	351.07	*	13.02	6.59E-01	1.80E-01	1.80E-01	miss

Analysis Report for 05-May-16-10012

L3-10220C-FRGS-012SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Pb-211	404.85		3.78	6.40E-02	3.60E-01	4.47E-01	miss
		427.09		1.76	-9.67E-02		8.72E-01	miss
		832.01		3.52	-2.38E-01		3.60E-01	miss
+	Bi-212	39.86		1.06	0.00E+00	3.73E-01	1.29E+01	miss
		727.33		6.67	2.26E-01		3.73E-01	miss
		785.37		1.10	1.16E-01		1.64E+00	miss
		1620.50		1.47	4.59E-01		1.57E+00	miss
+	Pb-212	115.18		0.60	9.68E-01	1.07E-01	3.69E+00	miss
		238.63	*	43.60	2.39E-01		1.07E-01	miss
		300.09		3.30	2.04E-01		5.63E-01	miss
+	Pb212-XR	74.82		10.28	3.62E-01	3.74E-01	6.88E-01	miss
		77.11	*	17.10	2.70E-01		3.74E-01	miss
		87.35		3.97	8.73E-01		9.72E-01	miss
		89.78		1.46	9.76E-01		2.29E+00	miss
+	Bi-214	609.32	*	45.49	2.36E-01	5.08E-02	5.08E-02	miss
		768.36		4.89	1.47E-01		4.40E-01	miss
		806.18		1.26	5.53E-02		1.12E+00	miss
		934.06		3.11	2.94E-01		7.93E-01	miss
		1120.29		14.92	1.71E-01		2.40E-01	miss
		1155.21		1.63	1.81E-01		1.66E+00	miss
		1238.12		5.83	2.67E-01		5.91E-01	miss
		1280.98		1.43	2.14E-01		1.70E+00	miss
		1377.67		3.99	4.58E-02		5.94E-01	miss
		1385.31		0.79	-1.97E-01		1.60E+00	miss
		1401.52		1.33	5.23E-01		1.64E+00	miss
		1407.99		2.39	-6.70E-02		9.16E-01	miss
		1509.21		2.13	5.56E-01		1.24E+00	miss
		1661.27		1.05	-9.38E-02		1.10E+00	miss
		1729.59		2.88	2.34E-01		8.46E-01	miss
		1764.49		15.30	2.32E-01		2.74E-01	miss
		1847.43		2.03	-8.37E-02		1.01E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	4.82E-02	6.57E-02	2.83E-01	miss
		295.22	*	18.42	2.48E-01		1.61E-01	miss
		351.93	*	35.60	2.41E-01		6.57E-02	miss
		785.96		1.06	1.94E-01		1.65E+00	miss
+	Pb214-XR	74.82		5.80	6.41E-01	6.58E-01	1.22E+00	miss
		77.11	*	9.70	4.75E-01		6.58E-01	miss
		87.35		2.24	1.55E+00		1.72E+00	miss
		89.78		0.82	1.74E+00		4.09E+00	miss
+	Ra-226	186.21	*	3.64	2.40E-01	5.01E-01	5.01E-01	miss
+	Ac-228	129.07		2.42	1.37E-01	7.53E-02	8.17E-01	miss
		209.25		3.89	3.21E-01		4.63E-01	miss
		270.24		3.46	1.78E-01		5.44E-01	miss
		328.00		2.95	1.79E-01		6.28E-01	miss
		338.32		11.27	1.51E-01		1.96E-01	miss
		409.46		1.92	-2.22E-01		8.48E-01	miss
		463.00		4.40	2.38E-01		4.84E-01	miss
		794.95		4.25	4.34E-01		6.58E-01	miss
		911.20	*	25.80	1.97E-01		7.53E-02	miss
		964.77	*	4.99	2.57E-01		4.04E-01	miss

Analysis Report for 05-May-16-10012

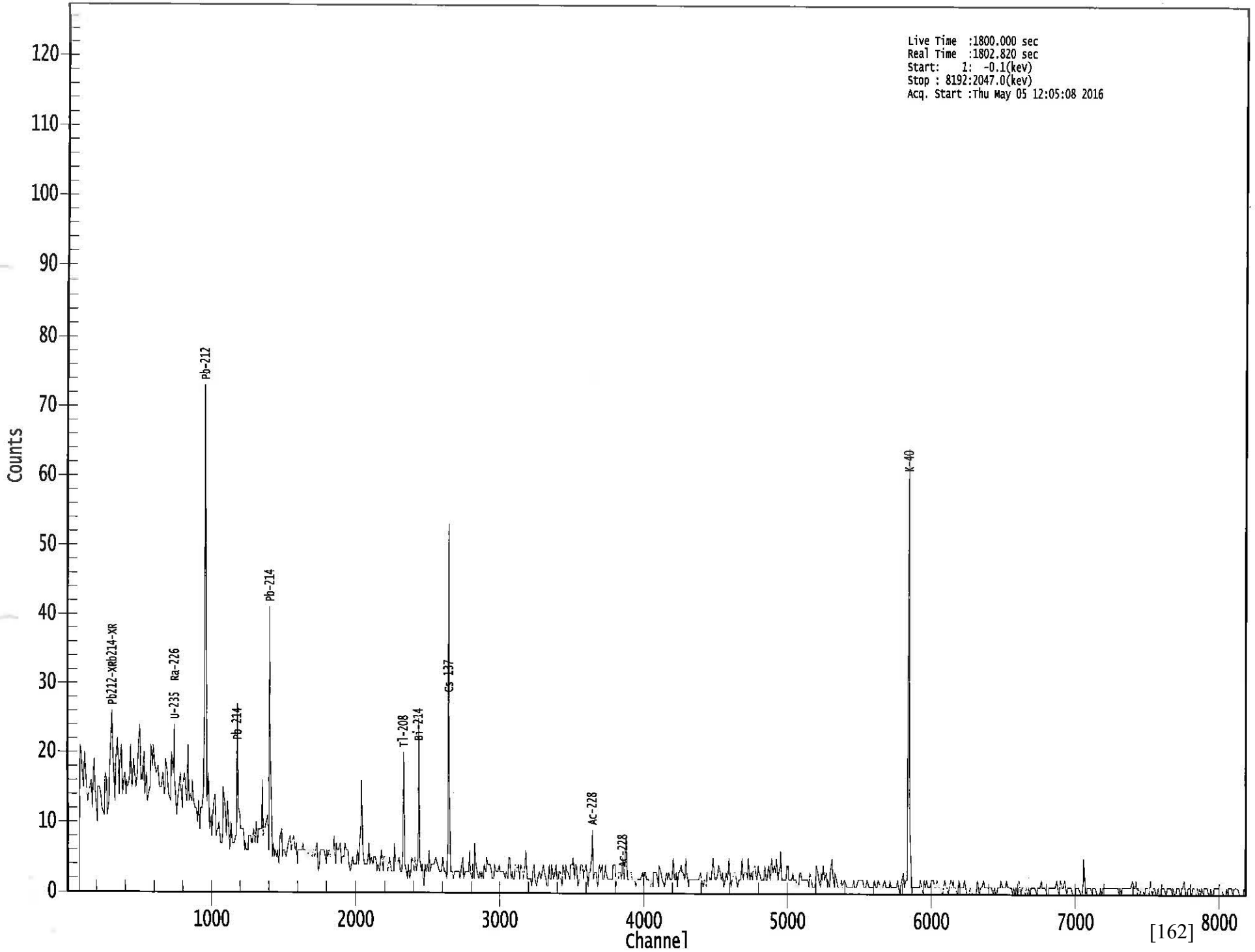
L3-10220C-FRGS-012SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	968.97		15.80	1.30E-01	7.53E-02	1.94E-01	miss
		1588.20		3.22	-1.35E-01		4.38E-01	miss
+	Pa-231	27.36		10.30	1.64E-01	7.52E-01	1.54E+00	miss
		283.69		1.70	5.91E-01		1.10E+00	miss
		300.07		2.47	2.73E-01		7.52E-01	miss
		302.65		2.20	4.25E-01		8.01E-01	miss
		330.06		1.40	-3.75E-01		1.18E+00	miss
+	Th-234	92.38		2.13	8.69E-01	1.78E+00	1.78E+00	miss
		92.80		2.10	1.24E+00		1.82E+00	miss
		112.81		0.21	1.54E+00		1.02E+01	miss
+	U-235	143.76		10.96	-9.19E-03	3.19E-02	1.61E-01	miss
		163.33		5.08	2.50E-02		3.31E-01	miss
		185.71	*	57.20	1.53E-02		3.19E-02	miss
		202.11		1.08	-1.69E-01		1.44E+00	miss
		205.31		5.01	3.34E-02		3.19E-01	miss
+	Am-241	59.54		35.90	-8.44E-02	4.16E-01	4.16E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000014857.CNF



Apex-Gamma

Analysis Report for 05-May-16-10002
L3-10220C-FRGS-013SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-May-16-10002
Sample Description	: L3-10220C-FRGS-013SS (DRIED)
Sample Type	: 1L 130G Soil Sample
Unit	:
Sample Point	:
Sample Size	: 1.624E+03 grams
Facility	: Default
Sample Taken On	: 5/3/2016 7:50:00AM
Acquisition Started	: 5/5/2016 8:19:53AM
Procedure	: 130G 1L Sand Sample
Operator	: JWelch
Detector Name	: P11314X2
Geometry	: 130G Sand
Live Time	: 1800.0 seconds
Real Time	: 1801.3 seconds
Dead Time	: 0.07 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 11/26/2012
Efficiency Calibration Description	:
Sample Number	: 14847

5-5-16 5/5/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 5/5/2016 8:56:30AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

5-5-16

DATA VALIDATED
6/2/16

Analysis Report for 05-May-16-10002

L3-10220C-FRGS-013SS (DRIED)

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
M	1	74.82	296 -	315	300.53	8.74E+01	25.90	2.28E+02	Pb214-XR Pb212-XR
m	2	77.01	296 -	315	309.24	1.24E+02	28.55	2.49E+02	Pb214-XR Pb212-XR
	3	86.80	345 -	354	348.35	4.30E+01	35.39	2.00E+02	Eu-155 Pb212-XR Pb214-XR
	4	92.76	367 -	377	372.18	5.19E+01	40.50	2.50E+02	Th-234 Th-234 Ac228-XR U235-XR
	5	209.40	835 -	842	838.09	2.77E+01	23.49	1.09E+02	Ac-228
M	6	238.63	949 -	973	954.83	2.84E+02	36.51	1.49E+02	Pb-212
m	7	241.87	949 -	973	967.79	6.00E+01	21.03	1.78E+02	Pb-214
	8	295.16	1176 -	1188	1180.68	1.28E+02	30.70	8.16E+01	Pb-214 Eu-152
	9	338.33	1347 -	1360	1353.18	7.14E+01	26.73	8.91E+01	Ac-228
	10	351.90	1400 -	1414	1407.39	1.85E+02	35.32	1.01E+02	Pb-214 Bi-211
	11	510.74	2037 -	2052	2042.17	4.84E+01	23.79	7.11E+01	..... AnH-511
	12	583.05	2324 -	2340	2331.20	9.40E+01	27.07	6.60E+01	Tl-208
	13	609.30	2429 -	2444	2436.12	1.54E+02	29.07	4.42E+01	Bi-214
	14	661.69	2639 -	2653	2645.57	5.37E+01	21.88	5.66E+01	Cs-137
	15	911.06	3636 -	3652	3642.75	6.40E+01	20.26	3.21E+01	Ac-228
	16	969.36	3869 -	3883	3875.92	4.04E+01	16.62	2.53E+01	Ac-228
	17	1120.16	4473 -	4485	4479.21	2.92E+01	15.76	3.37E+01	Bi-214
	18	1238.36	4947 -	4958	4952.19	1.01E+01	12.65	3.18E+01	Bi-214
	19	1460.90	5832 -	5855	5842.94	5.71E+02	49.26	2.67E+01	K-40
	20	1764.64	7053 -	7066	7059.25	2.47E+01	10.79	4.56E+00	Bi-214

JPW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Analysis Report for 05-May-16-10002

L3-10220C-FRGS-013SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
K-40	1.00	1460.82	*	10.66	6.53E+00	8.00E-01	miss
Cs-137	1.00	661.66	*	85.10	4.51E-02	1.92E-02	miss
Tl-208	0.99	583.19	*	85.00	7.26E-02	2.27E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	2.32E-01	4.79E-02	miss
		300.09		3.30			
Pb212-XR	0.99	74.82	*	10.28	5.64E-01	2.04E-01	miss
		77.11	*	17.10	4.47E-01	1.38E-01	miss
		87.35	*	3.97	4.84E-01	4.11E-01	miss
		89.78		1.46			
Bi-214	0.99	609.32	*	45.49	2.29E-01	5.12E-02	miss
		768.36		4.89			
		806.18		1.26			
		934.06		3.11			
		1120.29	*	14.92	1.99E-01	1.09E-01	miss
		1155.21		1.63			
		1238.12	*	5.83	1.87E-01	2.36E-01	miss
		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	2.28E-01	1.01E-01	miss
		1847.43		2.03			
		2118.51		1.16			
Pb-214	1.00	241.99	*	7.25	2.97E-01	1.15E-01	miss
		295.22	*	18.42	2.85E-01	8.22E-02	miss
		351.93	*	35.60	2.40E-01	5.97E-02	miss
		785.96		1.06			
Ac-228	0.99	129.07		2.42			
		209.25	*	3.89	2.36E-01	2.04E-01	miss
		270.24		3.46			
		328.00		2.95			
		338.32	*	11.27	2.85E-01	1.16E-01	miss
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20	*	25.80	2.20E-01	7.22E-02	miss
		964.77		4.99			
		968.97	*	15.80	2.36E-01	9.95E-02	miss
		1588.20		3.22			
Ac228-XR	0.98	89.96		1.90			
		93.35	*	3.10	6.85E-01	5.80E-01	miss
Th-234	1.00	92.38		2.13			
		92.80	*	2.10	1.07E+00	8.87E-01	miss
		112.81		0.21			
U235-XR	0.98	89.96		3.47			
		93.35	*	5.60	3.79E-01	3.06E-01	miss
		105.60		1.32			

Analysis Report for 05-May-16-10002

L3-10220C-FRGS-013SS (DRIED)

* = Energy line found in the spectrum.
\- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	1.000	6.53E+00	8.00E-01	
	Cs-137	1.000	4.51E-02	1.92E-02	
X	Eu-155	0.998			
	Tl-208	0.999	7.26E-02	2.27E-02	
X	Bi-211	0.958			
	Pb-212	1.000	2.32E-01	4.79E-02	
	Pb212-XR	0.997	4.84E-01	1.10E-01	
	Bi-214	0.999	2.23E-01	4.15E-02	
	Pb-214	1.000	2.62E-01	4.45E-02	
X	Pb214-XR	0.997			
	Ac-228	0.998	2.37E-01	5.06E-02	
?	Ac228-XR	0.987	6.85E-01	5.80E-01	
?	Th-234	1.000	1.07E+00	8.87E-01	
?	U235-XR	0.989	3.79E-01	3.06E-01	

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

Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10002

L3-10220C-FRGS-013SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/5/2016 8:56:30AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
11	510.74	2.69034E-02	24.56		ANH-511

JDW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	6.53E+00	2.57E-01	2.57E-01	miss
+	Cr-51	320.08		9.91	4.09E-02	1.42E-01	1.42E-01	free
+	Mn-54	834.85		99.98	1.93E-03	1.88E-02	1.88E-02	miss
+	Co-58	810.76		99.45	-2.66E-03	1.18E-02	1.18E-02	miss
		1674.73		0.52	-3.33E-02		1.96E+00	miss
+	Co-60	1173.23		99.85	5.50E-04	1.06E-02	2.36E-02	miss
		1332.49		99.98	-6.18E-03		1.06E-02	miss
+	Nb-94	702.65		99.81	-6.63E-04	1.24E-02	1.24E-02	miss
		871.09		99.89	-1.00E-03		1.36E-02	miss
+	Ag-108m	79.13		6.60	2.40E-02	1.48E-02	3.68E-01	miss
		433.94		90.50	-7.04E-04		1.48E-02	miss
		614.28		89.80	7.30E-03		1.97E-02	miss
		722.94		90.80	1.71E-03		1.68E-02	miss
+	Sn-113	255.13		2.11	1.55E-01	1.79E-02	6.12E-01	free
		391.70		64.97	-3.05E-03		1.79E-02	free
+	Cs-134	475.36		1.48	-2.14E-01	1.25E-02	8.24E-01	miss
		563.25		8.34	1.37E-02		1.34E-01	miss
		569.33		15.37	1.95E-02		8.72E-02	miss

Analysis Report for 05-May-16-10002

L3-10220C-FRGS-013SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	604.72		97.62	-5.27E-03	1.25E-02	1.25E-02	miss
		795.86		85.46	0.00E+00		1.91E-02	miss
		801.95		8.69	3.51E-02		2.00E-01	miss
		1038.61		0.99	4.71E-01		1.91E+00	miss
		1167.97		1.79	6.30E-01		1.49E+00	miss
		1365.19		3.02	2.02E-02		4.14E-01	miss
+	Cs-137	661.66	*	85.10	4.51E-02	2.48E-02	2.48E-02	miss
+	Eu-152	121.78		28.67	2.34E-03	4.11E-02	4.31E-02	miss
		244.70		7.61	-2.25E-02		1.68E-01	miss
		295.94		0.45	8.86E+00		5.13E+00	miss
		344.28		26.60	-1.18E-02		4.11E-02	miss
		367.79		0.86	-4.49E-01		1.30E+00	miss
		411.12		2.24	-5.24E-02		6.69E-01	miss
		443.96		2.83	5.44E-02		4.42E-01	miss
		488.68		0.42	-4.10E-01		2.87E+00	miss
		563.99		0.49	3.79E-01		2.07E+00	miss
		586.26		0.46	-4.41E-01		3.05E+00	miss
		678.62		0.47	1.62E+00		3.46E+00	miss
		688.67		0.86	1.23E-01		1.77E+00	miss
		719.35		0.28	-5.54E-01		5.10E+00	miss
		778.90		12.96	-5.27E-02		1.03E-01	miss
		810.45		0.32	-2.43E-01		3.83E+00	miss
		867.37		4.26	2.01E-03		3.50E-01	miss
		919.33		0.43	-1.41E+00		3.13E+00	miss
		964.08		14.65	5.59E-02		1.60E-01	miss
		1085.87		10.24	-5.36E-03		1.96E-01	miss
		1089.74		1.73	-4.78E-01		8.14E-01	miss
		1112.07		13.69	3.40E-03		1.66E-01	miss
		1212.95		1.43	-1.24E-01		1.60E+00	miss
		1249.94		0.19	-8.25E-02		1.05E+01	miss
		1299.14		1.63	4.92E-02		1.30E+00	miss
		1408.01		21.07	6.26E-02		1.13E-01	miss
		1457.64		0.50	-5.22E+00		6.83E+00	miss
		1528.10		0.28	3.63E-01		4.82E+00	miss
+	Eu-154	123.07		40.40	-1.23E-02	2.90E-02	2.90E-02	miss
		247.93		6.89	3.69E-02		1.94E-01	miss
		591.76		4.95	8.13E-02		3.01E-01	miss
		692.42		1.78	2.31E-01		1.04E+00	miss
		723.30		20.06	-6.12E-03		7.38E-02	miss
		756.80		4.52	1.89E-02		3.37E-01	miss
		873.18		12.08	2.49E-02		1.24E-01	miss
		996.29		10.48	-2.53E-02		1.43E-01	miss
		1004.76		18.01	8.29E-03		9.54E-02	miss
		1274.43		34.80	1.78E-02		6.77E-02	miss
		1596.48		1.80	-2.73E-02		6.75E-01	miss
+	Eu-155	45.30		1.31	-3.62E-01	7.64E-02	3.32E+00	miss
		60.01		1.22	-5.35E-01		4.07E+00	miss
		86.55	*	30.70	6.26E-02		8.27E-02	miss
		105.31		21.10	3.03E-02		7.64E-02	miss
+	Tl-208	583.19	*	85.00	7.26E-02	2.61E-02	2.61E-02	miss
+	Bi-211	351.07	*	13.02	6.56E-01	1.41E-01	1.41E-01	miss

Analysis Report for 05-May-16-10002

L3-10220C-FRGS-013SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Pb-211	404.85		3.78	-4.66E-02	3.24E-01	3.24E-01	miss
		427.09		1.76	4.81E-01		8.48E-01	miss
		832.01		3.52	2.52E-01		5.44E-01	miss
+	Bi-212	39.86		1.06	-1.04E+00	3.22E-01	3.96E+00	miss
		727.33		6.67	1.56E-01		3.22E-01	miss
		785.37		1.10	1.08E+00		1.99E+00	miss
		1620.50		1.47	1.50E-01		9.67E-01	miss
+	Pb-212	115.18		0.60	-3.81E-01	3.50E-02	2.33E+00	miss
		238.63	*	43.60	2.32E-01		3.50E-02	miss
		300.09		3.30	2.82E-01		4.91E-01	miss
+	Pb212-XR	74.82	*	10.28	5.64E-01	1.96E-01	3.38E-01	miss
		77.11	*	17.10	4.47E-01		1.96E-01	miss
		87.35	*	3.97	4.84E-01		6.39E-01	miss
		89.78		1.46	7.28E-01		1.43E+00	miss
+	Bi-214	609.32	*	45.49	2.29E-01	4.11E-02	4.11E-02	miss
		768.36		4.89	8.07E-02		3.44E-01	miss
		806.18		1.26	-1.12E-01		1.22E+00	miss
		934.06		3.11	1.98E-01		6.19E-01	miss
		1120.29	*	14.92	1.99E-01		1.47E-01	miss
		1155.21		1.63	5.88E-01		1.56E+00	miss
		1238.12	*	5.83	1.87E-01		3.85E-01	miss
		1280.98		1.43	2.65E-01		1.35E+00	miss
		1377.67		3.99	2.93E-02		3.84E-01	miss
		1385.31		0.79	5.91E-01		1.78E+00	miss
		1401.52		1.33	-6.77E-02		1.25E+00	miss
		1407.99		2.39	5.51E-01		9.97E-01	miss
		1509.21		2.13	2.10E-01		8.28E-01	miss
		1661.27		1.05	3.28E-01		1.69E+00	miss
		1729.59		2.88	2.95E-01		7.25E-01	miss
		1764.49	*	15.30	2.28E-01		8.84E-02	miss
		1847.43		2.03	8.76E-01		1.40E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99	*	7.25	2.97E-01	5.14E-02	2.31E-01	miss
		295.22	*	18.42	2.85E-01		8.19E-02	miss
		351.93	*	35.60	2.40E-01		5.14E-02	miss
		785.96		1.06	8.73E-01		1.97E+00	miss
+	Pb214-XR	74.82	*	5.80	1.00E+00	3.46E-01	5.99E-01	miss
		77.11	*	9.70	7.88E-01		3.46E-01	miss
		87.35	*	2.24	8.58E-01		1.13E+00	miss
		89.78		0.82	1.30E+00		2.55E+00	miss
+	Ra-226	186.21		3.64	3.15E-01	4.03E-01	4.03E-01	miss
+	Ac-228	129.07		2.42	2.76E-01	7.97E-02	5.71E-01	miss
		209.25	*	3.89	2.36E-01		3.18E-01	miss
		270.24		3.46	4.49E-01		4.75E-01	miss
		328.00		2.95	3.32E-01		5.95E-01	miss
		338.32	*	11.27	2.85E-01		1.47E-01	miss
		409.46		1.92	2.68E-01		8.40E-01	miss
		463.00		4.40	1.20E-01		3.48E-01	miss
		794.95		4.25	1.05E-01		4.27E-01	miss
		911.20	*	25.80	2.20E-01		7.97E-02	miss
		964.77		4.99	1.09E-01		4.62E-01	miss

Analysis Report for 05-May-16-10002

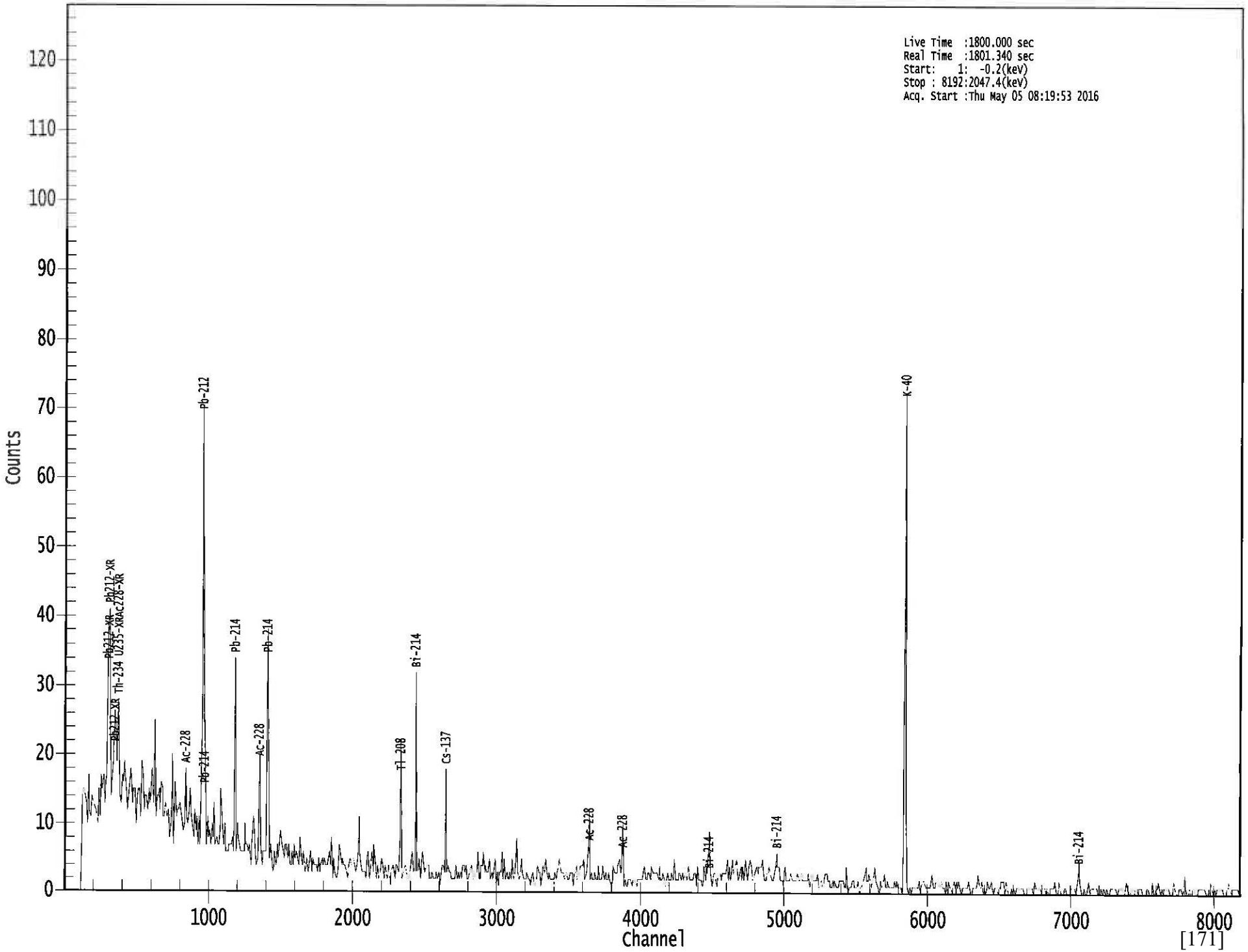
L3-10220C-FRGS-013SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	968.97	*	15.80	2.36E-01	7.97E-02	1.19E-01	miss
		1588.20		3.22	2.64E-01		7.04E-01	miss
+	Pa-231	27.36		10.30	0.00E+00	3.52E-02	3.52E-02	miss
		283.69		1.70	-2.89E-02		7.20E-01	miss
		300.07		2.47	3.77E-01		6.55E-01	miss
		302.65		2.20	-9.48E-02		5.88E-01	miss
		330.06		1.40	-1.65E-01		9.90E-01	miss
+	Th-234	92.38		2.13	1.18E+00	1.14E+00	1.14E+00	miss
		92.80	*	2.10	1.07E+00		1.34E+00	miss
		112.81		0.21	-2.36E+00		7.06E+00	miss
+	U-235	143.76		10.96	-3.63E-02	2.63E-02	1.03E-01	miss
		163.33		5.08	3.44E-02		2.53E-01	miss
		185.71		57.20	2.46E-02		2.63E-02	miss
		202.11		1.08	-2.41E-01		1.03E+00	miss
		205.31		5.01	6.83E-03		2.15E-01	miss
+	Am-241	59.54		35.90	-2.90E-03	1.48E-01	1.48E-01	miss

+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000014847.CNF



Apex-Gamma

Analysis Report for 05-May-16-10003
L3-10220C-FRGS-014SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-May-16-10003
Sample Description	: L3-10220C-FRGS-014SS (DRIED)
Sample Type	: 1L 130G Soil Sample
Unit	:
Sample Point	:
Sample Size	: 1.828E+03 grams
Facility	: Default
Sample Taken On	: 5/3/2016 8:16:00AM
Acquisition Started	: 5/5/2016 8:20:06AM
Procedure	: 130G 1L Sand Sample
Operator	: JWelch
Detector Name	: P40818B
Geometry	: 130G Sand
Live Time	: 1800.0 seconds
Real Time	: 1803.0 seconds
Dead Time	: 0.17 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 1/5/2015
Efficiency Calibration Description	:
Sample Number	: 14848

5-5-16 5/5/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 5/5/2016 8:57:32AM

Peak Analysis From Channel	: 120
Peak Analysis To Channel	: 8192
Tentative NID Library	: C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance	: 1.000FWHM

5-5-16

DATA VALIDATED 6/2/16

Analysis Report for 05-May-16-10003

L3-10220C-FRGS-014SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	0.99	806.18		1.26			
		934.06		3.11			
		1120.29	*	14.92	1.94E-01	1.06E-01	miss
		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	1.75E-01	8.77E-02	miss
		1847.43		2.03			
		2118.51		1.16			
Pb-214	1.00	241.99		7.25			
		295.22	*	18.42	2.57E-01	9.25E-02	miss
		351.93	*	35.60	2.68E-01	6.37E-02	miss
		785.96		1.06			
Pb214-XR	1.00	74.82	*	5.80	5.16E-01	6.61E-01	miss
		77.11		9.70			
		87.35		2.24			
		89.78		0.82			
Ac-228	0.99	129.07		2.42			
		209.25		3.89			
		270.24		3.46			
		328.00		2.95			
		338.32	*	11.27	2.88E-01	1.15E-01	miss
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20	*	25.80	2.88E-01	8.12E-02	miss
		964.77		4.99			
		968.97	*	15.80	1.98E-01	1.16E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

Analysis Report for 05-May-16-10003

L3-10220C-FRGS-014SS (DRIED)

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.996	5.47E+00	6.92E-01	
	Cs-137	1.000	1.90E-02 < MDA	1.37E-02	
	Tl-208	1.000	7.39E-02	2.19E-02	JPW 5-6-16
X	Bi-211	0.957			
	Pb-212	1.000	2.18E-01	5.40E-02	
?	Pb212-XR	1.000	2.91E-01	3.72E-01	
	Bi-214	0.999	2.00E-01	3.96E-02	
	Pb-214	1.000	2.64E-01	5.25E-02	
?	Pb214-XR	1.000	5.16E-01	6.61E-01	
	Ac-228	0.998	2.66E-01	5.76E-02	

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

Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10003

L3-10220C-FRGS-014SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/5/2016 8:57:32AM
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 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.47E+00	1.61E-01	1.61E-01	miss
+	Cr-51	320.08		9.91	1.74E-02	1.48E-01	1.48E-01	free
+	Mn-54	834.85		99.98	4.71E-03	2.03E-02	2.03E-02	miss
+	Co-58	810.76		99.45	-8.07E-03	1.31E-02	1.31E-02	miss
		1674.73		0.52	5.60E-01		3.16E+00	miss
+	Co-60	1173.23		99.85	3.37E-03	1.78E-02	2.14E-02	miss
		1332.49		99.98	3.53E-03		1.78E-02	miss
+	Nb-94	702.65		99.81	4.59E-03	1.54E-02	1.77E-02	miss
		871.09		99.89	1.04E-03		1.54E-02	miss
+	Ag-108m	79.13		6.60	1.74E-02	1.62E-02	5.86E-01	miss
		433.94		90.50	2.22E-03		1.62E-02	miss
		614.28		89.80	1.10E-02		2.04E-02	miss
		722.94		90.80	-5.05E-03		1.71E-02	miss
+	Sn-113	255.13		2.11	2.57E-01	1.68E-02	7.57E-01	free
		391.70		64.97	-1.17E-02		1.68E-02	free
+	Cs-134	475.36		1.48	1.11E-01	1.80E-02	9.90E-01	miss
		563.25		8.34	6.00E-02		2.17E-01	miss
		569.33		15.37	2.38E-02		1.11E-01	miss
		604.72		97.62	6.41E-03		1.80E-02	miss

Analysis Report for 05-May-16-10003

L3-10220C-FRGS-014SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	-7.78E-04	1.80E-02	2.20E-02	miss
		801.95		8.69	-1.02E-02		1.97E-01	miss
		1038.61		0.99	-3.06E-01		1.82E+00	miss
		1167.97		1.79	-3.05E-01		1.08E+00	miss
		1365.19		3.02	2.59E-02		6.33E-01	miss
+	Cs-137	661.66	*	85.10	1.90E-02	2.03E-02	2.03E-02	miss
+	Eu-152	121.78		28.67	1.87E-02	4.69E-02	5.67E-02	miss
		244.70		7.61	-4.52E-03		2.06E-01	miss
		295.94		0.45	6.43E+00		5.10E+00	miss
		344.28		26.60	-2.82E-02		4.69E-02	miss
		367.79		0.86	-1.97E-01		1.49E+00	miss
		411.12		2.24	-4.91E-02		6.21E-01	miss
		443.96		2.83	-2.24E-01		4.15E-01	miss
		488.68		0.42	-2.02E+00		2.99E+00	miss
		563.99		0.49	3.38E+00		3.89E+00	miss
		586.26		0.46	-5.28E-01		3.32E+00	miss
		678.62		0.47	2.53E-02		2.96E+00	miss
		688.67		0.86	8.58E-02		1.89E+00	miss
		719.35		0.28	-8.26E-01		6.00E+00	miss
		778.90		12.96	3.54E-02		1.33E-01	miss
		810.45		0.32	-8.55E-01		4.73E+00	miss
		867.37		4.26	3.46E-02		4.11E-01	miss
		919.33		0.43	2.12E+00		4.13E+00	miss
		964.08		14.65	2.11E-02		1.55E-01	miss
		1085.87		10.24	4.47E-02		1.93E-01	miss
		1089.74		1.73	-1.17E-01		9.91E-01	miss
		1112.07		13.69	1.54E-02		1.42E-01	miss
		1212.95		1.43	2.12E-02		1.66E+00	miss
		1249.94		0.19	-2.50E+00		1.07E+01	miss
		1299.14		1.63	2.19E-01		1.41E+00	miss
		1408.01		21.07	5.65E-02		1.15E-01	miss
		1457.64		0.50	-2.77E+00		7.32E+00	miss
		1528.10		0.28	-3.16E-01		4.76E+00	miss
+	Eu-154	123.07		40.40	7.64E-03	3.93E-02	3.93E-02	miss
		247.93		6.89	-2.74E-02		2.18E-01	miss
		591.76		4.95	-4.84E-03		2.96E-01	miss
		692.42		1.78	5.45E-01		1.14E+00	miss
		723.30		20.06	-2.88E-02		7.73E-02	miss
		756.80		4.52	1.62E-01		4.43E-01	miss
		873.18		12.08	-4.09E-02		1.05E-01	miss
		996.29		10.48	1.03E-03		1.54E-01	miss
		1004.76		18.01	-1.21E-03		9.03E-02	miss
		1274.43		34.80	-2.46E-02		5.46E-02	miss
		1596.48		1.80	-1.44E-01		7.73E-01	miss
+	Eu-155	45.30		1.31	4.75E+00	9.96E-02	1.07E+01	miss
		60.01		1.22	-1.40E+00		1.08E+01	miss
		86.55		30.70	-1.66E-02		1.07E-01	miss
		105.31		21.10	6.61E-03		9.96E-02	miss
+	Tl-208	583.19	*	85.00	7.39E-02	2.38E-02	2.38E-02	miss
+	Bi-211	351.07	*	13.02	7.33E-01	1.40E-01	1.40E-01	miss
+	Pb-211	404.85		3.78	1.27E-01	4.28E-01	4.28E-01	miss

Analysis Report for 05-May-16-10003

L3-10220C-FRGS-014SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	2.80E-01	4.28E-01	9.31E-01	miss
		832.01		3.52	4.57E-02		4.97E-01	miss
+	Bi-212	39.86		1.06	-7.95E+00	2.53E-01	9.89E+00	miss
		727.33		6.67	2.19E-02		2.53E-01	miss
		785.37		1.10	1.21E-01		1.69E+00	miss
		1620.50		1.47	5.70E-01		1.33E+00	miss
+	Pb-212	115.18		0.60	8.56E-01	5.32E-02	3.19E+00	miss
		238.63	*	43.60	2.18E-01		5.32E-02	miss
		300.09		3.30	3.79E-01		5.09E-01	miss
+	Pb212-XR	74.82	*	10.28	2.91E-01	3.43E-01	6.04E-01	miss
		77.11		17.10	4.02E-01		3.43E-01	miss
		87.35		3.97	5.93E-01		8.53E-01	miss
		89.78		1.46	4.63E-01		1.86E+00	miss
+	Bi-214	609.32	*	45.49	2.09E-01	4.21E-02	4.21E-02	miss
		768.36		4.89	-5.62E-02		3.74E-01	miss
		806.18		1.26	-2.03E-01		1.36E+00	miss
		934.06		3.11	-4.77E-02		5.57E-01	miss
		1120.29	*	14.92	1.94E-01		1.42E-01	miss
		1155.21		1.63	2.74E-01		1.44E+00	miss
		1238.12		5.83	2.08E-01		4.93E-01	miss
		1280.98		1.43	3.03E-01		1.53E+00	miss
		1377.67		3.99	2.33E-01		5.81E-01	miss
		1385.31		0.79	1.21E+00		2.75E+00	miss
		1401.52		1.33	-1.13E-01		1.39E+00	miss
		1407.99		2.39	4.97E-01		1.01E+00	miss
		1509.21		2.13	4.37E-01		1.01E+00	miss
		1661.27		1.05	1.06E-02		1.37E+00	miss
		1729.59		2.88	4.76E-01		8.30E-01	miss
		1764.49	*	15.30	1.75E-01		7.95E-02	miss
		1847.43		2.03	7.96E-02		9.98E-01	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	2.09E-01	5.12E-02	2.71E-01	miss
		295.22	*	18.42	2.57E-01		1.18E-01	miss
		351.93	*	35.60	2.68E-01		5.12E-02	miss
		785.96		1.06	1.82E-01		1.71E+00	miss
+	Pb214-XR	74.82	*	5.80	5.16E-01	6.04E-01	1.07E+00	miss
		77.11		9.70	7.09E-01		6.04E-01	miss
		87.35		2.24	1.05E+00		1.51E+00	miss
		89.78		0.82	8.24E-01		3.32E+00	miss
+	Ra-226	186.21		3.64	5.23E-01	5.02E-01	5.02E-01	miss
+	Ac-228	129.07		2.42	1.41E-01	8.40E-02	7.40E-01	miss
		209.25		3.89	2.17E-01		4.08E-01	miss
		270.24		3.46	1.64E-01		5.16E-01	miss
		328.00		2.95	4.95E-01		6.15E-01	miss
		338.32	*	11.27	2.88E-01		1.43E-01	miss
		409.46		1.92	7.36E-02		7.33E-01	miss
		463.00		4.40	2.74E-01		4.34E-01	miss
		794.95		4.25	2.28E-01		5.12E-01	miss
		911.20	*	25.80	2.88E-01		8.40E-02	miss
		964.77		4.99	1.39E-01		4.64E-01	miss
		968.97	*	15.80	1.98E-01		1.68E-01	miss

Analysis Report for 05-May-16-10003

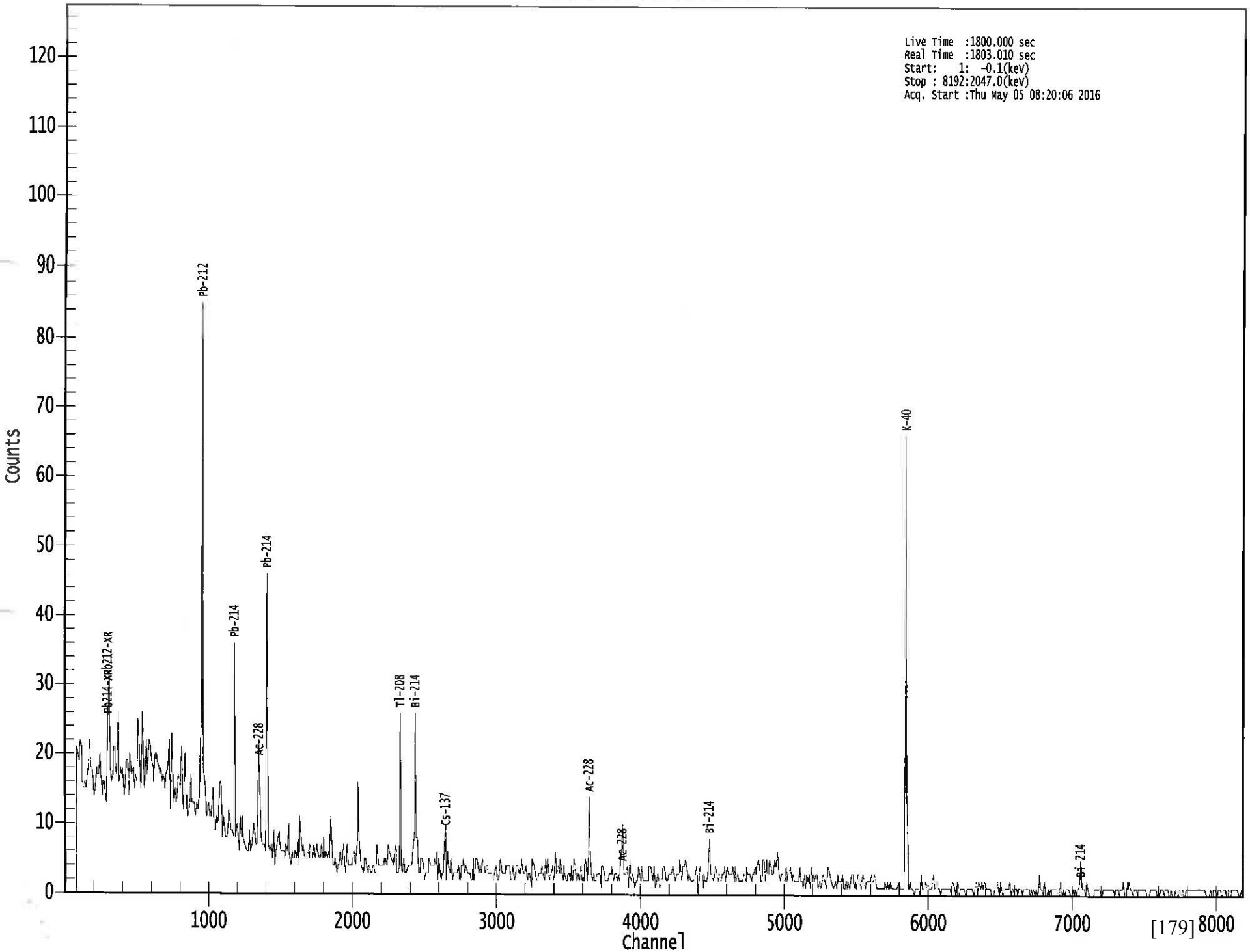
L3-10220C-FRGS-014SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20	3.22	2.50E-01	8.40E-02	6.33E-01	miss
+	Pa-231	27.36	10.30	2.59E-03	5.31E-01	1.21E+00	miss
		283.69	1.70	-9.04E-02		8.99E-01	miss
		300.07	2.47	5.06E-01		6.80E-01	miss
		302.65	2.20	-4.76E-01		5.31E-01	miss
		330.06	1.40	-7.38E-01		9.81E-01	miss
+	Th-234	92.38	2.13	9.33E-01	1.47E+00	1.47E+00	miss
		92.80	2.10	1.08E+00		1.48E+00	miss
		112.81	0.21	5.56E+00		1.03E+01	miss
+	U-235	143.76	10.96	5.69E-02	3.19E-02	1.49E-01	miss
		163.33	5.08	3.32E-02		2.86E-01	miss
		185.71	57.20	2.65E-02		3.19E-02	miss
		202.11	1.08	-7.44E-02		1.28E+00	miss
		205.31	5.01	1.59E-01		2.85E-01	miss
+	Am-241	59.54	35.90	1.55E-01	3.88E-01	3.88E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000014848.CNF



Apex-Gamma

Analysis Report for 02-Jun-16-10007
L3-10220C-FJGS-015SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	02-Jun-16-10007
Sample Description	L3-10220C-FJGS-015SS (DRIED)
Sample Type	Off Site Sample
Unit	
Sample Point	
Sample Size	1.151E+03 grams
Facility	Default
Sample Taken On	5/23/2016 4:10:00PM
Acquisition Started	6/2/2016 12:47:11PM
Procedure	130G 1L Soil Sample
Operator	JWelch
Detector Name	P11314X2
Geometry	130G Soil
Live Time	600.0 seconds
Real Time	600.5 seconds
Dead Time	0.08 %
Peak Locate Threshold	2.80
Peak Locate Range (in channels)	120 - 8192
Peak Area Range (in channels)	120 - 8192
Identification Energy Tolerance	1.000FWHM
Energy Calibration Used Done On	1/27/2016
Efficiency Calibration Used Done On	6/28/2012
Efficiency Calibration Description	
Sample Number	15055

6/6/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 12:57:17PM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED 6/6/16

Analysis Report for 02-Jun-16-10007

L3-10220C-FJGS-015SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	76.84	305 -	314	308.57	3.96E+01	22.80	6.68E+01	Pb214-XR
								Pb212-XR
2	238.57	948 -	961	954.58	4.68E+01	25.63	8.23E+01	Pb-212
3	338.36	1348 -	1359	1353.30	1.70E+01	14.29	2.80E+01	Ac-228
4	352.00	1400 -	1412	1407.78	4.78E+01	17.74	2.64E+01	Pb-214
								Bi-211
5	582.90	2326 -	2335	2330.61	2.31E+01	12.16	1.39E+01	Tl-208
6	609.32	2429 -	2441	2436.20	3.91E+01	13.88	7.83E+00	Bi-214
7	661.55	2639 -	2652	2645.02	5.26E+01	16.70	1.48E+01	Cs-137
8	911.39	3640 -	3650	3644.08	1.63E+01	9.70	7.33E+00	Ac-228
9	1460.70	5833 -	5851	5842.12	1.14E+02	22.22	3.03E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	5.47E+00	1.17E+00	miss
Cs-137	0.99	661.66	*	85.10	1.85E-01	6.28E-02	miss
Tl-208	0.99	583.19	*	85.00	7.44E-02	4.02E-02	miss
Bi-211	0.94	351.07	*	13.02	7.06E-01	2.86E-01	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	1.59E-01	9.09E-02	miss
		300.09		3.30			
Pb212-XR	0.99	74.82		10.28			
		77.11	*	17.10	6.24E-01	3.81E-01	miss
		87.35		3.97			
		89.78		1.46			
Bi-214	1.00	609.32	*	45.49	2.43E-01	9.11E-02	miss
		768.36		4.89			
		806.18		1.26			
		934.06		3.11			
		1120.29		14.92			
		1155.21		1.63			

Analysis Report for 02-Jun-16-10007

L3-10220C-FJGS-015SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	1.00	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	2.58E-01	1.04E-01	miss
		785.96		1.06			
Pb214-XR	0.99	74.82		5.80			
		77.11	*	9.70	1.10E+00	6.80E-01	miss
		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	2.83E-01	2.42E-01	miss
		409.46		1.92			
		463.00		4.40			
		794.95		4.25			
		911.20	*	25.80	2.35E-01	1.41E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

Analysis Report for 02-Jun-16-10007

L3-10220C-FJGS-015SS (DRIED)

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	5.47E+00	1.17E+00	
	Cs-137	0.999	1.85E-01	6.28E-02	
	Tl-208	0.995	7.44E-02	4.02E-02	
?	Bi-211	0.948	7.06E-01	2.86E-01	
	Pb-212	1.000	1.59E-01	9.09E-02	
?	Pb212-XR	0.998	6.24E-01	3.81E-01	
	Bi-214	1.000	2.43E-01	9.11E-02	
?	Pb-214	1.000	2.58E-01	1.04E-01	
?	Pb214-XR	0.998	1.10E+00	6.80E-01	
	Ac-228	0.999	2.47E-01	1.22E-01	

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

Errors quoted at 2.000sigma

Analysis Report for 02-Jun-16-10007

L3-10220C-FJGS-015SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 12:57:17PM
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 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.47E+00	6.15E-01	6.15E-01	miss
+	Cr-51	320.08		9.91	9.90E-02	4.06E-01	4.06E-01	free
+	Mn-54	834.85		99.98	2.78E-03	3.85E-02	3.85E-02	miss
+	Co-58	810.76		99.45	0.00E+00	1.03E-02	1.03E-02	miss
		1674.73		0.52	0.00E+00		3.27E+00	miss
+	Co-60	1173.23		99.85	1.78E-02	1.30E-02	6.62E-02	miss
		1332.49		99.98	0.00E+00		1.30E-02	miss
+	Nb-94	702.65		99.81	1.41E-02	2.65E-02	5.20E-02	miss
		871.09		99.89	-7.80E-03		2.65E-02	miss
+	Ag-108m	79.13		6.60	2.32E-01	2.94E-02	9.94E-01	miss
		433.94		90.50	1.18E-03		3.23E-02	miss
		614.28		89.80	-6.33E-03		2.94E-02	miss
		722.94		90.80	4.08E-03		3.76E-02	miss
+	Sn-113	255.13		2.11	-3.27E-01	4.79E-02	1.24E+00	free
		391.70		64.97	-6.79E-03		4.79E-02	free
+	Cs-134	475.36		1.48	-1.77E+00	3.49E-02	1.95E+00	miss
		563.25		8.34	-2.16E-01		3.89E-01	miss
		569.33		15.37	9.99E-02		3.08E-01	miss
		604.72		97.62	2.33E-03		3.49E-02	miss

Analysis Report for 02-Jun-16-10007

L3-10220C-FJGS-015SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	9.33E-03	3.49E-02	5.64E-02	miss
		801.95		8.69	-9.55E-02		3.67E-01	miss
		1038.61		0.99	-1.03E+00		3.04E+00	miss
		1167.97		1.79	-6.69E-01		1.82E+00	miss
		1365.19		3.02	2.14E-01		2.13E+00	miss
+	Cs-137	661.66	*	85.10	1.85E-01	5.74E-02	5.74E-02	miss
+	Eu-152	121.78		28.67	3.19E-02	1.01E-01	1.03E-01	miss
		244.70		7.61	-1.43E-02		3.15E-01	miss
		295.94		0.45	5.18E+00		9.94E+00	miss
		344.28		26.60	-2.62E-03		1.01E-01	miss
		367.79		0.86	-2.15E-01		3.25E+00	miss
		411.12		2.24	2.59E-01		1.45E+00	miss
		443.96		2.83	-1.18E-01		8.64E-01	miss
		488.68		0.42	1.85E+00		8.68E+00	miss
		563.99		0.49	-1.24E+00		7.71E+00	miss
		586.26		0.46	-3.48E+00		7.20E+00	miss
		678.62		0.47	-4.30E-01		6.95E+00	miss
		688.67		0.86	-1.19E+00		4.30E+00	miss
		719.35		0.28	1.77E+00		1.22E+01	miss
		778.90		12.96	2.04E-02		3.10E-01	miss
		810.45		0.32	2.14E+00		9.93E+00	miss
		867.37		4.26	-1.26E-01		7.83E-01	miss
		919.33		0.43	1.89E+00		1.05E+01	miss
		964.08		14.65	1.41E-01		4.40E-01	miss
		1085.87		10.24	1.55E-01		5.35E-01	miss
		1089.74		1.73	5.19E-01		2.91E+00	miss
		1112.07		13.69	8.86E-03		3.72E-01	miss
		1212.95		1.43	-5.40E-01		2.92E+00	miss
		1249.94		0.19	-1.62E+00		2.61E+01	miss
		1299.14		1.63	0.00E+00		7.83E-01	miss
		1408.01		21.07	-5.74E-02		1.74E-01	miss
		1457.64		0.50	-1.15E+01		1.61E+01	miss
		1528.10		0.28	0.00E+00		5.09E+00	miss
+	Eu-154	123.07		40.40	-1.68E-02	7.12E-02	7.12E-02	miss
		247.93		6.89	1.32E-01		4.17E-01	miss
		591.76		4.95	4.11E-02		6.04E-01	miss
		692.42		1.78	-5.94E-01		1.61E+00	miss
		723.30		20.06	1.76E-02		1.71E-01	miss
		756.80		4.52	-2.12E-01		8.72E-01	miss
		873.18		12.08	2.99E-02		3.22E-01	miss
		996.29		10.48	-4.40E-02		2.78E-01	miss
		1004.76		18.01	4.78E-02		2.65E-01	miss
		1274.43		34.80	1.43E-02		1.24E-01	miss
		1596.48		1.80	6.50E-01		3.29E+00	miss
+	Eu-155	45.30		1.31	-8.74E-01	1.51E-01	7.40E+00	miss
		60.01		1.22	6.76E+00		1.23E+01	miss
		86.55		30.70	2.90E-02		1.75E-01	miss
		105.31		21.10	-6.47E-03		1.51E-01	miss
+	Tl-208	583.19	*	85.00	7.44E-02	4.83E-02	4.83E-02	miss
+	Bi-211	351.07	*	13.02	7.06E-01	3.10E-01	3.10E-01	miss
+	Pb-211	404.85		3.78	1.03E-01	8.93E-01	8.93E-01	miss

Analysis Report for 02-Jun-16-10007

L3-10220C-FJGS-015SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	1.84E-01	8.93E-01	1.77E+00	miss
		832.01		3.52	5.78E-02		1.19E+00	miss
+	Bi-212	39.86		1.06	2.96E+00	5.74E-01	1.08E+01	miss
		727.33		6.67	4.78E-02		5.74E-01	miss
		785.37		1.10	-4.06E-01		2.83E+00	miss
		1620.50		1.47	0.00E+00		1.02E+00	miss
+	Pb-212	115.18		0.60	1.69E+00	1.30E-01	5.62E+00	miss
		238.63	*	43.60	1.59E-01		1.30E-01	miss
		300.09		3.30	-1.83E-01		9.12E-01	miss
+	Pb212-XR	74.82		10.28	7.15E-01	5.35E-01	9.28E-01	miss
		77.11	*	17.10	6.24E-01		5.35E-01	miss
		87.35		3.97	1.13E-01		1.27E+00	miss
		89.78		1.46	5.22E-01		3.15E+00	miss
+	Bi-214	609.32	*	45.49	2.43E-01	7.84E-02	7.84E-02	miss
		768.36		4.89	2.25E-02		8.11E-01	miss
		806.18		1.26	2.93E-01		3.24E+00	miss
		934.06		3.11	4.31E-01		1.93E+00	miss
		1120.29		14.92	6.81E-02		4.97E-01	miss
		1155.21		1.63	-6.84E-01		2.86E+00	miss
		1238.12		5.83	2.88E-01		1.17E+00	miss
		1280.98		1.43	1.30E+00		3.89E+00	miss
		1377.67		3.99	3.86E-01		1.61E+00	miss
		1385.31		0.79	1.15E+00		5.76E+00	miss
		1401.52		1.33	-2.13E-01		3.46E+00	miss
		1407.99		2.39	-5.05E-01		1.53E+00	miss
		1509.21		2.13	1.06E-01		1.81E+00	miss
		1661.27		1.05	0.00E+00		1.46E+00	miss
		1729.59		2.88	0.00E+00		5.48E-01	miss
		1764.49		15.30	2.71E-01		5.81E-01	miss
		1847.43		2.03	0.00E+00		8.14E-01	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	3.23E-01	1.13E-01	5.46E-01	miss
		295.22		18.42	2.79E-01		2.84E-01	miss
		351.93	*	35.60	2.58E-01		1.13E-01	miss
		785.96		1.06	8.18E-01		3.80E+00	miss
+	Pb214-XR	74.82		5.80	1.27E+00	9.44E-01	1.65E+00	miss
		77.11	*	9.70	1.10E+00		9.44E-01	miss
		87.35		2.24	2.01E-01		2.26E+00	miss
		89.78		0.82	9.29E-01		5.61E+00	miss
+	Ra-226	186.21		3.64	1.88E-01	9.43E-01	9.43E-01	miss
+	Ac-228	129.07		2.42	3.42E-01	1.66E-01	1.26E+00	miss
		209.25		3.89	1.06E-01		7.78E-01	miss
		270.24		3.46	2.51E-01		1.10E+00	miss
		328.00		2.95	1.24E-01		1.13E+00	miss
		338.32	*	11.27	2.83E-01		3.64E-01	miss
		409.46		1.92	-2.14E-01		1.68E+00	miss
		463.00		4.40	6.16E-01		1.07E+00	miss
		794.95		4.25	2.52E-01		1.12E+00	miss
		911.20	*	25.80	2.35E-01		1.66E-01	miss
		964.77		4.99	5.44E-01		1.35E+00	miss
		968.97		15.80	3.28E-01		5.22E-01	miss

Analysis Report for 02-Jun-16-10007

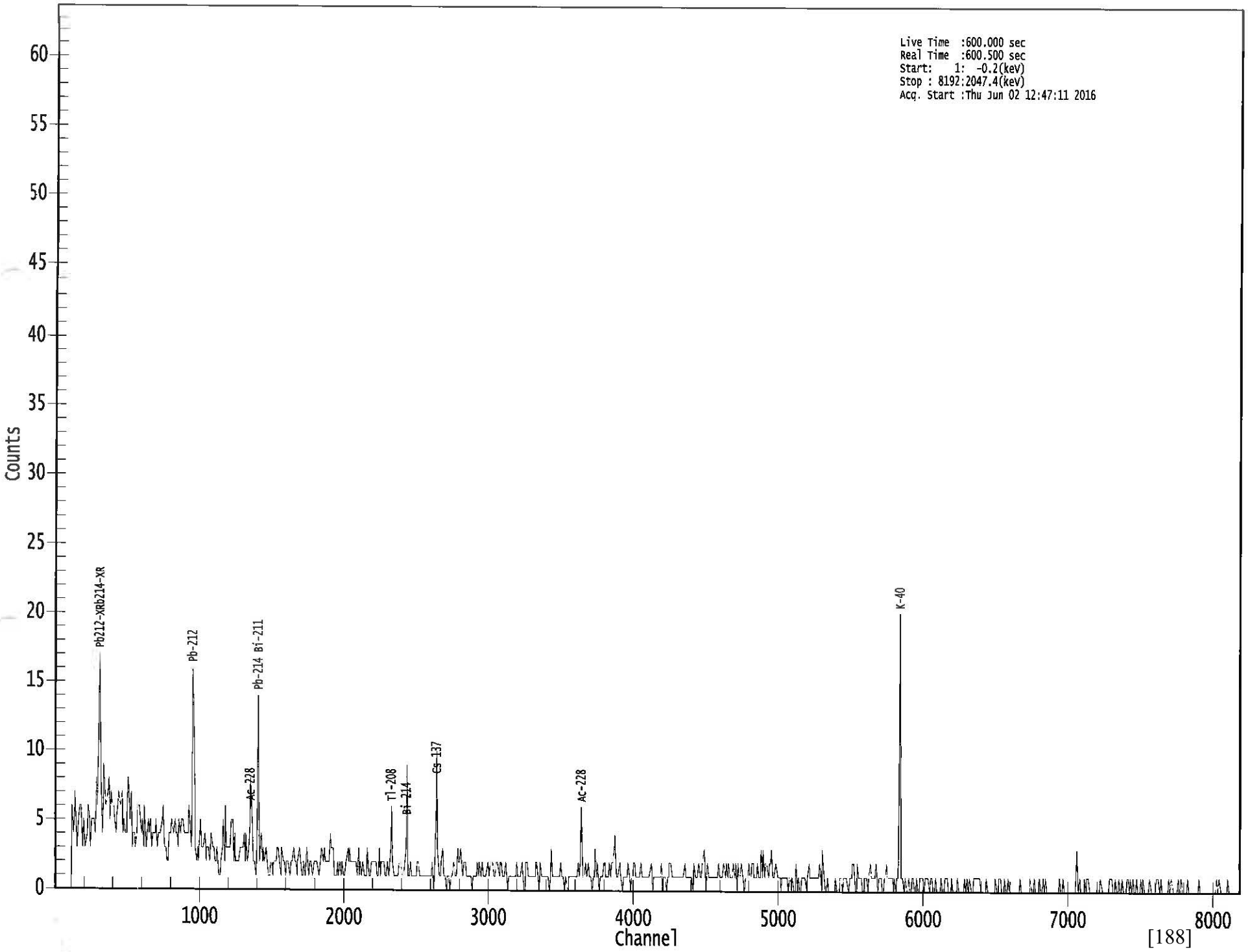
L3-10220C-FJGS-015SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20	3.22	-7.27E-02	1.66E-01	1.57E+00	miss
+	Pa-231	27.36	10.30	0.00E+00	1.60E-01	1.60E-01	miss
		283.69	1.70	4.90E-02		1.38E+00	miss
		300.07	2.47	-2.45E-01		1.22E+00	miss
		302.65	2.20	-1.19E-01		1.49E+00	miss
		330.06	1.40	3.18E-01		2.48E+00	miss
+	Th-234	92.38	2.13	5.65E-01	3.17E+00	3.17E+00	miss
		92.80	2.10	7.92E-01		3.25E+00	miss
		112.81	0.21	-2.20E-01		1.87E+01	miss
+	U-235	143.76	10.96	-2.67E-02	6.39E-02	2.72E-01	miss
		163.33	5.08	-2.02E-01		5.04E-01	miss
		185.71	57.20	3.90E-02		6.39E-02	miss
		202.11	1.08	6.74E-01		2.96E+00	miss
		205.31	5.01	1.10E-01		5.50E-01	miss
+	Am-241	59.54	35.90	5.63E-03	3.88E-01	3.88E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000015055.CNF



Apex-Gamma

Analysis Report for 02-Jun-16-10008

L3-10220C-FJGS-016SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 02-Jun-16-10008
Sample Description	: L3-10220C-FJGS-016SS (DRIED)
Sample Type	: Off Site Sample
Unit	:
Sample Point	:
Sample Size	: 1.362E+03 grams
Facility	: Default
Sample Taken On	: 5/23/2016 4:15:00PM
Acquisition Started	: 6/2/2016 12:47:18PM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P40818B
Geometry	: 130G Soil
Live Time	: 600.0 seconds
Real Time	: 601.0 seconds
Dead Time	: 0.17 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 1/5/2015
Efficiency Calibration Description	:
Sample Number	: 15056

6/6/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 12:57:56PM

Peak Analysis From Channel : 120

Peak Analysis To Channel : 8192

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB

Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED 10/6/16

Analysis Report for 02-Jun-16-10008

L3-10220C-FJGS-016SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	238.70	947 -	960	955.28	9.47E+01	30.53	1.01E+02	Pb-212
2	295.06	1175 -	1188	1180.57	4.25E+01	21.09	4.90E+01	Pb-214
								Eu-152
3	351.92	1403 -	1416	1407.88	6.67E+01	20.98	3.47E+01	Pb-214
								Bi-211
4	511.07	2039 -	2049	2044.15	2.27E+01	12.76	1.67E+01	.....
5	583.09	2325 -	2339	2332.12	4.15E+01	15.53	1.50E+01	Tl-208
6	608.90	2430 -	2444	2435.37	5.78E+01	18.72	2.24E+01	Bi-214
7	910.92	3638 -	3649	3643.37	3.33E+01	12.47	5.50E+00	Ac-228
8	1460.81	5834 -	5854	5844.20	1.36E+02	23.93	5.75E+00	K-40
9	1764.04	7052 -	7065	7058.57	1.80E+01	8.94	1.91E+00	Bi-214

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	1.00	1460.82	*	10.66	6.13E+00	1.20E+00	miss
Tl-208	0.99	583.19	*	85.00	1.25E-01	4.93E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	3.07E-01	1.11E-01	miss
		300.09		3.30			
Bi-214	0.99	609.32	*	45.49	3.36E-01	1.16E-01	miss
		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			

Analysis Report for 02-Jun-16-10008

L3-10220C-FJGS-016SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	0.99	1509.21		2.13			
		1661.27		1.05			
		1729.59		2.88			
		1764.49	*	15.30	6.56E-01	3.29E-01	miss
		1847.43		2.03			
		2118.51		1.16			
Pb-214	1.00	241.99		7.25			
		295.22	*	18.42	3.73E-01	1.94E-01	miss
		351.93	*	35.60	3.38E-01	1.19E-01	miss
		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	4.48E-01	1.73E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	1.000	6.13E+00	1.20E+00	
Tl-208	0.999	1.25E-01	4.93E-02	

Analysis Report for 02-Jun-16-10008

L3-10220C-FJGS-016SS (DRIED)

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
X	Bi-211	0.956			
	Pb-212	1.000	3.07E-01	1.11E-01	
	Bi-214	0.994	3.72E-01	1.10E-01	
	Pb-214	1.000	3.48E-01	1.02E-01	
	Ac-228	0.998	4.48E-01	1.73E-01	

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

Errors quoted at 2.000sigma

Analysis Report for 02-Jun-16-10008

L3-10220C-FJGS-016SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 12:57:56PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
4	511.07	3.77527E-02	28.15		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	6.13E+00	5.17E-01	5.17E-01	miss
+	Cr-51	320.08		9.91	0.00E+00	4.81E-01	4.81E-01	free
+	Mn-54	834.85		99.98	2.07E-02	5.58E-02	5.58E-02	miss
+	Co-58	810.76		99.45	-1.48E-02	3.83E-02	3.83E-02	miss
		1674.73		0.52	1.84E+00		1.22E+01	miss
+	Co-60	1173.23		99.85	2.13E-02	5.40E-02	6.56E-02	miss
		1332.49		99.98	9.63E-03		5.40E-02	miss
+	Nb-94	702.65		99.81	-1.78E-02	4.12E-02	4.12E-02	miss
		871.09		99.89	1.35E-03		4.42E-02	miss
+	Ag-108m	79.13		6.60	-8.29E-01	3.89E-02	1.31E+00	miss
		433.94		90.50	-2.22E-03		4.03E-02	miss
		614.28		89.80	-7.36E-03		3.89E-02	miss
		722.94		90.80	1.60E-02		5.46E-02	miss
+	Sn-113	255.13		2.11	-1.30E-01	5.78E-02	1.62E+00	free
		391.70		64.97	3.01E-03		5.78E-02	free
+	Cs-134	475.36		1.48	7.17E-01	3.27E-02	2.87E+00	miss
		563.25		8.34	-7.18E-03		5.51E-01	miss
		569.33		15.37	2.37E-02		2.49E-01	miss

Analysis Report for 02-Jun-16-10008

L3-10220C-FJGS-016SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	604.72		97.62	-2.59E-03	3.27E-02	3.27E-02	miss
		795.86		85.46	5.20E-04		5.28E-02	miss
		801.95		8.69	-2.47E-02		3.99E-01	miss
		1038.61		0.99	3.16E+00		6.75E+00	miss
		1167.97		1.79	1.10E-01		2.49E+00	miss
		1365.19		3.02	0.00E+00		4.13E-01	miss
+	Cs-137	661.66		85.10	2.48E-02	6.20E-02	6.20E-02	miss
+	Eu-152	121.78		28.67	-6.78E-02	1.15E-01	1.15E-01	miss
		244.70		7.61	5.86E-02		4.53E-01	miss
		295.94		0.45	9.05E+00		1.25E+01	miss
		344.28		26.60	1.16E-02		1.39E-01	miss
		367.79		0.86	7.24E-01		4.36E+00	miss
		411.12		2.24	3.48E-01		1.64E+00	miss
		443.96		2.83	-8.37E-03		1.25E+00	miss
		488.68		0.42	1.08E-01		6.51E+00	miss
		563.99		0.49	-4.10E-02		8.92E+00	miss
		586.26		0.46	-1.54E+00		8.91E+00	miss
		678.62		0.47	-1.41E+00		7.93E+00	miss
		688.67		0.86	5.87E-01		4.03E+00	miss
		719.35		0.28	3.55E-01		1.39E+01	miss
		778.90		12.96	-1.61E-02		2.60E-01	miss
		810.45		0.32	-5.12E+00		1.08E+01	miss
		867.37		4.26	8.77E-02		8.50E-01	miss
		919.33		0.43	-1.91E+00		7.61E+00	miss
		964.08		14.65	1.09E-01		4.31E-01	miss
		1085.87		10.24	2.40E-02		5.02E-01	miss
		1089.74		1.73	-1.50E+00		2.98E+00	miss
		1112.07		13.69	1.38E-01		4.10E-01	miss
		1212.95		1.43	6.33E-01		3.55E+00	miss
		1249.94		0.19	3.90E+00		2.98E+01	miss
		1299.14		1.63	0.00E+00		2.52E+00	miss
		1408.01		21.07	-9.20E-02		2.06E-01	miss
		1457.64		0.50	-1.23E+01		1.73E+01	miss
		1528.10		0.28	3.53E+00		1.64E+01	miss
+	Eu-154	123.07		40.40	-5.26E-03	9.41E-02	9.41E-02	miss
		247.93		6.89	5.85E-02		4.60E-01	miss
		591.76		4.95	-1.63E-01		4.88E-01	miss
		692.42		1.78	1.09E-01		2.58E+00	miss
		723.30		20.06	7.18E-02		2.48E-01	miss
		756.80		4.52	3.40E-02		9.59E-01	miss
		873.18		12.08	-3.50E-03		3.36E-01	miss
		996.29		10.48	-8.84E-02		4.25E-01	miss
		1004.76		18.01	-2.41E-02		1.92E-01	miss
		1274.43		34.80	1.79E-03		1.16E-01	miss
		1596.48		1.80	5.38E-01		2.67E+00	miss
+	Eu-155	45.30		1.31	-1.99E+01	2.37E-01	2.29E+01	miss
		60.01		1.22	-4.39E+00		2.50E+01	miss
		86.55		30.70	-1.24E-01		2.37E-01	miss
		105.31		21.10	-2.22E-02		2.51E-01	miss
+	Tl-208	583.19	*	85.00	1.25E-01	5.14E-02	5.14E-02	miss
+	Bi-211	351.07	*	13.02	9.25E-01	3.38E-01	3.38E-01	miss

Analysis Report for 02-Jun-16-10008

L3-10220C-FJGS-016SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Pb-211	404.85		3.78	-1.09E-01	8.80E-01	8.80E-01	miss
		427.09		1.76	4.71E-02		1.87E+00	miss
		832.01		3.52	-9.90E-02		1.22E+00	miss
+	Bi-212	39.86		1.06	8.72E+00	8.72E-01	3.22E+01	miss
		727.33		6.67	2.26E-01		8.72E-01	miss
		785.37		1.10	-3.17E-02		3.07E+00	miss
		1620.50		1.47	1.06E+00		3.81E+00	miss
+	Pb-212	115.18		0.60	8.92E-01	1.34E-01	7.86E+00	miss
		238.63	*	43.60	3.07E-01		1.34E-01	miss
		300.09		3.30	7.14E-02		9.64E-01	miss
+	Pb212-XR	74.82		10.28	3.87E-01	9.73E-01	1.48E+00	miss
		77.11		17.10	9.97E-01		9.73E-01	miss
		87.35		3.97	4.04E-01		2.04E+00	miss
		89.78		1.46	1.60E+00		5.21E+00	miss
+	Bi-214	609.32	*	45.49	3.36E-01	1.20E-01	1.20E-01	miss
		768.36		4.89	-2.00E-01		8.93E-01	miss
		806.18		1.26	5.90E-01		3.57E+00	miss
		934.06		3.11	1.76E-01		1.37E+00	miss
		1120.29		14.92	2.21E-01		4.85E-01	miss
		1155.21		1.63	-7.60E-01		3.52E+00	miss
		1238.12		5.83	2.18E-01		1.03E+00	miss
		1280.98		1.43	-8.69E-02		3.28E+00	miss
		1377.67		3.99	7.03E-01		1.73E+00	miss
		1385.31		0.79	-1.58E+00		4.28E+00	miss
		1401.52		1.33	-3.25E-01		3.25E+00	miss
		1407.99		2.39	-8.08E-01		1.81E+00	miss
		1509.21		2.13	5.18E-01		2.49E+00	miss
		1661.27		1.05	-6.34E-01		3.73E+00	miss
		1729.59		2.88	4.04E-01		2.29E+00	miss
		1764.49	*	15.30	6.56E-01		2.64E-01	miss
		1847.43		2.03	1.13E+00		3.40E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	4.58E-01	1.24E-01	6.73E-01	miss
		295.22	*	18.42	3.73E-01		2.63E-01	miss
		351.93	*	35.60	3.38E-01		1.24E-01	miss
		785.96		1.06	3.46E-01		3.19E+00	miss
+	Pb214-XR	74.82		5.80	6.85E-01	1.72E+00	2.62E+00	miss
		77.11		9.70	1.76E+00		1.72E+00	miss
		87.35		2.24	7.16E-01		3.61E+00	miss
		89.78		0.82	2.85E+00		9.27E+00	miss
+	Ra-226	186.21		3.64	5.35E-01	1.14E+00	1.14E+00	miss
+	Ac-228	129.07		2.42	1.98E-01	1.42E-01	1.63E+00	miss
		209.25		3.89	7.71E-02		9.02E-01	miss
		270.24		3.46	1.77E-01		1.17E+00	miss
		328.00		2.95	1.45E-01		1.28E+00	miss
		338.32		11.27	3.92E-01		4.85E-01	miss
		409.46		1.92	-2.78E-01		1.26E+00	miss
		463.00		4.40	1.57E-01		7.48E-01	miss
		794.95		4.25	5.49E-01		1.30E+00	miss
		911.20	*	25.80	4.48E-01		1.42E-01	miss
		964.77		4.99	3.50E-01		1.26E+00	miss

Analysis Report for 02-Jun-16-10008

L3-10220C-FJGS-016SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	968.97	15.80	3.96E-01	1.42E-01	5.40E-01	miss
		1588.20	3.22	5.97E-02		1.17E+00	miss
+	Pa-231	27.36	10.30	2.25E-01	1.24E+00	2.97E+00	miss
		283.69	1.70	2.35E-01		1.92E+00	miss
		300.07	2.47	9.53E-02		1.29E+00	miss
		302.65	2.20	0.00E+00		1.24E+00	miss
		330.06	1.40	-9.91E-02		2.33E+00	miss
+	Th-234	92.38	2.13	-3.50E-01	4.06E+00	4.06E+00	miss
		92.80	2.10	1.65E+00		4.41E+00	miss
		112.81	0.21	8.15E+00		3.06E+01	miss
+	U-235	143.76	10.96	-5.92E-02	7.45E-02	3.51E-01	miss
		163.33	5.08	-4.32E-02		7.39E-01	miss
		185.71	57.20	4.54E-02		7.45E-02	miss
		202.11	1.08	1.23E+00		3.25E+00	miss
		205.31	5.01	2.08E-02		5.90E-01	miss
+	Am-241	59.54	35.90	3.20E-01	9.46E-01	9.46E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

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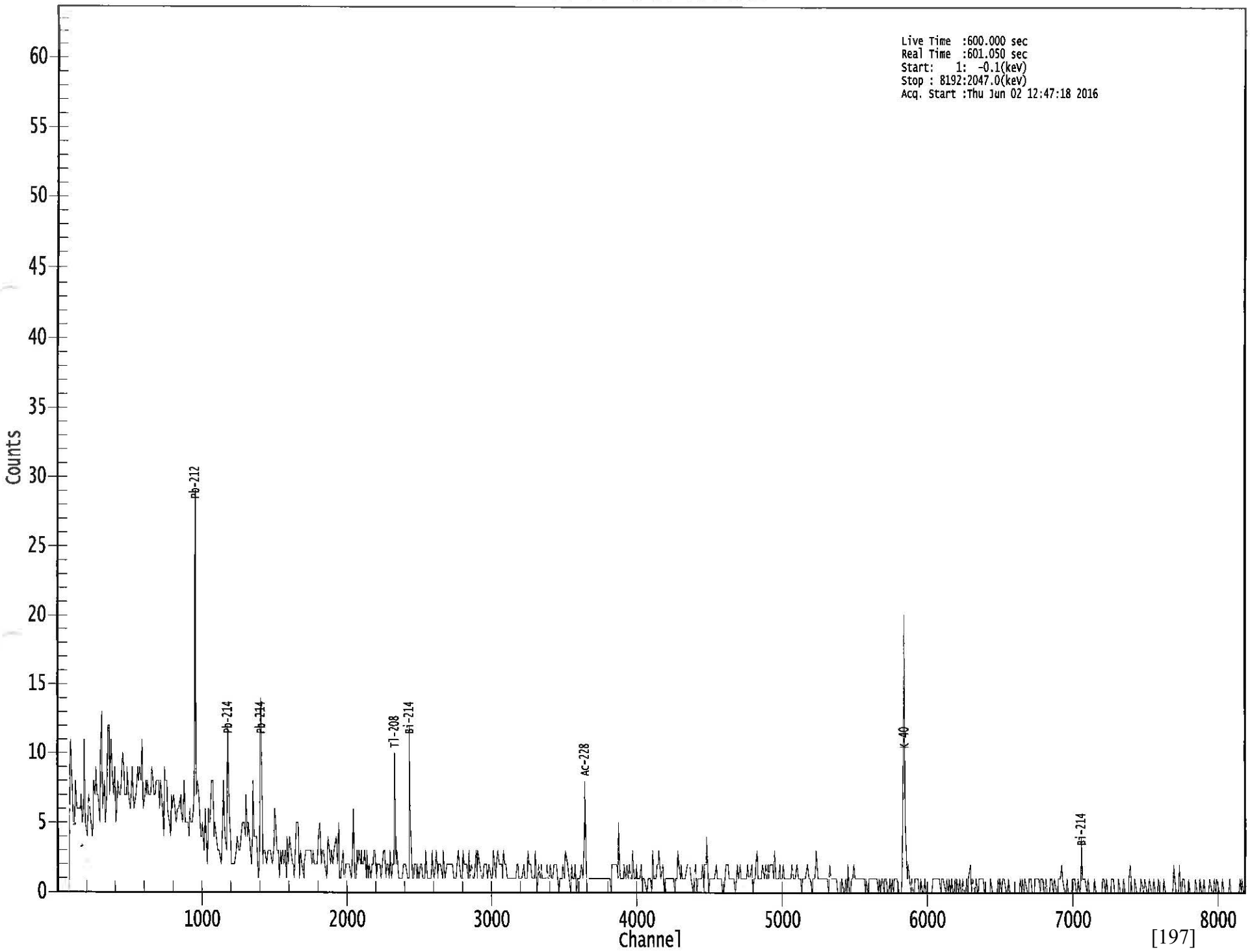

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Apex-Gamma

Analysis Report for 02-Jun-16-10009
L3-10220C-FJGS-017SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	02-Jun-16-10009
Sample Description	L3-10220C-FJGS-017SS (DRIED)
Sample Type	Off Site Sample
Unit	
Sample Point	
Sample Size	1.290E+03 grams
Facility	Default
Sample Taken On	5/23/2016 4:33:00PM
Acquisition Started	6/2/2016 2:22:29PM
Procedure	130G 1L Soil Sample
Operator	JWelch
Detector Name	P11314X2
Geometry	130G Soil
Live Time	600.0 seconds
Real Time	600.4 seconds
Dead Time	0.07 %
Peak Locate Threshold	2.80
Peak Locate Range (in channels)	120 - 8192
Peak Area Range (in channels)	120 - 8192
Identification Energy Tolerance	1.000FWHM
Energy Calibration Used Done On	1/27/2016
Efficiency Calibration Used Done On	6/28/2012
Efficiency Calibration Description	
Sample Number	15057

6/6/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 2:32:39PM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED 6/6/16

Analysis Report for 02-Jun-16-10009

L3-10220C-FJGS-017SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	238.69	949 -	960	955.10	8.35E+01	23.67	4.51E+01	Pb-212
2	295.02	1176 -	1187	1180.14	2.69E+01	15.65	2.63E+01	Pb-214
								Eu-152
3	351.92	1401 -	1416	1407.47	5.43E+01	19.78	3.34E+01	Pb-214
								Bi-211
4	583.16	2327 -	2337	2331.63	2.61E+01	12.93	1.39E+01	Tl-208
5	609.24	2431 -	2441	2435.90	3.19E+01	13.38	1.22E+01	Bi-214
6	661.64	2638 -	2652	2645.36	7.85E+01	19.53	1.50E+01	Cs-137
7	1460.73	5831 -	5852	5842.26	1.36E+02	23.70	3.08E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	5.85E+00	1.14E+00	miss
Cs-137	1.00	661.66	*	85.10	2.46E-01	6.81E-02	miss
Tl-208	1.00	583.19	*	85.00	7.51E-02	3.83E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	2.53E-01	8.27E-02	miss
		300.09		3.30			
Bi-214	1.00	609.32	*	45.49	1.77E-01	7.72E-02	miss
		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			

Analysis Report for 02-Jun-16-10009

L3-10220C-FJGS-017SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	1.00	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	2.23E-01	1.34E-01	miss
		351.93	*	35.60	2.62E-01	1.04E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.999	5.85E+00	1.14E+00	
	Cs-137	1.000	2.46E-01	6.81E-02	
	Tl-208	1.000	7.51E-02	3.83E-02	
X	Bi-211	0.956			
	Pb-212	1.000	2.53E-01	8.27E-02	
	Bi-214	1.000	1.77E-01	7.72E-02	
	Pb-214	0.999	2.47E-01	8.23E-02	

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

Errors quoted at 2.000sigma

Analysis Report for 02-Jun-16-10009

L3-10220C-FJGS-017SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 2:32:38PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

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

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.85E+00	3.96E-01	3.96E-01	miss
+	Cr-51	320.08		9.91	-7.57E-03	3.78E-01	3.78E-01	free
+	Mn-54	834.85		99.98	7.98E-04	3.83E-02	3.83E-02	miss
+	Co-58	810.76		99.45	-3.67E-03	3.15E-02	3.15E-02	miss
		1674.73		0.52	-1.35E-01		7.95E+00	miss
+	Co-60	1173.23		99.85	5.76E-03	4.60E-02	4.73E-02	miss
		1332.49		99.98	8.76E-03		4.60E-02	miss
+	Nb-94	702.65		99.81	1.67E-03	3.65E-02	3.65E-02	miss
		871.09		99.89	-2.14E-03		3.86E-02	miss
+	Ag-108m	79.13		6.60	-3.60E-02	3.04E-02	9.17E-01	miss
		433.94		90.50	7.19E-03		4.15E-02	miss
		614.28		89.80	-5.65E-03		3.04E-02	miss
		722.94		90.80	5.20E-03		4.40E-02	miss
+	Sn-113	255.13		2.11	-3.15E-01	5.28E-02	1.21E+00	free
		391.70		64.97	1.94E-02		5.28E-02	free
+	Cs-134	475.36		1.48	-4.28E-01	4.32E-02	2.30E+00	miss
		563.25		8.34	9.74E-02		4.08E-01	miss
		569.33		15.37	1.90E-02		1.70E-01	miss
		604.72		97.62	5.19E-04		4.32E-02	miss

Analysis Report for 02-Jun-16-10009

L3-10220C-FJGS-017SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	1.35E-02	4.32E-02	5.03E-02	miss
		801.95		8.69	-2.94E-02		2.60E-01	miss
		1038.61		0.99	4.43E-01		4.84E+00	miss
		1167.97		1.79	-1.18E-01		2.64E+00	miss
		1365.19		3.02	8.29E-02		1.07E+00	miss
+	Cs-137	661.66	*	85.10	2.46E-01	5.09E-02	5.09E-02	miss
+	Eu-152	121.78		28.67	-2.26E-02	7.73E-02	7.73E-02	miss
		244.70		7.61	-2.56E-02		3.45E-01	miss
		295.94		0.45	4.22E+00		8.71E+00	miss
		344.28		26.60	-1.09E-02		1.11E-01	miss
		367.79		0.86	-6.02E-01		4.01E+00	miss
		411.12		2.24	-3.93E-02		1.29E+00	miss
		443.96		2.83	4.09E-03		1.08E+00	miss
		488.68		0.42	2.68E+00		7.75E+00	miss
		563.99		0.49	1.94E+00		6.88E+00	miss
		586.26		0.46	-6.42E+00		7.01E+00	miss
		678.62		0.47	2.55E+00		8.65E+00	miss
		688.67		0.86	-5.33E-01		2.97E+00	miss
		719.35		0.28	-1.35E+00		1.43E+01	miss
		778.90		12.96	7.67E-03		2.48E-01	miss
		810.45		0.32	2.94E+00		1.15E+01	miss
		867.37		4.26	-2.07E-01		6.99E-01	miss
		919.33		0.43	-7.81E-01		5.74E+00	miss
		964.08		14.65	6.28E-02		3.09E-01	miss
		1085.87		10.24	-3.47E-03		5.14E-01	miss
		1089.74		1.73	6.79E-01		2.83E+00	miss
		1112.07		13.69	3.56E-02		3.32E-01	miss
		1212.95		1.43	0.00E+00		7.61E-01	miss
		1249.94		0.19	4.51E+00		2.84E+01	miss
		1299.14		1.63	1.29E+00		3.38E+00	miss
		1408.01		21.07	4.22E-02		1.96E-01	miss
		1457.64		0.50	-6.75E+00		1.71E+01	miss
		1528.10		0.28	-1.68E+00		1.56E+01	miss
+	Eu-154	123.07		40.40	2.14E-02	6.67E-02	6.67E-02	miss
		247.93		6.89	-1.50E-01		2.97E-01	miss
		591.76		4.95	-1.50E-01		3.68E-01	miss
		692.42		1.78	1.94E-02		1.86E+00	miss
		723.30		20.06	-2.89E-02		1.70E-01	miss
		756.80		4.52	1.84E-01		7.78E-01	miss
		873.18		12.08	-5.22E-02		3.20E-01	miss
		996.29		10.48	-2.81E-02		2.48E-01	miss
		1004.76		18.01	1.31E-02		2.37E-01	miss
		1274.43		34.80	-4.54E-02		1.28E-01	miss
		1596.48		1.80	5.46E-01		2.53E+00	miss
+	Eu-155	45.30		1.31	1.39E-01	1.46E-01	7.25E+00	miss
		60.01		1.22	-1.94E+00		8.66E+00	miss
		86.55		30.70	6.32E-02		1.46E-01	miss
		105.31		21.10	2.93E-02		1.66E-01	miss
+	Tl-208	583.19	*	85.00	7.51E-02	4.54E-02	4.54E-02	miss
+	Bi-211	351.07	*	13.02	7.16E-01	3.22E-01	3.22E-01	miss
+	Pb-211	404.85		3.78	-1.71E-01	7.08E-01	7.08E-01	miss

Analysis Report for 02-Jun-16-10009

L3-10220C-FJGS-017SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	3.36E-01	7.08E-01	2.11E+00	miss
		832.01		3.52	5.40E-02		9.52E-01	miss
+	Bi-212	39.86		1.06	-7.60E-01	7.43E-01	9.29E+00	miss
		727.33		6.67	4.26E-01		7.43E-01	miss
		785.37		1.10	-6.34E-01		2.00E+00	miss
		1620.50		1.47	0.00E+00		9.11E-01	miss
+	Pb-212	115.18		0.60	-8.82E-01	8.34E-02	4.69E+00	miss
		238.63	*	43.60	2.53E-01		8.34E-02	miss
		300.09		3.30	4.08E-01		1.12E+00	miss
+	Pb212-XR	74.82		10.28	1.28E-01	5.84E-01	8.01E-01	miss
		77.11		17.10	6.28E-01		5.84E-01	miss
		87.35		3.97	2.31E-01		1.19E+00	miss
		89.78		1.46	2.44E-01		2.86E+00	miss
+	Bi-214	609.32	*	45.49	1.77E-01	8.05E-02	8.05E-02	miss
		768.36		4.89	-5.03E-03		7.24E-01	miss
		806.18		1.26	9.38E-02		2.60E+00	miss
		934.06		3.11	-1.09E-01		1.01E+00	miss
		1120.29		14.92	1.68E-01		4.44E-01	miss
		1155.21		1.63	-5.68E-01		2.85E+00	miss
		1238.12		5.83	4.07E-01		1.10E+00	miss
		1280.98		1.43	-7.72E-01		3.12E+00	miss
		1377.67		3.99	2.09E-01		1.18E+00	miss
		1385.31		0.79	-4.35E-01		5.14E+00	miss
		1401.52		1.33	9.51E-02		3.09E+00	miss
		1407.99		2.39	3.71E-01		1.72E+00	miss
		1509.21		2.13	7.07E-01		2.64E+00	miss
		1661.27		1.05	0.00E+00		1.30E+00	miss
		1729.59		2.88	2.37E-01		1.68E+00	miss
		1764.49		15.30	4.61E-02		3.72E-01	miss
		1847.43		2.03	-2.35E-01		1.98E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	4.20E-01	1.18E-01	5.57E-01	miss
		295.22	*	18.42	2.23E-01		1.82E-01	miss
		351.93	*	35.60	2.62E-01		1.18E-01	miss
		785.96		1.06	-1.27E+00		2.08E+00	miss
+	Pb214-XR	74.82		5.80	2.27E-01	1.03E+00	1.42E+00	miss
		77.11		9.70	1.11E+00		1.03E+00	miss
		87.35		2.24	4.10E-01		2.11E+00	miss
		89.78		0.82	4.35E-01		5.10E+00	miss
+	Ra-226	186.21		3.64	8.44E-01	9.88E-01	9.88E-01	miss
+	Ac-228	129.07		2.42	-1.45E-01	2.95E-01	1.07E+00	miss
		209.25		3.89	1.00E-01		6.95E-01	miss
		270.24		3.46	-4.37E-02		8.62E-01	miss
		328.00		2.95	2.38E-01		1.04E+00	miss
		338.32		11.27	2.48E-01		3.85E-01	miss
		409.46		1.92	5.78E-01		1.94E+00	miss
		463.00		4.40	2.75E-01		9.23E-01	miss
		794.95		4.25	2.81E-01		1.07E+00	miss
		911.20		25.80	1.84E-01		2.95E-01	miss
		964.77		4.99	2.88E-01		9.74E-01	miss
		968.97		15.80	1.58E-01		3.81E-01	miss

Analysis Report for 02-Jun-16-10009

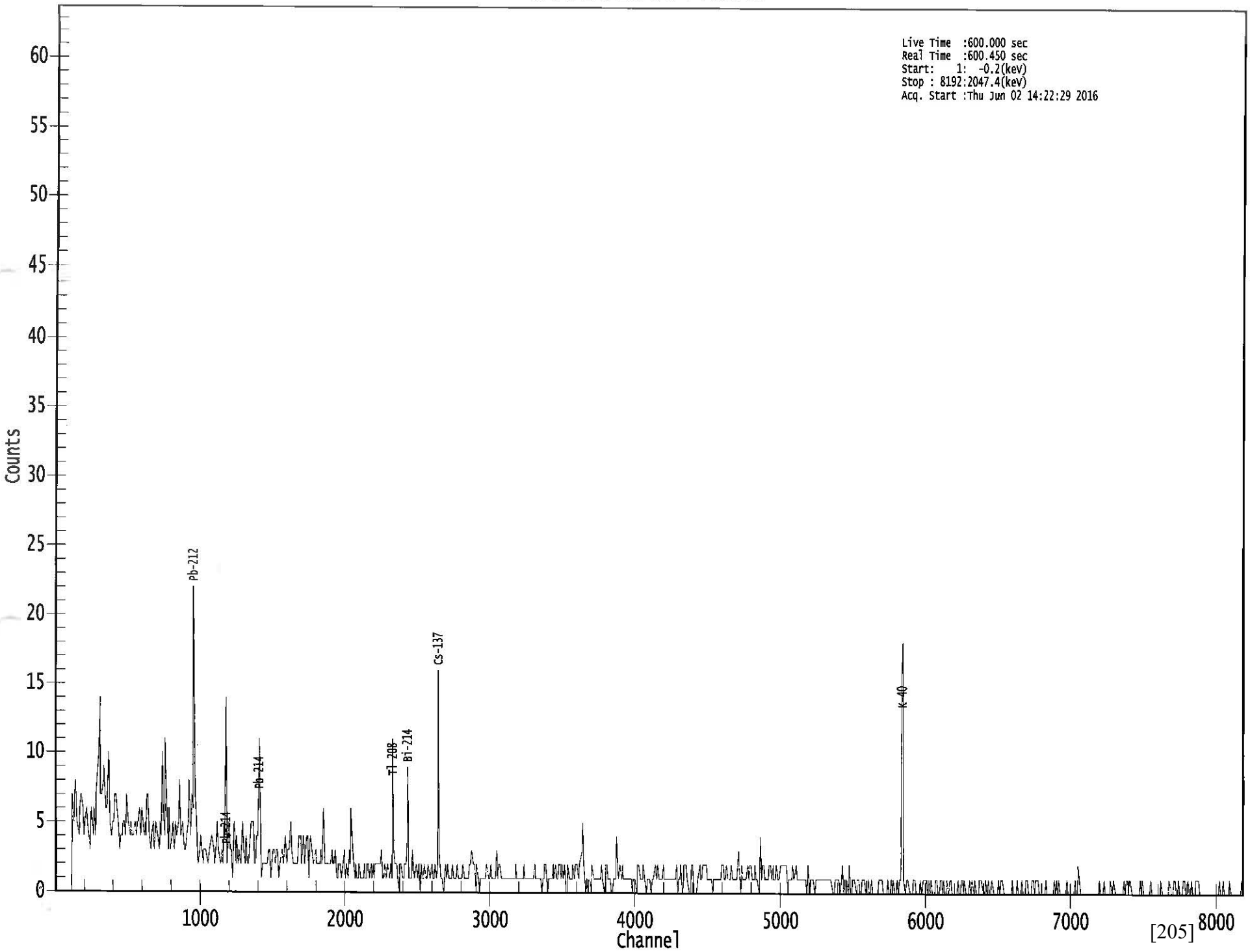
L3-10220C-FJGS-017SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20	3.22	0.00E+00	2.95E-01	4.10E-01	miss
+	Pa-231	27.36	10.30	0.00E+00	1.43E-01	1.43E-01	miss
		283.69	1.70	-5.11E-01		1.59E+00	miss
		300.07	2.47	5.45E-01		1.50E+00	miss
		302.65	2.20	3.70E-01		1.42E+00	miss
		330.06	1.40	5.87E-01		2.36E+00	miss
+	Th-234	92.38	2.13	2.66E+00	3.38E+00	3.38E+00	miss
		92.80	2.10	2.72E+00		3.44E+00	miss
		112.81	0.21	-5.32E+00		1.67E+01	miss
+	U-235	143.76	10.96	-5.95E-02	6.12E-02	2.26E-01	miss
		163.33	5.08	-4.30E-04		4.35E-01	miss
		185.71	57.20	4.59E-02		6.12E-02	miss
		202.11	1.08	4.86E-01		2.52E+00	miss
		205.31	5.01	-7.86E-02		4.25E-01	miss
+	Am-241	59.54	35.90	-3.02E-02	2.84E-01	2.84E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000015057.CNF



Apex-Gamma

Analysis Report for 02-Jun-16-10010
L3-10220C-FJGS-018SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 02-Jun-16-10010
Sample Description	: L3-10220C-FJGS-018SS (DRIED)
Sample Type	: Off Site Sample
Unit	:
Sample Point	:
Sample Size	: 1.858E+03 grams
Facility	: Default
Sample Taken On	: 5/16/2016 4:44:00PM
Acquisition Started	: 6/2/2016 2:22:36PM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P40818B
Geometry	: 130G Soil
Live Time	: 600.0 seconds
Real Time	: 600.9 seconds
Dead Time	: 0.16 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 1/5/2015
Efficiency Calibration Description	:
Sample Number	: 15058

6/6/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 2:33:17PM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED 6/6/16

Analysis Report for 02-Jun-16-10010

L3-10220C-FJGS-018SS (DRIED)

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
1	209.06	832 -	842	836.81	1.87E+01	18.30	5.46E+01	Ac-228
2	238.57	949 -	961	954.77	8.97E+01	31.10	1.13E+02	Pb-212
3	295.30	1174 -	1190	1181.55	6.52E+01	23.26	4.35E+01	Pb-214 Eu-152
4	351.84	1401 -	1413	1407.56	5.97E+01	19.25	2.86E+01	Pb-214 Bi-211
5	583.01	2325 -	2339	2331.80	4.08E+01	15.34	1.43E+01	Tl-208
6	609.21	2428 -	2445	2436.58	6.47E+01	17.82	1.06E+01	Bi-214
7	1460.63	5833 -	5853	5843.48	1.50E+02	25.10	5.92E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	4.96E+00	9.34E-01	miss
Tl-208	0.99	583.19	*	85.00	9.06E-02	3.57E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	2.13E-01	8.14E-02	miss
		300.09		3.30			
Bi-214	1.00	609.32	*	45.49	2.76E-01	8.30E-02	miss
		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			

Analysis Report for 02-Jun-16-10010

L3-10220C-FJGS-018SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
Bi-214	1.00	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	4.20E-01	1.64E-01	miss
		351.93	*	35.60	2.22E-01	7.99E-02	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.998	4.96E+00	9.34E-01	
	Tl-208	0.998	9.06E-02	3.57E-02	
X	Bi-211	0.964			
	Pb-212	1.000	2.13E-01	8.14E-02	
	Bi-214	1.000	2.76E-01	8.30E-02	
	Pb-214	1.000	2.60E-01	7.18E-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 2.000sigma

Analysis Report for 02-Jun-16-10010

L3-10220C-FJGS-018SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 2:33:17PM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
1	209.06	3.11775E-02	48.90	Tol.	Ac-228

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	4.96E+00	3.85E-01	3.85E-01	miss
+	Cr-51	320.08		9.91	-6.60E-02	4.09E-01	4.09E-01	free
+	Mn-54	834.85		99.98	3.00E-03	4.15E-02	4.15E-02	miss
+	Co-58	810.76		99.45	-5.12E-03	3.35E-02	3.35E-02	miss
		1674.73		0.52	0.00E+00		2.41E+00	miss
+	Co-60	1173.23		99.85	1.87E-02	3.56E-02	4.82E-02	miss
		1332.49		99.98	3.30E-03		3.56E-02	miss
+	Nb-94	702.65		99.81	1.08E-02	3.02E-02	3.02E-02	miss
		871.09		99.89	2.34E-03		3.49E-02	miss
+	Ag-108m	79.13		6.60	3.65E-01	2.61E-02	1.26E+00	miss
		433.94		90.50	9.68E-03		3.20E-02	miss
		614.28		89.80	3.92E-03		2.61E-02	miss
		722.94		90.80	-2.12E-02		2.88E-02	miss
+	Sn-113	255.13		2.11	-6.99E-02	4.06E-02	1.21E+00	free
		391.70		64.97	-4.98E-03		4.06E-02	free
+	Cs-134	475.36		1.48	-2.72E-01	2.63E-02	1.87E+00	miss
		563.25		8.34	1.35E-01		3.90E-01	miss
		569.33		15.37	1.54E-02		1.84E-01	miss

Analysis Report for 02-Jun-16-10010

L3-10220C-FJGS-018SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	604.72		97.62	-5.95E-03	2.63E-02	2.63E-02	miss
		795.86		85.46	-9.21E-03		3.32E-02	miss
		801.95		8.69	9.11E-02		3.85E-01	miss
		1038.61		0.99	0.00E+00		2.10E+00	miss
		1167.97		1.79	1.43E+00		2.84E+00	miss
		1365.19		3.02	0.00E+00		3.05E-01	miss
+	Cs-137	661.66		85.10	1.62E-02	4.55E-02	4.55E-02	miss
+	Eu-152	121.78		28.67	4.54E-02	8.20E-02	1.10E-01	miss
		244.70		7.61	6.02E-04		3.46E-01	miss
		295.94		0.45	1.08E+01		1.03E+01	miss
		344.28		26.60	3.94E-03		8.20E-02	miss
		367.79		0.86	-1.07E-01		2.88E+00	miss
		411.12		2.24	2.05E-01		1.33E+00	miss
		443.96		2.83	-2.32E-01		7.79E-01	miss
		488.68		0.42	7.32E-01		5.22E+00	miss
		563.99		0.49	-5.18E-01		6.26E+00	miss
		586.26		0.46	-4.70E+00		4.44E+00	miss
		678.62		0.47	-1.52E+00		5.82E+00	miss
		688.67		0.86	6.39E-01		3.70E+00	miss
		719.35		0.28	4.01E+00		1.36E+01	miss
		778.90		12.96	6.63E-02		2.66E-01	miss
		810.45		0.32	-1.10E+00		8.83E+00	miss
		867.37		4.26	7.73E-02		7.60E-01	miss
		919.33		0.43	-5.34E-01		6.47E+00	miss
		964.08		14.65	1.34E-01		3.41E-01	miss
		1085.87		10.24	6.55E-02		3.96E-01	miss
		1089.74		1.73	-3.81E-01		1.79E+00	miss
		1112.07		13.69	8.53E-03		2.80E-01	miss
		1212.95		1.43	1.01E+00		3.06E+00	miss
		1249.94		0.19	-2.62E+00		1.80E+01	miss
		1299.14		1.63	0.00E+00		5.39E-01	miss
		1408.01		21.07	3.49E-02		1.96E-01	miss
		1457.64		0.50	-3.50E+00		1.17E+01	miss
		1528.10		0.28	3.89E+00		1.40E+01	miss
+	Eu-154	123.07		40.40	-2.46E-02	6.80E-02	6.80E-02	miss
		247.93		6.89	-4.09E-02		3.63E-01	miss
		591.76		4.95	-2.65E-02		5.80E-01	miss
		692.42		1.78	-4.78E-01		8.80E-01	miss
		723.30		20.06	-1.12E-02		1.64E-01	miss
		756.80		4.52	-3.62E-01		6.00E-01	miss
		873.18		12.08	2.87E-02		3.26E-01	miss
		996.29		10.48	1.04E-02		3.40E-01	miss
		1004.76		18.01	3.29E-02		1.82E-01	miss
		1274.43		34.80	2.87E-02		1.30E-01	miss
		1596.48		1.80	0.00E+00		5.70E-01	miss
+	Eu-155	45.30		1.31	-4.61E+00	1.77E-01	1.99E+01	miss
		60.01		1.22	2.16E+00		2.20E+01	miss
		86.55		30.70	6.89E-02		2.02E-01	miss
		105.31		21.10	1.42E-02		1.77E-01	miss
+	Tl-208	583.19	*	85.00	9.06E-02	3.69E-02	3.69E-02	miss
+	Bi-211	351.07	*	13.02	6.07E-01	2.19E-01	2.19E-01	miss

Analysis Report for 02-Jun-16-10010

L3-10220C-FJGS-018SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Pb-211	404.85		3.78	-1.02E-01	6.45E-01	6.45E-01	miss
		427.09		1.76	3.37E-01		1.62E+00	miss
		832.01		3.52	-1.93E-01		8.17E-01	miss
+	Bi-212	39.86		1.06	-1.13E+00	6.18E-01	2.36E+01	miss
		727.33		6.67	5.97E-02		6.18E-01	miss
		785.37		1.10	4.23E-01		3.14E+00	miss
		1620.50		1.47	0.00E+00		7.03E-01	miss
+	Pb-212	115.18		0.60	3.68E+00	1.03E-01	6.58E+00	miss
		238.63	*	43.60	2.13E-01		1.03E-01	miss
		300.09		3.30	3.22E-01		9.25E-01	miss
+	Pb212-XR	74.82		10.28	4.65E-01	6.45E-01	1.09E+00	miss
		77.11		17.10	4.54E-01		6.45E-01	miss
		87.35		3.97	-2.30E-01		1.38E+00	miss
		89.78		1.46	4.93E-01		3.43E+00	miss
+	Bi-214	609.32	*	45.49	2.76E-01	6.54E-02	6.54E-02	miss
		768.36		4.89	3.48E-01		9.04E-01	miss
		806.18		1.26	7.73E-01		3.09E+00	miss
		934.06		3.11	-6.96E-03		1.00E+00	miss
		1120.29		14.92	2.59E-01		4.51E-01	miss
		1155.21		1.63	-2.35E-01		1.70E+00	miss
		1238.12		5.83	2.91E-01		9.72E-01	miss
		1280.98		1.43	7.01E-01		2.92E+00	miss
		1377.67		3.99	1.81E-01		1.01E+00	miss
		1385.31		0.79	-7.92E-01		3.14E+00	miss
		1401.52		1.33	-3.67E-01		2.76E+00	miss
		1407.99		2.39	3.07E-01		1.72E+00	miss
		1509.21		2.13	1.45E-01		1.57E+00	miss
		1661.27		1.05	0.00E+00		1.01E+00	miss
		1729.59		2.88	0.00E+00		3.77E-01	miss
		1764.49		15.30	2.17E-01		4.44E-01	miss
		1847.43		2.03	4.15E-01		1.92E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	4.79E-01	8.03E-02	5.49E-01	miss
		295.22	*	18.42	4.20E-01		1.94E-01	miss
		351.93	*	35.60	2.22E-01		8.03E-02	miss
		785.96		1.06	7.82E-01		3.27E+00	miss
+	Pb214-XR	74.82		5.80	8.25E-01	1.14E+00	1.94E+00	miss
		77.11		9.70	8.01E-01		1.14E+00	miss
		87.35		2.24	-4.08E-01		2.44E+00	miss
		89.78		0.82	8.79E-01		6.10E+00	miss
+	Ra-226	186.21		3.64	2.13E-01	8.41E-01	8.41E-01	miss
+	Ac-228	129.07		2.42	-6.61E-03	2.47E-01	1.35E+00	miss
		209.25		3.89	4.60E-01		7.76E-01	miss
		270.24		3.46	2.37E-01		8.70E-01	miss
		328.00		2.95	5.68E-01		1.15E+00	miss
		338.32		11.27	3.01E-01		3.37E-01	miss
		409.46		1.92	-2.37E-01		1.34E+00	miss
		463.00		4.40	2.26E-01		7.57E-01	miss
		794.95		4.25	3.64E-02		7.71E-01	miss
		911.20		25.80	2.03E-01		2.47E-01	miss
		964.77		4.99	2.17E-02		8.86E-01	miss

Analysis Report for 02-Jun-16-10010

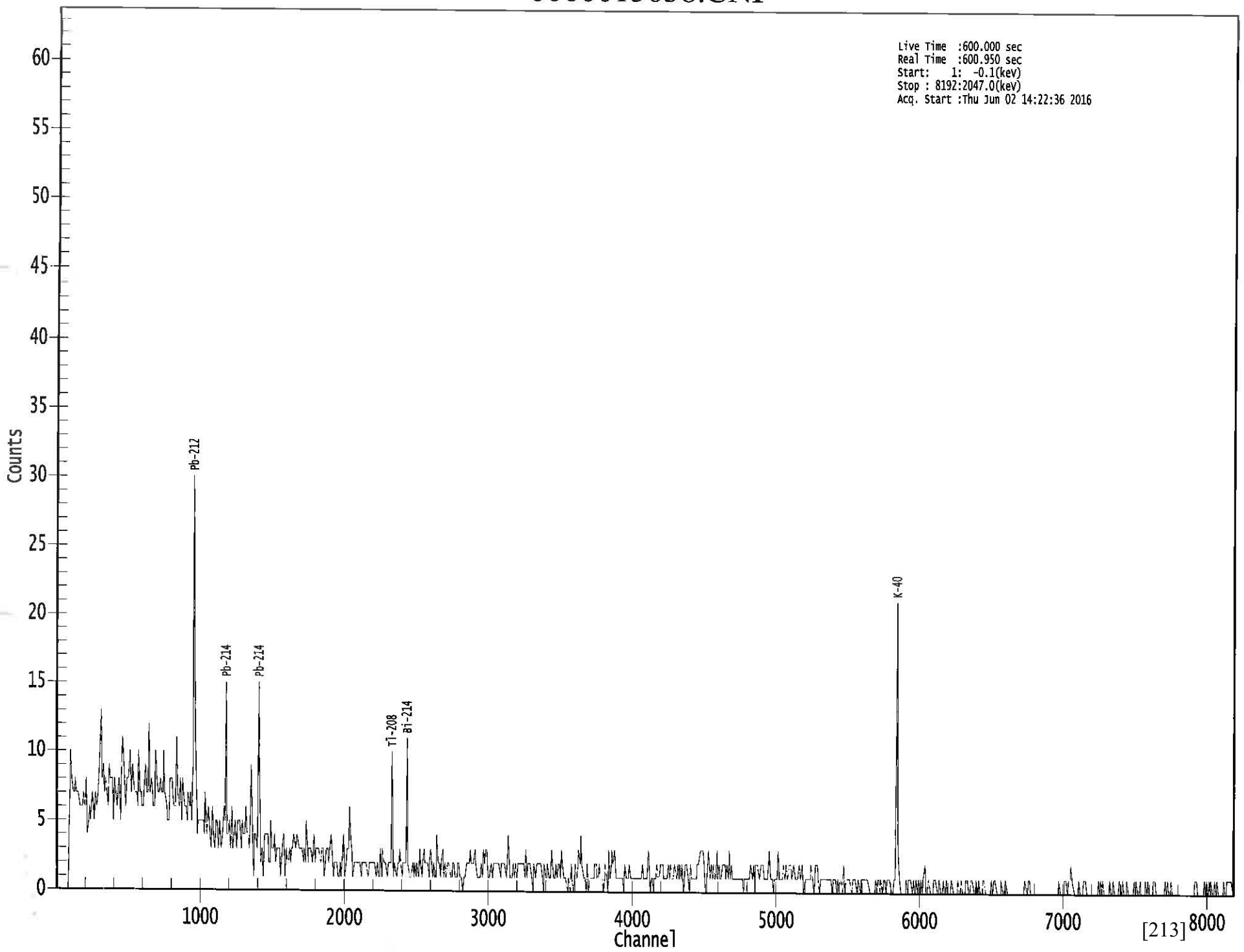
L3-10220C-FJGS-018SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	968.97	15.80	9.13E-02	2.47E-01	3.05E-01	miss
		1588.20	3.22	7.29E-02		8.59E-01	miss
+	Pa-231	27.36	10.30	5.85E-01	1.24E+00	2.65E+00	miss
		283.69	1.70	1.01E+00		1.76E+00	miss
		300.07	2.47	4.30E-01		1.24E+00	miss
		302.65	2.20	1.15E-01		1.26E+00	miss
		330.06	1.40	-2.87E-01		1.88E+00	miss
+	Th-234	92.38	2.13	2.73E+00	4.22E+00	4.27E+00	miss
		92.80	2.10	2.47E+00		4.22E+00	miss
		112.81	0.21	-6.55E+00		2.57E+01	miss
+	U-235	143.76	10.96	-9.15E-02	5.46E-02	2.43E-01	miss
		163.33	5.08	-6.02E-02		5.19E-01	miss
		185.71	57.20	3.01E-02		5.46E-02	miss
		202.11	1.08	1.02E+00		2.72E+00	miss
		205.31	5.01	-7.27E-02		4.72E-01	miss
+	Am-241	59.54	35.90	9.24E-02	7.69E-01	7.69E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000015058.CNF



Apex-Gamma

Analysis Report for 02-Jun-16-10011
L3-10220C-FJGS-019SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 02-Jun-16-10011
Sample Description	: L3-10220C-FJGS-019SS (DRIED)
Sample Type	: Off Site Sample
Unit	:
Sample Point	:
Sample Size	: 5.972E+02 grams
Facility	: Default
Sample Taken On	: 5/23/2016 5:00:00PM
Acquisition Started	: 6/2/2016 2:38:48PM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P11314X2
Geometry	: 130G Soil
Live Time	: 600.0 seconds
Real Time	: 600.4 seconds
Dead Time	: 0.07 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 6/28/2012
Efficiency Calibration Description	:
Sample Number	: 15059

6/6/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 6/2/2016 2:48:50PM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

6-2-16

DATA VALIDATED 6/6/16

Analysis Report for 02-Jun-16-10011

L3-10220C-FJGS-019SS (DRIED)

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
M	1	74.74	297 -	315	300.19	1.41E+01	8.17	1.45E+01	Pb214-XR
									Pb212-XR
m	2	76.96	297 -	315	309.05	2.35E+01	10.26	1.07E+01	Pb214-XR
									Pb212-XR
	3	238.37	949 -	960	953.81	2.77E+01	14.63	2.06E+01	Pb-212
	4	351.83	1401 -	1412	1407.10	3.57E+01	14.44	1.46E+01	Pb-214
									Bi-211
	5	661.66	2641 -	2652	2645.46	2.65E+01	13.93	2.11E+01	Cs-137
	6	1460.58	5834 -	5851	5841.64	4.98E+01	14.48	2.31E+00	K-40

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.99	1460.82	*	10.66	4.61E+00	1.40E+00	miss
Cs-137	1.00	661.66	*	85.10	1.79E-01	9.68E-02	miss
Bi-211	0.96	351.07	*	13.02	1.02E+00	4.42E-01	miss
Pb-212	0.99	115.18		0.60			
		238.63	*	43.60	1.81E-01	1.00E-01	miss
		300.09		3.30			
Pb212-XR	0.99	74.82	*	10.28	7.68E-01	4.73E-01	miss
		77.11	*	17.10	7.10E-01	3.43E-01	miss
		87.35		3.97			
		89.78		1.46			
Pb-214	0.51	241.99		7.25			
		295.22		18.42			
		351.93	*	35.60	3.71E-01	1.62E-01	miss
		785.96		1.06			

Analysis Report for 02-Jun-16-10011

L3-10220C-FJGS-019SS (DRIED)

* = Energy line found in the spectrum.
= Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.996	4.61E+00	1.40E+00	
	Cs-137	1.000	1.79E-01	9.68E-02	
?	Bi-211	0.965	1.02E+00	4.42E-01	
	Pb-212	0.996	1.81E-01	1.00E-01	
	Pb212-XR	0.999	7.30E-01	2.78E-01	
?	Pb-214	0.512	3.71E-01	1.62E-01	
X	Pb214-XR	0.999			

? = 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 2.000sigma

Analysis Report for 02-Jun-16-10011

L3-10220C-FJGS-019SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 6/2/2016 2:48:50PM
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 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	4.61E+00	7.35E-01	7.35E-01	miss
+	Cr-51	320.08		9.91	-5.62E-02	3.31E-01	3.31E-01	free
+	Mn-54	834.85		99.98	8.04E-03	7.42E-02	7.42E-02	miss
+	Co-58	810.76		99.45	-9.76E-03	5.39E-02	5.39E-02	miss
		1674.73		0.52	0.00E+00		6.31E+00	miss
+	Co-60	1173.23		99.85	1.70E-02	2.50E-02	7.89E-02	miss
		1332.49		99.98	0.00E+00		2.50E-02	miss
+	Nb-94	702.65		99.81	2.33E-02	6.44E-02	7.88E-02	miss
		871.09		99.89	-1.56E-02		6.44E-02	miss
+	Ag-108m	79.13		6.60	-1.61E-02	5.12E-02	1.02E+00	miss
		433.94		90.50	1.59E-03		5.12E-02	miss
		614.28		89.80	-7.32E-03		6.57E-02	miss
		722.94		90.80	2.52E-02		8.83E-02	miss
+	Sn-113	255.13		2.11	5.48E-01	7.05E-02	2.26E+00	free
		391.70		64.97	-1.75E-03		7.05E-02	free
+	Cs-134	475.36		1.48	-2.63E+00	4.12E-02	3.37E+00	miss
		563.25		8.34	-1.62E-01		4.60E-01	miss
		569.33		15.37	-2.73E-02		2.51E-01	miss
		604.72		97.62	-1.57E-02		4.12E-02	miss

Analysis Report for 02-Jun-16-10011

L3-10220C-FJGS-019SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	795.86		85.46	1.80E-02	4.12E-02	9.26E-02	miss
		801.95		8.69	1.65E-01		9.15E-01	miss
		1038.61		0.99	-9.29E-01		7.40E+00	miss
		1167.97		1.79	3.40E-01		3.50E+00	miss
		1365.19		3.02	4.48E-02		2.31E+00	miss
+	Cs-137	661.66	*	85.10	1.79E-01	1.23E-01	1.23E-01	miss
+	Eu-152	121.78		28.67	-2.07E-03	1.34E-01	1.54E-01	miss
		244.70		7.61	9.88E-02		7.20E-01	miss
		295.94		0.45	1.84E+00		1.29E+01	miss
		344.28		26.60	-3.02E-02		1.80E-01	miss
		367.79		0.86	-2.13E-01		5.83E+00	miss
		411.12		2.24	1.19E-01		2.43E+00	miss
		443.96		2.83	-3.40E-01		1.67E+00	miss
		488.68		0.42	2.12E+00		1.34E+01	miss
		563.99		0.49	1.26E+00		1.13E+01	miss
		586.26		0.46	9.24E-01		1.39E+01	miss
		678.62		0.47	2.07E-01		1.34E+01	miss
		688.67		0.86	6.90E-01		5.08E+00	miss
		719.35		0.28	3.10E+00		2.63E+01	miss
		778.90		12.96	0.00E+00		1.34E-01	miss
		810.45		0.32	-2.06E+00		1.52E+01	miss
		867.37		4.26	-1.22E-01		1.51E+00	miss
		919.33		0.43	4.27E+00		2.21E+01	miss
		964.08		14.65	1.02E-01		4.72E-01	miss
		1085.87		10.24	1.87E-01		8.47E-01	miss
		1089.74		1.73	-1.93E+00		3.43E+00	miss
		1112.07		13.69	1.71E-02		4.40E-01	miss
		1212.95		1.43	-1.39E+00		5.64E+00	miss
		1249.94		0.19	0.00E+00		1.26E+01	miss
		1299.14		1.63	7.96E-02		5.18E+00	miss
		1408.01		21.07	4.23E-02		4.23E-01	miss
		1457.64		0.50	-3.64E+00		2.36E+01	miss
		1528.10		0.28	0.00E+00		9.82E+00	miss
+	Eu-154	123.07		40.40	-2.09E-03	6.96E-02	1.04E-01	miss
		247.93		6.89	-2.67E-02		6.77E-01	miss
		591.76		4.95	-6.06E-01		7.96E-01	miss
		692.42		1.78	3.35E-01		3.11E+00	miss
		723.30		20.06	-8.92E-03		3.67E-01	miss
		756.80		4.52	-3.50E-01		1.03E+00	miss
		873.18		12.08	-8.64E-02		5.35E-01	miss
		996.29		10.48	1.21E-02		6.75E-01	miss
		1004.76		18.01	-3.55E-02		3.13E-01	miss
		1274.43		34.80	0.00E+00		6.96E-02	miss
		1596.48		1.80	0.00E+00		1.59E+00	miss
+	Eu-155	45.30		1.31	-4.91E+00	2.03E-01	1.18E+01	miss
		60.01		1.22	-1.70E+00		1.47E+01	miss
		86.55		30.70	-8.38E-02		2.03E-01	miss
		105.31		21.10	5.61E-02		2.55E-01	miss
+	Tl-208	583.19		85.00	2.69E-02	1.13E-01	1.13E-01	miss
+	Bi-211	351.07	*	13.02	1.02E+00	4.56E-01	4.56E-01	miss
+	Pb-211	404.85		3.78	4.34E-02	1.30E+00	1.30E+00	miss

Analysis Report for 02-Jun-16-10011

L3-10220C-FJGS-019SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Pb-211	427.09		1.76	-3.22E-01	1.30E+00	2.60E+00	miss
		832.01		3.52	-1.27E-01		1.41E+00	miss
+	Bi-212	39.86		1.06	-1.11E+00	1.21E+00	1.45E+01	miss
		727.33		6.67	2.46E-02		1.21E+00	miss
		785.37		1.10	9.78E-02		5.45E+00	miss
		1620.50		1.47	0.00E+00		1.97E+00	miss
+	Pb-212	115.18		0.60	2.26E-01	1.27E-01	7.16E+00	miss
		238.63	*	43.60	1.81E-01		1.27E-01	miss
		300.09		3.30	-3.94E-01		1.32E+00	miss
+	Pb212-XR	74.82	*	10.28	7.68E-01	4.07E-01	8.33E-01	miss
		77.11	*	17.10	7.10E-01		4.07E-01	miss
		87.35		3.97	1.34E+00		2.05E+00	miss
		89.78		1.46	-6.35E-01		1.75E+00	miss
+	Bi-214	609.32		45.49	2.31E-01	2.94E-01	2.94E-01	miss
		768.36		4.89	2.17E-02		1.21E+00	miss
		806.18		1.26	1.13E+00		6.25E+00	miss
		934.06		3.11	3.22E-01		2.82E+00	miss
		1120.29		14.92	3.85E-01		8.26E-01	miss
		1155.21		1.63	-3.66E-01		3.77E+00	miss
		1238.12		5.83	-2.58E-01		1.39E+00	miss
		1280.98		1.43	1.70E+00		7.51E+00	miss
		1377.67		3.99	2.70E-01		2.55E+00	miss
		1385.31		0.79	1.45E+00		1.11E+01	miss
		1401.52		1.33	8.73E-01		6.67E+00	miss
		1407.99		2.39	3.72E-01		3.72E+00	miss
		1509.21		2.13	-2.04E-01		3.50E+00	miss
		1661.27		1.05	1.04E+00		7.66E+00	miss
		1729.59		2.88	7.81E-01		3.63E+00	miss
		1764.49		15.30	7.93E-02		6.93E-01	miss
		1847.43		2.03	7.25E-02		4.27E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99		7.25	2.59E-01	1.67E-01	7.75E-01	miss
		295.22		18.42	1.53E-01		3.60E-01	miss
		351.93	*	35.60	3.71E-01		1.67E-01	miss
		785.96		1.06	-5.09E-01		5.67E+00	miss
+	Pb214-XR	74.82	*	5.80	1.36E+00	7.18E-01	1.48E+00	miss
		77.11	*	9.70	1.25E+00		7.18E-01	miss
		87.35		2.24	2.38E+00		3.63E+00	miss
		89.78		0.82	-1.13E+00		3.12E+00	miss
+	Ra-226	186.21		3.64	2.32E-01	1.47E+00	1.47E+00	miss
+	Ac-228	129.07		2.42	7.16E-01	4.63E-01	2.26E+00	miss
		209.25		3.89	6.98E-01		1.33E+00	miss
		270.24		3.46	-1.05E-01		1.50E+00	miss
		328.00		2.95	1.58E-01		1.80E+00	miss
		338.32		11.27	2.39E-01		6.03E-01	miss
		409.46		1.92	1.15E-01		2.32E+00	miss
		463.00		4.40	3.48E-01		1.62E+00	miss
		794.95		4.25	7.67E-02		1.42E+00	miss
		911.20		25.80	2.13E-01		4.63E-01	miss
		964.77		4.99	2.98E-01		1.38E+00	miss
		968.97		15.80	2.36E-01		6.19E-01	miss

Analysis Report for 02-Jun-16-10011

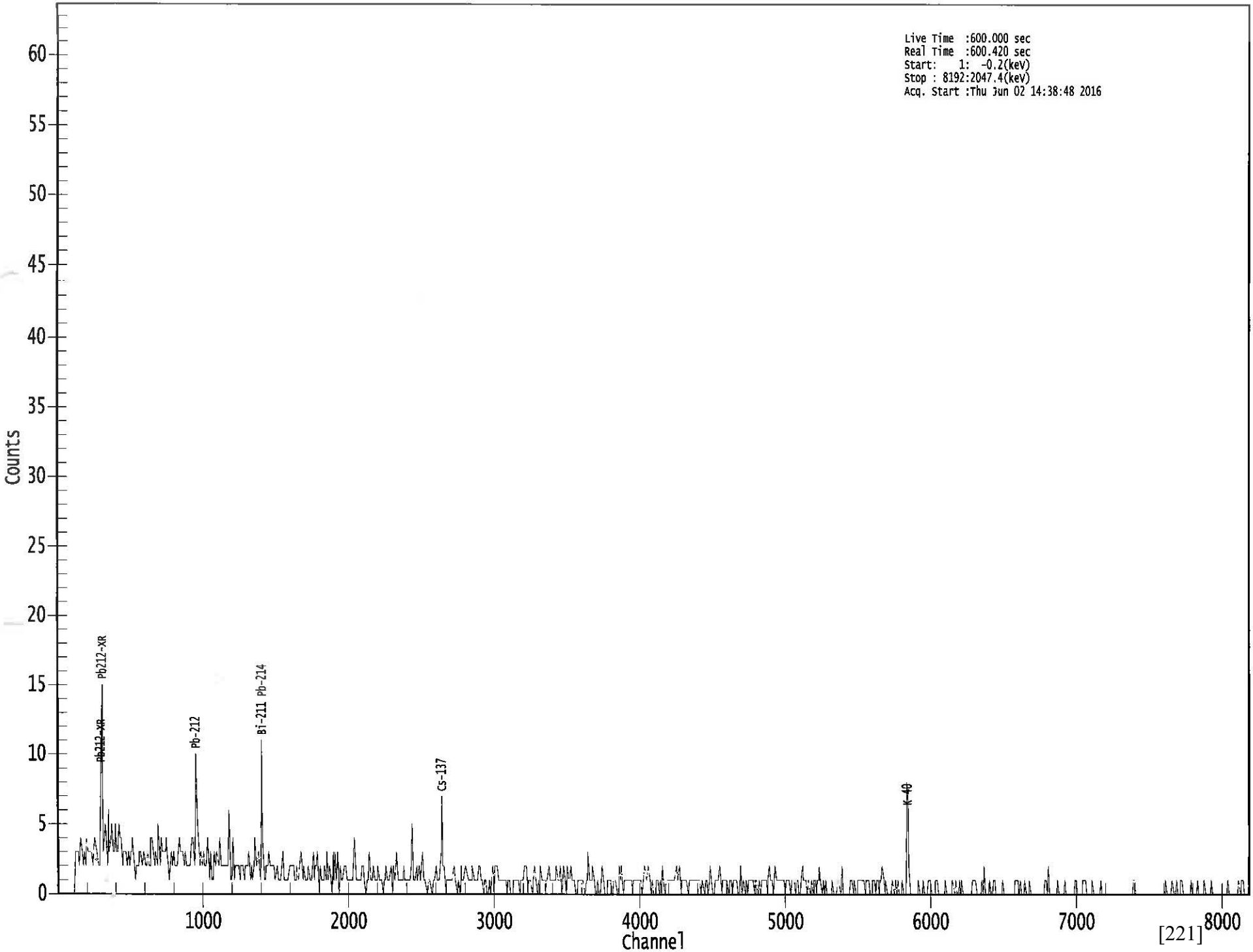
L3-10220C-FJGS-019SS (DRIED)

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	1588.20	3.22	-2.80E-01	4.63E-01	3.03E+00	miss
+	Pa-231	27.36	10.30	0.00E+00	3.08E-01	3.08E-01	miss
		283.69	1.70	-1.48E-01		2.83E+00	miss
		300.07	2.47	-5.26E-01		1.77E+00	miss
		302.65	2.20	0.00E+00		2.54E+00	miss
		330.06	1.40	-2.17E-01		3.81E+00	miss
+	Th-234	92.38	2.13	6.67E-01	4.49E+00	4.49E+00	miss
		92.80	2.10	2.27E+00		5.00E+00	miss
		112.81	0.21	7.54E+00		2.90E+01	miss
+	U-235	143.76	10.96	-4.37E-02	9.57E-02	3.15E-01	miss
		163.33	5.08	-2.61E-01		6.33E-01	miss
		185.71	57.20	1.93E-02		9.57E-02	miss
		202.11	1.08	-3.15E-01		3.18E+00	miss
		205.31	5.01	5.45E-02		7.91E-01	miss
+	Am-241	59.54	35.90	-1.81E-01	4.89E-01	4.89E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000015059.CNF



Apex-Gamma

Analysis Report for 05-May-16-10009
L3-10220C-FQGS-011SS (DRIED)

GAMMA SPECTRUM ANALYSIS

Sample Identification	: 05-May-16-10009
Sample Description	: L3-10220C-FQGS-011SS (DRIED)
Sample Type	: 1L 130G Soil Sample
Unit	:
Sample Point	:
Sample Size	: 1.091E+03 grams
Facility	: Default
Sample Taken On	: 5/2/2016 1:05:00PM
Acquisition Started	: 5/5/2016 10:39:24AM
Procedure	: 130G 1L Soil Sample
Operator	: JWelch
Detector Name	: P40818B
Geometry	: 130G Soil
Live Time	: 1800.0 seconds
Real Time	: 1803.1 seconds
Dead Time	: 0.17 %
Peak Locate Threshold	: 2.80
Peak Locate Range (in channels)	: 120 - 8192
Peak Area Range (in channels)	: 120 - 8192
Identification Energy Tolerance	: 1.000FWHM
Energy Calibration Used Done On	: 1/27/2016
Efficiency Calibration Used Done On	: 1/5/2015
Efficiency Calibration Description	:
Sample Number	: 14854

5/5/16

PEAK WITH NID REPORT

Peak Analysis Performed on : 5/5/2016 11:09:33AM

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

Tentative NID Library : C:\Canberra\Apex\Root\Default\Library\Zion Lib-BNL.NLB
Peak Match Tolerance : 1.000FWHM

5-5-16

DATA VALIDATED 6/2/16

Analysis Report for 05-May-16-10009

L3-10220C-FQGS-011SS (DRIED)

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	Tentative Nuclide
M	1	238.59	948 -	974	954.86	2.47E+02	33.40	1.46E+02	Pb-212
m	2	241.45	948 -	974	966.30	5.17E+01	17.95	1.19E+02	Pb-214
	3	295.24	1175 -	1186	1181.31	5.08E+01	28.04	1.16E+02	Pb-214 Eu-152
	4	338.24	1346 -	1359	1353.20	4.18E+01	24.08	8.44E+01	Ac-228
	5	351.83	1403 -	1414	1407.49	1.01E+02	29.23	1.01E+02	Pb-214 Bi-211
	6	462.55	1846 -	1855	1850.13	1.59E+01	17.28	5.82E+01	Cs-138 Ac-228 Sb-125
	7	510.63	2036 -	2047	2042.38	3.31E+01	22.23	8.18E+01	..... Ac228-511
	8	583.14	2325 -	2337	2332.35	5.84E+01	21.69	5.12E+01	Tl-208
	9	609.27	2430 -	2442	2436.81	8.64E+01	23.91	4.92E+01	Bi-214
	10	661.43	2638 -	2654	2645.44	1.43E+02	28.20	4.67E+01	Cs-137
	11	768.54	3068 -	3079	3073.83	2.03E+01	12.58	1.74E+01	Bi-214
	12	911.15	3637 -	3652	3644.30	5.52E+01	18.19	2.35E+01	Ac-228
	13	968.77	3869 -	3881	3874.85	3.15E+01	14.41	1.90E+01	Ac-228
	14	1460.32	5831 -	5854	5842.26	2.83E+02	34.14	6.54E+00	K-40

JTW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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	Coinc Corr
K-40	0.98	1460.82	*	10.66	5.30E+00	7.89E-01	miss
Cs-137	0.99	661.66	*	85.10	1.95E-01	4.52E-02	miss
Tl-208	1.00	583.19	*	85.00	7.35E-02	2.87E-02	miss
Pb-212	1.00	115.18		0.60			
		238.63	*	43.60	3.32E-01	7.01E-02	miss
		300.09		3.30			
Bi-214	1.00	609.32	*	45.49	2.09E-01	6.32E-02	miss
		768.36	*	4.89	5.34E-01	3.37E-01	miss
		806.18		1.26			
		934.06		3.11			

Analysis Report for 05-May-16-10009

L3-10220C-FQGS-011SS (DRIED)

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty	Coinc Corr
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	4.22E-01	1.61E-01	miss
		295.22	*	18.42	1.86E-01	1.07E-01	miss
		351.93	*	35.60	2.14E-01	7.06E-02	miss
		785.96		1.06			
Ac-228	0.99	129.07		2.42			
		209.25		3.89			
		270.24		3.46			
		328.00		2.95			
		338.32	*	11.27	2.72E-01	1.63E-01	miss
		409.46		1.92			
		463.00	*	4.40	3.29E-01	3.61E-01	miss
		794.95		4.25			
		911.20	*	25.80	3.10E-01	1.06E-01	miss
		964.77		4.39			
		968.97	*	15.80	3.01E-01	1.40E-01	miss
		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 : 1.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

INTERFERENCE CORRECTED REPORT

Analysis Report for 05-May-16-10009

L3-10220C-FQGS-011SS (DRIED)

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
	K-40	0.985	5.30E+00	7.89E-01	
	Cs-137	0.997	1.95E-01	4.52E-02	
	Tl-208	1.000	7.35E-02	2.87E-02	
X	Bi-211	0.966			
	Pb-212	1.000	3.32E-01	7.01E-02	
	Bi-214	1.000	2.20E-01	6.21E-02	
	Pb-214	0.998	2.31E-01	5.53E-02	
	Ac-228	0.999	3.01E-01	7.33E-02	

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

Errors quoted at 2.000sigma

Analysis Report for 05-May-16-10009

L3-10220C-FQGS-011SS (DRIED)

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/5/2016 11:09:33AM
Peak Locate From Channel : 120
Peak Locate To Channel : 8192

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
7	510.63	1.84024E-02	33.55		

ANH-511
JPW 5-5-16

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

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)	Coinc Corr
+	K-40	1460.82	*	10.66	5.30E+00	2.32E-01	2.32E-01	miss
+	Cr-51	320.08		9.91	5.76E-03	2.16E-01	2.16E-01	free
+	Mn-54	834.85		99.98	5.85E-03	2.76E-02	2.76E-02	miss
+	Co-58	810.76		99.45	-1.84E-03	1.66E-02	1.66E-02	miss
		1674.73		0.52	-6.62E-01		3.25E+00	miss
+	Co-60	1173.23		99.85	-2.39E-03	3.11E-02	3.23E-02	miss
		1332.49		99.98	8.09E-03		3.11E-02	miss
+	Nb-94	702.65		99.81	5.81E-04	1.98E-02	2.52E-02	miss
		871.09		99.89	-7.49E-03		1.98E-02	miss
+	Ag-108m	79.13		6.60	5.17E-01	2.37E-02	1.00E+00	miss
		433.94		90.50	7.06E-04		2.46E-02	miss
		614.28		89.80	6.76E-03		3.03E-02	miss
		722.94		90.80	-1.14E-04		2.37E-02	miss
+	Sn-113	255.13		2.11	1.02E-01	3.48E-02	1.07E+00	free
		391.70		64.97	3.56E-03		3.48E-02	free
+	Cs-134	475.36		1.48	-9.17E-01	2.47E-02	1.10E+00	miss
		563.25		8.34	5.38E-03		3.02E-01	miss
		569.33		15.37	-2.34E-02		1.29E-01	miss

Analysis Report for 05-May-16-10009

L3-10220C-FQGS-011SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Cs-134	604.72		97.62	-6.76E-04	2.47E-02	2.47E-02	miss
		795.86		85.46	6.82E-03		3.11E-02	miss
		801.95		8.69	8.82E-02		3.08E-01	miss
		1038.61		0.99	8.52E-01		3.01E+00	miss
		1167.97		1.79	-3.67E-01		1.74E+00	miss
		1365.19		3.02	-7.66E-02		5.86E-01	miss
+	Cs-137	661.66	*	85.10	1.95E-01	3.75E-02	3.75E-02	miss
+	Eu-152	121.78		28.67	-2.62E-03	6.98E-02	8.84E-02	miss
		244.70		7.61	-1.06E-01		2.61E-01	miss
		295.94		0.45	-4.14E-01		6.90E+00	miss
		344.28		26.60	-4.01E-02		6.98E-02	miss
		367.79		0.86	9.80E-01		2.76E+00	miss
		411.12		2.24	1.10E-01		1.03E+00	miss
		443.96		2.83	5.64E-02		7.36E-01	miss
		488.68		0.42	6.01E-02		5.06E+00	miss
		563.99		0.49	1.77E+00		5.43E+00	miss
		586.26		0.46	-4.07E+00		5.61E+00	miss
		678.62		0.47	-3.35E-02		4.38E+00	miss
		688.67		0.86	7.29E-01		3.05E+00	miss
		719.35		0.28	2.61E+00		8.62E+00	miss
		778.90		12.96	-3.13E-02		1.51E-01	miss
		810.45		0.32	-1.11E+00		5.00E+00	miss
		867.37		4.26	-1.75E-01		6.18E-01	miss
		919.33		0.43	1.22E+00		5.93E+00	miss
		964.08		14.65	6.03E-02		2.36E-01	miss
		1085.87		10.24	3.91E-02		2.09E-01	miss
		1089.74		1.73	-2.25E-02		1.33E+00	miss
		1112.07		13.69	-4.00E-02		1.81E-01	miss
		1212.95		1.43	8.42E-01		2.55E+00	miss
		1249.94		0.19	9.05E+00		2.07E+01	miss
		1299.14		1.63	-4.39E-01		1.79E+00	miss
		1408.01		21.07	4.14E-02		1.39E-01	miss
		1457.64		0.50	-2.33E+00		1.26E+01	miss
		1528.10		0.28	1.15E+00		6.82E+00	miss
+	Eu-154	123.07		40.40	1.70E-02	6.15E-02	6.15E-02	miss
		247.93		6.89	-1.27E-01		2.84E-01	miss
		591.76		4.95	1.61E-01		5.57E-01	miss
		692.42		1.78	-2.09E-01		9.55E-01	miss
		723.30		20.06	-1.38E-02		9.80E-02	miss
		756.80		4.52	3.17E-02		5.12E-01	miss
		873.18		12.08	-2.24E-02		1.75E-01	miss
		996.29		10.48	-3.18E-02		2.21E-01	miss
		1004.76		18.01	1.20E-02		1.50E-01	miss
		1274.43		34.80	-1.01E-02		7.81E-02	miss
		1596.48		1.80	1.34E-01		1.68E+00	miss
+	Eu-155	45.30		1.31	4.75E+00	1.43E-01	1.71E+01	miss
		60.01		1.22	7.04E+00		1.75E+01	miss
		86.55		30.70	-3.82E-02		1.49E-01	miss
		105.31		21.10	6.23E-03		1.43E-01	miss
+	Tl-208	583.19	*	85.00	7.35E-02	3.53E-02	3.53E-02	miss
+	Bi-211	351.07	*	13.02	5.86E-01	2.17E-01	2.17E-01	miss

Analysis Report for 05-May-16-10009

L3-10220C-FQGS-011SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
+	Pb-211	404.85		3.78	-2.48E-01	5.28E-01	5.28E-01	miss
		427.09		1.76	-1.09E-01		1.13E+00	miss
		832.01		3.52	-1.88E-01		6.13E-01	miss
+	Bi-212	39.86		1.06	-1.36E+00	4.75E-01	1.70E+01	miss
		727.33		6.67	2.19E-01		4.75E-01	miss
		785.37		1.10	2.52E-01		2.39E+00	miss
		1620.50		1.47	4.05E-01		1.77E+00	miss
+	Pb-212	115.18		0.60	1.66E+00	5.72E-02	4.48E+00	miss
		238.63	*	43.60	3.32E-01		5.72E-02	miss
		300.09		3.30	3.82E-01		7.33E-01	miss
+	Pb212-XR	74.82		10.28	5.44E-01	4.96E-01	8.72E-01	miss
		77.11		17.10	4.70E-01		4.96E-01	miss
		87.35		3.97	7.25E-01		1.21E+00	miss
		89.78		1.46	5.59E-01		2.97E+00	miss
+	Bi-214	609.32	*	45.49	2.09E-01	6.65E-02	6.65E-02	miss
		768.36	*	4.89	5.34E-01		4.52E-01	miss
		806.18		1.26	8.43E-01		2.42E+00	miss
		934.06		3.11	-1.31E-01		8.60E-01	miss
		1120.29		14.92	1.48E-01		2.94E-01	miss
		1155.21		1.63	4.45E-02		1.56E+00	miss
		1238.12		5.83	2.68E-01		7.46E-01	miss
		1280.98		1.43	8.81E-01		2.21E+00	miss
		1377.67		3.99	3.15E-01		7.61E-01	miss
		1385.31		0.79	5.67E-01		3.17E+00	miss
		1401.52		1.33	1.87E-01		1.91E+00	miss
		1407.99		2.39	3.65E-01		1.22E+00	miss
		1509.21		2.13	3.03E-01		1.26E+00	miss
		1661.27		1.05	2.46E-01		2.27E+00	miss
		1729.59		2.88	3.96E-01		1.04E+00	miss
		1764.49		15.30	2.28E-01		3.31E-01	miss
		1847.43		2.03	6.93E-01		1.96E+00	miss
>		2118.51		1.16	0.00E+00		0.00E+00	miss
+	Pb-214	241.99	*	7.25	4.22E-01	7.93E-02	3.15E-01	miss
		295.22	*	18.42	1.86E-01		1.55E-01	miss
		351.93	*	35.60	2.14E-01		7.93E-02	miss
		785.96		1.06	-2.95E-01		2.32E+00	miss
+	Pb214-XR	74.82		5.80	9.65E-01	8.74E-01	1.55E+00	miss
		77.11		9.70	8.28E-01		8.74E-01	miss
		87.35		2.24	1.29E+00		2.14E+00	miss
		89.78		0.82	9.95E-01		5.30E+00	miss
+	Ra-226	186.21		3.64	6.71E-01	7.28E-01	7.28E-01	miss
+	Ac-228	129.07		2.42	1.39E-01	1.12E-01	1.09E+00	miss
		209.25		3.89	2.93E-01		6.44E-01	miss
		270.24		3.46	2.53E-01		7.17E-01	miss
		328.00		2.95	-9.93E-02		8.18E-01	miss
		338.32	*	11.27	2.72E-01		2.35E-01	miss
		409.46		1.92	3.85E-01		1.27E+00	miss
		463.00	*	4.40	3.29E-01		5.78E-01	miss
		794.95		4.25	5.43E-01		7.76E-01	miss
		911.20	*	25.80	3.10E-01		1.12E-01	miss
		964.77		4.99	1.41E-01		6.77E-01	miss

Analysis Report for 05-May-16-10009

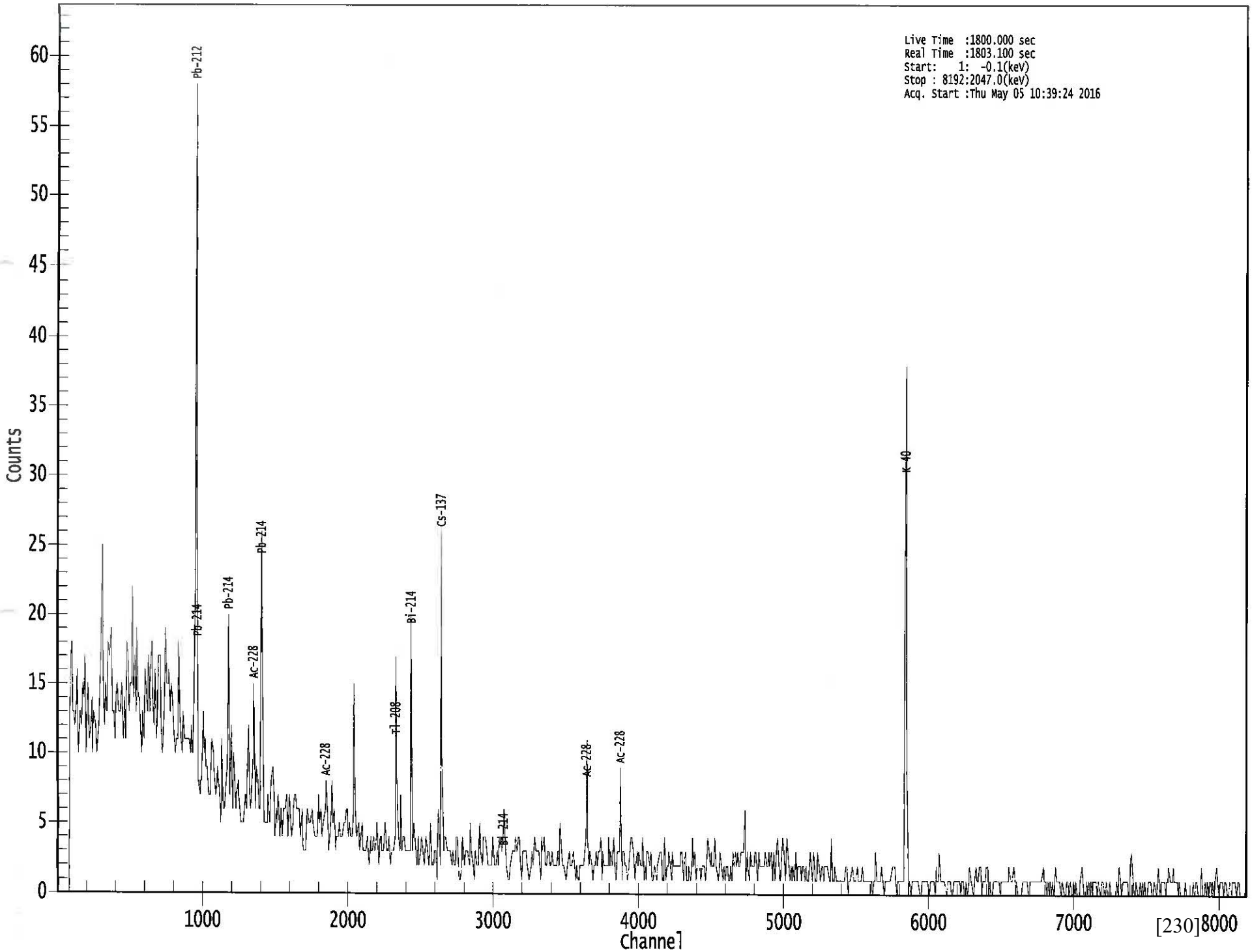
L3-10220C-FQGS-011SS (DRIED)

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)	Coinc Corr
	Ac-228	968.97	*	15.80	3.01E-01	1.12E-01	1.68E-01	miss
		1588.20		3.22	3.08E-01		9.95E-01	miss
+	Pa-231	27.36		10.30	-2.21E-01	9.51E-01	1.85E+00	miss
		283.69		1.70	4.25E-01		1.32E+00	miss
		300.07		2.47	5.11E-01		9.79E-01	miss
		302.65		2.20	-2.95E-01		9.51E-01	miss
		330.06		1.40	6.10E-01		1.80E+00	miss
+	Th-234	92.38		2.13	8.82E-01	2.24E+00	2.24E+00	miss
		92.80		2.10	1.31E+00		2.29E+00	miss
		112.81		0.21	-4.55E+00		1.33E+01	miss
+	U-235	143.76		10.96	1.52E-02	4.35E-02	1.87E-01	miss
		163.33		5.08	1.97E-01		4.65E-01	miss
		185.71		57.20	2.82E-02		4.35E-02	miss
		202.11		1.08	1.26E-01		1.83E+00	miss
		205.31		5.01	1.18E-01		4.17E-01	miss
+	Am-241	59.54		35.90	1.90E-01	6.14E-01	6.14E-01	miss

\+ = 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

Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.

0000014854.CNF



ATTACHMENT 7
EBERLINE ANALYTICAL REPORTS

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
101 Shiloh Blvd
Zion, IL 60099

Work Order Details:
SDG: 17-03011
Purchase Order: 671498
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
17-03011-01	LCS	KNOWN	03/03/17 00:00	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	1.51E+03	4.52E+01				pCi/g
17-03011-01	LCS	SPIKE	03/03/17 00:00	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	1.52E+03	9.33E+00	9.01E+01	2.11E+00		pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	1.58E+00	1.27E+00	1.27E+00	2.11E+00	U	pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	2.19E+00	1.39E+00	1.39E+00	2.29E+00	U	pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	1.71E+00	1.37E+00	1.37E+00	2.28E+00	U	pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	3.46E+00	1.39E+00	1.40E+00	2.25E+00		pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	2.88E-01	1.36E+00	1.36E+00	2.31E+00	U	pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	-1.69E+00	1.65E+00	1.65E+00	2.90E+00	U	pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	6.89E-01	1.40E+00	1.40E+00	2.37E+00	U	pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	8.22E-01	1.30E+00	1.30E+00	2.20E+00	U	pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	1.06E+00	1.27E+00	1.27E+00	2.13E+00	U	pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	3.84E+00	1.40E+00	1.42E+00	2.25E+00		pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/14/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	2.34E+00	1.48E+00	1.49E+00	2.44E+00	U	pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/15/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	1.97E+00	1.36E+00	1.37E+00	2.26E+00	U	pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/15/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	1.09E+00	1.42E+00	1.42E+00	2.39E+00	U	pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/15/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	9.12E-01	1.44E+00	1.44E+00	2.44E+00	U	pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/15/2017	17-03011	Nickel-63	ASTM 3500-Ni Modified	1.02E+01	1.52E+00	1.64E+00	2.24E+00		pCi/g
17-03011-01	LCS	KNOWN	03/03/17 00:00	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	5.43E+01	3.04E-01				pCi/g
17-03011-01	LCS	SPIKE	03/03/17 00:00	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	6.16E+01	1.65E+00	2.15E+01	8.24E-01		pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	-2.14E-02	4.23E-01	4.23E-01	9.04E-01	U	pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	7.78E-01	3.45E-01	4.39E-01	6.48E-01		pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	5.42E-01	3.48E-01	3.96E-01	6.83E-01	U	pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	3.59E-01	3.59E-01	3.81E-01	7.29E-01	U	pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	3.97E-01	3.66E-01	3.91E-01	7.40E-01	U	pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	5.85E-01	4.17E-01	4.64E-01	8.27E-01	U	pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	6.39E-02	3.97E-01	3.98E-01	8.41E-01	U	pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	9.84E-01	3.37E-01	4.80E-01	6.09E-01		pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	4.59E-01	3.45E-01	3.80E-01	6.86E-01	U	pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	6.36E-01	3.86E-01	4.45E-01	7.54E-01	U	pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	8.09E-01	4.19E-01	5.05E-01	8.12E-01	U	pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	7.29E-01	3.98E-01	4.72E-01	7.75E-01	U	pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	3.09E-01	3.90E-01	4.04E-01	8.00E-01	U	pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	1.03E-01	3.61E-01	3.62E-01	7.59E-01	U	pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/27/2017	17-03011	Strontium-90	EIChroM SRW01 Modified	5.03E-01	3.78E-01	4.17E-01	7.53E-01	U	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank; DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:

Patricia Giza
Zion Solutions
101 Shiloh Blvd
Zion, IL 60099

Work Order Details:

SDG: **17-03011**
Purchase Order: 671498
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
17-03011-01	LCS	KNOWN	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	6.21E+01	2.48E+00				pCi/g
17-03011-01	LCS	KNOWN	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	3.94E+01	1.58E+00				pCi/g
17-03011-01	LCS	SPIKE	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	7.58E+01	5.03E+00	6.36E+00	6.59E-01		pCi/g
17-03011-01	LCS	SPIKE	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	4.44E+01	4.02E+00	4.62E+00	6.97E-01		pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	4.74E-02	4.81E-02	4.82E-02	8.85E-02	U	pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	1.72E-02	2.56E-02	2.57E-02	4.39E-02	U	pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	1.29E-02	1.46E-02	1.46E-02	2.73E-02	U	pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	-1.28E-04	1.27E-02	1.27E-02	1.91E-02	U	pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	6.40E-03	1.48E-02	1.48E-02	2.34E-02	U	pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	1.37E-01	1.68E-01	1.69E-01	3.28E-01	U	pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	6.28E-03	1.70E-02	1.70E-02	2.64E-02	U	pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	-3.01E-03	2.42E-02	2.42E-02	3.65E-02	U	pCi/g
17-03011-02	MBL	BLANK	03/03/17 00:00	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	-5.23E-03	4.16E-02	4.16E-02	6.34E-02	U	pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	4.11E-01	1.33E-01	1.34E-01	2.02E-01		pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	4.84E-01	1.17E-01	1.19E-01	1.04E-01		pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	-2.54E-03	3.32E-02	3.32E-02	4.18E-02	U	pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	2.64E-04	1.18E-02	1.18E-02	4.72E-02	U	pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	5.75E-02	4.30E-02	4.31E-02	7.05E-02	U	pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	1.01E+01	1.11E+00	1.23E+00	4.65E-01		pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	4.00E-01	5.25E-02	5.64E-02	8.50E-02		pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	3.90E-01	1.31E-01	1.33E-01	9.32E-02		pCi/g
17-03011-03	DUP	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	2.46E-01	6.92E-02	7.04E-02	5.39E-02		pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	4.23E-01	1.04E-01	1.06E-01	2.03E-01		pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	4.66E-01	1.11E-01	1.13E-01	8.49E-02		pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	4.50E-04	3.33E-02	3.33E-02	3.46E-02	U	pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	-5.96E-03	1.09E-02	1.09E-02	4.15E-02	U	pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	6.04E-02	3.06E-02	3.08E-02	4.76E-02		pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	1.02E+01	1.13E+00	1.24E+00	5.53E-01		pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	3.75E-01	5.11E-02	5.46E-02	8.70E-02		pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	4.00E-01	1.33E-01	1.35E-01	1.11E-01		pCi/g
17-03011-04	DO	L310212AFRGS002SS-A	05/11/16 10:30	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	1.86E-01	6.47E-02	6.54E-02	6.95E-02		pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank; DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:

Patricia Giza
Zion Solutions
101 Shiloh Blvd
Zion, IL 60099

Work Order Details:

SDG: **17-03011**
Purchase Order: 671498
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
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	3.95E-01	6.68E-02	6.98E-02	2.26E-01		pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	3.88E-01	6.28E-02	6.59E-02	8.04E-02		pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	1.89E-02	2.04E-02	2.04E-02	2.86E-02	U	pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	-3.06E-03	1.04E-02	1.04E-02	2.78E-02	U	pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	4.11E-01	6.15E-02	6.50E-02	3.88E-02		pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	6.85E+00	8.02E-01	8.76E-01	2.60E-01		pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	3.45E-01	5.27E-02	5.56E-02	4.16E-02		pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	3.73E-01	6.08E-02	6.37E-02	7.27E-02		pCi/g
17-03011-05	TRG	L310213AFRGS008SS-A	04/14/16 08:00	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	3.93E-01	7.55E-02	7.82E-02	6.80E-02		pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	3.14E-01	1.00E-01	1.02E-01	1.05E-01		pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	3.82E-01	7.07E-02	7.34E-02	7.96E-02		pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	2.05E-03	1.95E-02	1.95E-02	2.33E-02	U	pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	4.00E-03	6.34E-03	6.34E-03	2.49E-02	U	pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	2.25E-02	2.00E-02	2.01E-02	3.30E-02	U	pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	8.06E+00	1.03E+00	1.11E+00	4.94E-01		pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	3.61E-01	1.24E-01	1.26E-01	6.77E-02		pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	3.73E-01	1.30E-01	1.31E-01	6.84E-02		pCi/g
17-03011-06	TRG	L310219AFRGS006SS-A	10/03/16 09:10	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	2.87E-01	7.16E-02	7.31E-02	5.18E-02		pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	2.85E-01	1.06E-01	1.07E-01	2.08E-01		pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	4.30E-01	9.29E-02	9.55E-02	1.27E-01		pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	1.61E-03	9.25E-03	9.25E-03	5.27E-02	U	pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	8.33E-03	1.55E-02	1.55E-02	4.39E-02	U	pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	6.93E-01	1.06E-01	1.12E-01	6.05E-02		pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	4.65E+00	7.78E-01	8.14E-01	5.30E-01		pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	5.59E-02	5.32E-02	5.33E-02	1.04E-01	U	pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	3.45E-01	8.88E-02	9.05E-02	1.15E-01		pCi/g
17-03011-07	TRG	L310219BFRGS004SS-A	09/27/16 08:25	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	2.39E-01	8.59E-02	8.67E-02	1.47E-01		pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank; DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:		Work Order Details:	
Patricia Giza		SDG:	17-03011
Zion Solutions		Purchase Order:	671498
101 Shiloh Blvd		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
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	2.93E-01	1.05E-01	1.06E-01	2.39E-01		pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	3.41E-01	6.34E-02	6.57E-02	1.35E-01		pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	-3.32E-02	4.28E-02	4.28E-02	5.98E-02	U	pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	6.49E-03	2.04E-02	2.04E-02	4.57E-02	U	pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	4.03E-01	7.19E-02	7.49E-02	8.51E-02		pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	8.03E+00	1.20E+00	1.27E+00	6.92E-01		pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	3.68E-01	5.53E-02	5.84E-02	1.09E-01		pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	2.92E-01	6.40E-02	6.57E-02	1.03E-01		pCi/g
17-03011-08	TRG	L310220CRFGS002SS-A	05/23/16 14:30	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	4.27E-01	1.02E-01	1.04E-01	1.72E-01		pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	2.67E-01	1.03E-01	1.03E-01	7.51E-02		pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	3.06E-01	6.14E-02	6.33E-02	6.49E-02		pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	1.29E-02	1.47E-02	1.47E-02	1.62E-02	U	pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	1.85E-03	5.88E-03	5.88E-03	2.29E-02	U	pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	5.77E-03	1.18E-02	1.18E-02	1.84E-02	U	pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	4.97E+00	6.50E-01	6.98E-01	3.09E-01		pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	2.92E-01	9.35E-02	9.47E-02	5.97E-02		pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	3.26E-01	1.09E-01	1.11E-01	5.08E-02		pCi/g
17-03011-09	TRG	L310223AFRGS004SS-A	04/25/16 13:15	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	2.49E-01	6.26E-02	6.39E-02	6.96E-02		pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	4.56E-01	8.81E-02	9.11E-02	1.90E-01		pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	3.52E-01	1.14E-01	1.16E-01	7.67E-02		pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	-1.95E-03	2.38E-02	2.38E-02	2.96E-02	U	pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	-2.43E-03	1.04E-02	1.04E-02	3.39E-02	U	pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	1.68E-02	1.97E-02	1.97E-02	3.18E-02	U	pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	5.89E+00	7.05E-01	7.67E-01	4.46E-01		pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	5.13E-01	5.35E-02	5.96E-02	8.50E-02		pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	4.53E-01	1.30E-01	1.32E-01	6.76E-02		pCi/g
17-03011-10	TRG	L310224AFRGS004SS-A	06/02/16 12:40	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	3.20E-01	6.85E-02	7.04E-02	3.88E-02		pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank; DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:
Patricia Giza
Zion Solutions
101 Shiloh Blvd
Zion, IL 60099

Work Order Details:
SDG: 17-03011
Purchase Order: 671498
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
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	3.10E-01	1.38E-01	1.39E-01	2.87E-01		pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	2.90E-01	8.05E-02	8.19E-02	1.08E-01		pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	-1.08E-02	4.50E-02	4.50E-02	5.74E-02	U	pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	7.65E-03	1.58E-02	1.58E-02	4.69E-02	U	pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	3.28E-01	6.71E-02	6.92E-02	8.42E-02		pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	9.77E+00	1.40E+00	1.49E+00	6.37E-01		pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	3.17E-01	5.43E-02	5.66E-02	9.23E-02		pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	3.38E-01	7.09E-02	7.30E-02	1.13E-01		pCi/g
17-03011-11	TRG	L310301AFRGS003SS-A	06/14/16 13:27	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	3.08E-01	1.13E-01	1.14E-01	1.65E-01		pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	4.28E-01	8.53E-02	8.80E-02	1.50E-01		pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	3.40E-01	7.01E-02	7.22E-02	9.44E-02		pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	1.84E-02	2.40E-02	2.40E-02	3.33E-02	U	pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	-2.32E-02	2.89E-02	2.89E-02	3.14E-02	U	pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	2.81E-02	2.43E-02	2.43E-02	3.95E-02	U	pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	7.18E+00	8.97E-01	9.70E-01	5.24E-01		pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	5.13E-01	7.92E-02	8.35E-02	6.71E-02		pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	3.46E-01	5.95E-02	6.21E-02	7.38E-02		pCi/g
17-03011-12	TRG	L310212AFJGS019SS-A	05/16/16 10:45	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	3.96E-01	8.55E-02	8.78E-02	1.12E-01		pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/6/2017	17-03011	Actinium-228	LANL ER-130 Modified	2.89E-01	1.08E-01	1.09E-01	1.71E-01		pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/6/2017	17-03011	Bismuth-214	LANL ER-130 Modified	4.18E-01	8.65E-02	8.91E-02	7.83E-02		pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/6/2017	17-03011	Cobalt-60	LANL ER-130 Modified	6.19E-03	2.06E-02	2.06E-02	2.63E-02	U	pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/6/2017	17-03011	Cesium-134	LANL ER-130 Modified	6.73E-03	1.17E-02	1.17E-02	2.91E-02	U	pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/6/2017	17-03011	Cesium-137	LANL ER-130 Modified	6.84E-02	2.08E-02	2.11E-02	3.89E-02		pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/6/2017	17-03011	Potassium-40	LANL ER-130 Modified	7.14E+00	9.28E-01	9.97E-01	4.26E-01		pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/6/2017	17-03011	Lead-212	LANL ER-130 Modified	3.24E-01	1.13E-01	1.15E-01	9.05E-02		pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/6/2017	17-03011	Lead-214	LANL ER-130 Modified	3.61E-01	1.29E-01	1.30E-01	5.38E-02		pCi/g
17-03011-13	TRG	L310219AFRJS019SS-A	09/27/16 12:30	3/3/2017	3/6/2017	17-03011	Thallium-208	LANL ER-130 Modified	2.52E-01	7.63E-02	7.74E-02	1.17E-01		pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank; DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect

Eberline Analytical
Final Report of Analysis

Report To:

Patricia Giza
Zion Solutions
101 Shiloh Blvd
Zion, IL 60099

Work Order Details:

SDG: **17-03011**
Purchase Order: 671498
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
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/7/2017	17-03011	Actinium-228	LANL ER-130 Modified	2.73E-01	9.62E-02	9.72E-02	1.03E-01		pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/7/2017	17-03011	Bismuth-214	LANL ER-130 Modified	2.99E-01	6.02E-02	6.21E-02	6.14E-02		pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/7/2017	17-03011	Cobalt-60	LANL ER-130 Modified	2.51E-02	1.55E-02	1.56E-02	2.24E-02		pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/7/2017	17-03011	Cesium-134	LANL ER-130 Modified	-5.07E-03	9.42E-03	9.43E-03	2.76E-02	U	pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/7/2017	17-03011	Cesium-137	LANL ER-130 Modified	3.38E-01	4.02E-02	4.38E-02	3.33E-02		pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/7/2017	17-03011	Potassium-40	LANL ER-130 Modified	6.77E+00	8.72E-01	9.39E-01	3.88E-01		pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/7/2017	17-03011	Lead-212	LANL ER-130 Modified	3.17E-01	1.10E-01	1.11E-01	6.70E-02		pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/7/2017	17-03011	Lead-214	LANL ER-130 Modified	2.31E-01	8.83E-02	8.91E-02	5.75E-02		pCi/g
17-03011-14	TRG	L310220CFRGS009SS-A	05/02/16 14:00	3/3/2017	3/7/2017	17-03011	Thallium-208	LANL ER-130 Modified	3.12E-01	7.53E-02	7.70E-02	5.09E-02		pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/7/2017	17-03011	Actinium-228	LANL ER-130 Modified	3.28E-01	5.75E-02	5.99E-02	1.19E-01		pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/7/2017	17-03011	Bismuth-214	LANL ER-130 Modified	2.77E-01	5.55E-02	5.72E-02	7.49E-02		pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/7/2017	17-03011	Cobalt-60	LANL ER-130 Modified	2.22E-03	1.65E-02	1.65E-02	2.20E-02	U	pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/7/2017	17-03011	Cesium-134	LANL ER-130 Modified	2.87E-03	6.84E-03	6.84E-03	1.89E-02	U	pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/7/2017	17-03011	Cesium-137	LANL ER-130 Modified	2.03E-02	1.30E-02	1.30E-02	2.04E-02	U	pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/7/2017	17-03011	Potassium-40	LANL ER-130 Modified	6.22E+00	6.92E-01	7.62E-01	2.36E-01		pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/7/2017	17-03011	Lead-212	LANL ER-130 Modified	2.87E-01	4.16E-02	4.42E-02	4.20E-02		pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/7/2017	17-03011	Lead-214	LANL ER-130 Modified	2.66E-01	4.22E-02	4.44E-02	4.27E-02		pCi/g
17-03011-15	TRG	L310224AFRGS012SS-A	06/02/16 14:16	3/3/2017	3/7/2017	17-03011	Thallium-208	LANL ER-130 Modified	2.87E-01	5.58E-02	5.77E-02	4.54E-02		pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/7/2017	17-03011	Actinium-228	LANL ER-130 Modified	3.84E-01	1.09E-01	1.11E-01	2.05E-01		pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/7/2017	17-03011	Bismuth-214	LANL ER-130 Modified	2.85E-01	9.70E-02	9.81E-02	1.05E-01		pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/7/2017	17-03011	Cobalt-60	LANL ER-130 Modified	8.55E-03	3.20E-02	3.20E-02	5.09E-02	U	pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/7/2017	17-03011	Cesium-134	LANL ER-130 Modified	1.76E-03	1.48E-02	1.48E-02	4.53E-02	U	pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/7/2017	17-03011	Cesium-137	LANL ER-130 Modified	3.37E-01	6.23E-02	6.46E-02	7.54E-02		pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/7/2017	17-03011	Potassium-40	LANL ER-130 Modified	6.05E+00	8.31E-01	8.87E-01	5.71E-01		pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/7/2017	17-03011	Lead-212	LANL ER-130 Modified	4.33E-01	5.83E-02	6.23E-02	8.32E-02		pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/7/2017	17-03011	Lead-214	LANL ER-130 Modified	3.29E-01	1.49E-01	1.50E-01	1.23E-01		pCi/g
17-03011-16	TRG	L310301AFIGS017SS-A	06/14/16 13:40	3/3/2017	3/7/2017	17-03011	Thallium-208	LANL ER-130 Modified	2.56E-01	8.59E-02	8.69E-02	1.05E-01		pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample;MBL=Blank; DUP=Duplicate;TRG=Normal Sample;DO=Duplicate Original;U=Non-detect