LA CROSSE BOILING WATER REACTOR
FINAL STATUS SURVEY RELEASE RECORD

SURVEY UNIT L1-010-107
OUTSIDE EAST LSE AREA

LACROSSE SOLUTIONS

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LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
DQA	Data Quality Assessment
DQO	Data Quality Objective
DCGL	Derived Concentration Guideline Level
$DCGL_S$	Soil Derived Concentration Guideline Level
FSS	Final Status Survey
GPS	Global Positioning System
HSA	Historical Site Assessment
HTD	Hard-to-Detect
IC	Insignificant Contributors
LACBWR	La Crosse Boiling Water Reactor
LBGR	Lower Bound of the Gray Region
LSE	LACBWR Site Enclosure
LTP	License Termination Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
NaI	Sodium Iodide
$OpDCGL_S$	Soil Operational Derived Concentration Guideline Level
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Radiological Assessment
ROC	Radionuclides of Concern
SOF	Sum-of-Fractions
TEDE	Total Effective Dose Equivalent
UBGR	Upper Bound of the Gray Region
UCL	Upper Confidence Limit

1. EXECUTIVE SUMMARY

This Final Status Survey (FSS) Release Record for survey unit L1-010-107, the Outside East LSE Area, has been generated in accordance with LaCrosse*Solutions* procedure LC-FS-PR-009, *Final Status Survey Data Reporting* (Reference 1) and satisfies the requirements of Section 5.11 of the *La Crosse Boiling Water Reactor License Termination Plan* (LACBWR LTP) (Reference 2).

An FSS sample plan for this survey unit was developed in accordance with LaCrosse*Solutions* procedure LC-FS-PR-002, *Final Status Survey Package Development* (Reference 3), the LACBWR LTP, and with guidance from NUREG-1575, Revision 1, *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (Reference 4).

Survey unit L1-010-107, an open land survey unit, has a MARSSIM classification of 1. 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. As a systematic sample population, fourteen (14) soil samples were acquired from the survey unit. In addition, soil scanning was performed on 100% of the total surface area in the survey unit. The analytical results for all soil samples taken in survey unit L1-010-107 indicate that the maximum Sum-of-Fractions (SOF), considering the concentration of all applicable Radionuclides of Concern (ROC) either by direct measurement or by inference, is equal to 0.0795 when applying the respective Operational Derived Concentration Guideline Levels ($OpDCGL_S$) for soil. Therefore, the null hypothesis is rejected and survey unit L1-010-107 is acceptable for unrestricted release. The mean SOF when applying the respective Base Case DCGLs ($DCGL_S$) for soil is 0.0135. This SOF equates to a dose for the survey unit of 0.3377 mrem/yr.

2. SURVEY UNIT DESCRIPTION

Survey unit L1-010-107 is an impacted Class 1 open land survey unit. The surface area of the survey unit is 1,675 m^2.

The boundary of the survey unit and the location of the soil samples were defined using a Global Positioning System (GPS). Refer to Attachment 1 of this report for figures and maps depicting survey unit L1-010-107.

3. CLASSIFICATION BASIS

Survey unit L1-010-107 was not originally identified in the Historical Site Assessment (HSA) (Reference 5). Portions of survey units L2-011-101 and L2-011-102, as originally

defined in the HSA and during characterization, make up survey unit L1-010-107 in its FSS configuration. The following summarizes the results of the characterization survey for survey units L2-011-101 and L2-011-102.

The initial site characterization surveys performed by Energy*Solutions* were conducted between October 9, 2014, and August 6, 2015. In total, twenty-three (23) surface soil samples, twenty-three (23) subsurface soil samples, and twelve (12) asphalt samples were collected in survey units L2-011-101 and L2-011-102. All samples were analyzed by the on-site gamma spectroscopy system. For surface soil samples, Cs-137 was detected at concentrations above Minimum Detectable Concentration (MDC) in fourteen (14) of the samples, at a maximum concentration of 2.00E-01 pCi/g. Co-60 was not detected at concentrations above MDC in any of the surface soil samples. For subsurface soil samples, Cs-137 was detected at concentrations above MDC in four (4) of the samples, at a maximum concentration of 8.80E-02 pCi/g. Co-60 was detected at concentrations above MDC in one (1) of the subsurface soil samples, at a maximum concentration of 1.12E-01 pCi/g. For asphalt samples, Cs-137 was detected at concentrations above MDC in three (3) of the samples, at a maximum concentration of 5.50E-02 pCi/g. Co-60 was not detected at concentrations above MDC in any of the asphalt samples. A summary of the analyses for the surface soil, subsurface soil, and asphalt samples taken during site characterization are presented in Table 3-1.

Three (3) surface soil, five (5) subsurface soil, two (2) sediment, and three (3) asphalt samples from characterization were sent to Test America Laboratories for off-site analysis. A summary of the off-site analyses is presented in Table 3-2.

Table 3-1 - Statistical Quantities for Cs-137 and Co-60 from the Characterization Survey

L2-011-101			L2-011-102		
Surface Soil	**Co-60**	**Cs-137**	**Surface Soil**	**Co-60**	**Cs-137**
# of Samples	13		# of Samples	10	
# >MDC	0	8	# >MDC	0	6
Mean (pCi/g)	7.30E-02	9.00E-02	Mean (pCi/g)	6.40E-02	6.50E-02
Median (pCi/g)	7.70E-02	1.00E-01	Median (pCi/g)	6.40E-02	5.40E-02
Max (pCi/g)	1.06E-01	1.39E-01	Max (pCi/g)	8.10E-02	2.00E-01
Min (pCi/g)	5.30E-02	4.10E-02	Min (pCi/g)	5.20E-02	3.00E-02
Standard Deviation (pCi/g)	1.60E-02	3.00E-02	Standard Deviation (pCi/g)	9.00E-03	4.90E-02
Subsurface Soil	**Co-60**	**Cs-137**	**Subsurface Soil**	**Co-60**	**Cs-137**
# of Samples	16		# of Samples	7	
# >MDC	1	2	# >MDC	0	2
Mean (pCi/g)	5.20E-02	4.90E-02	Mean (pCi/g)	4.90E-02	3.80E-02
Median (pCi/g)	4.60E-02	4.80E-02	Median (pCi/g)	4.80E-02	3.30E-02
Max (pCi/g)	1.12E-01	8.80E-02	Max (pCi/g)	5.50E-02	5.20E-02
Min (pCi/g)	4.00E-02	3.40E-02	Min (pCi/g)	4.20E-02	2.90E-02
Standard Deviation (pCi/g)	1.80E-02	1.20E-02	Standard Deviation (pCi/g)	4.00E-03	9.00E-03
Asphalt	**Co-60**	**Cs-137**	**Asphalt**	**Co-60**	**Cs-137**
# of Samples	6		# of Samples	6	
# >MDC	0	0	# >MDC	0	3
Mean (pCi/g)	5.10E-02	5.10E-02	Mean (pCi/g)	5.60E-02	4.80E-02
Median (pCi/g)	5.10E-02	5.10E-02	Median (pCi/g)	5.70E-02	5.10E-02
Max (pCi/g)	5.40E-02	5.40E-02	Max (pCi/g)	5.90E-02	5.50E-02
Min (pCi/g)	4.70E-02	4.70E-02	Min (pCi/g)	4.90E-02	9.00E-03
Standard Deviation (pCi/g)	2.00E-03	3.00E-03	Standard Deviation (pCi/g)	3.00E-03	8.00E-03

Table 3-2 – Off-site Analysis for Characterization Samples

Radionuclide	H-3	C-14	Fe-55	Ni-59	Co-60	Ni-63	Sr-90	Nb-94	Tc-99	Cs-137	Pm-147	Eu-152	Eu-154	Eu-155	Np-237	Pu-238	Pu-239/240	Pu-241	Am-241	Am-243	Cm-243/244
L2011101-CJ-GS-001-SM					**0.096**			*0.011*		**0.137**		*0.041*	*0.098*	*0.033*					*0.031*		
L2011101-CR-PA-003-AV					*0.023*			*0.016*		*0.017*		*0.039*	*0.131*	*0.039*					*0.038*		
L2011101-QJ-GS-001-SB	*0.518*	*0.727*	*2.290*	*2.660*	*0.016*	*4.030*	*0.273*	*0.014*	*0.643*	*0.015*	*0.705*	*0.033*	*0.108*	*0.040*	*0.022*	*0.028*	*0.025*	*2.470*	*0.015*	*0.022*	*0.019*
L2011101-QJ-GS-001-SM	**2.040**	*0.707*	*2.240*	*2.950*	**0.049**	*4.140*	*0.523*	*0.018*	*0.585*	**0.107**	*0.615*	*0.048*	*0.178*	*0.049*	*0.026*	*0.045*	*0.021*	*3.100*	*0.037*	*0.036*	**0.034**
L2011101-QJ-GS-001-SS					*0.012*			*0.020*		**0.080**		*0.060*	*0.188*	*0.091*					*0.042*		
L2011101-QQ-GS-001-SB					*0.017*			*0.012*		*0.013*		*0.040*	*0.127*	*0.037*					*0.031*		
L2011101-QQ-GS-001-SS	**11.810**	*0.726*	*2.590*	*2.600*	*0.035*	*3.720*	*0.255*	*0.035*	*0.532*	**0.103**	*0.779*	*0.097*	*0.205*	*0.102*	*0.023*	*0.037*	*0.024*	*2.800*	*0.019*	*0.015*	*0.015*
L2011101-QQ-GS-002-SB	**2.500**	*0.731*	**1.940**	*2.680*	*0.017*	*3.870*	*0.314*	*0.014*	*0.616*	*0.016*	*0.697*	*0.037*	*0.119*	*0.041*	*0.019*	*0.039*	*0.016*	*2.920*	*0.020*	*0.028*	*0.016*
L2011101-QQ-PA-001-AV					*0.022*			*0.015*		*0.015*		*0.046*	*0.135*	*0.042*					*0.040*		
L2011102-QQ-GS-001-SB	**1.370**	**1.560**	*2.260*	*3.040*	*0.007*	*4.390*	*0.291*	*0.018*	*0.537*	*0.021*	*0.672*	*0.044*	*0.173*	*0.055*	*0.031*	*0.026*	*0.018*	*2.680*	*0.029*	*0.028*	*0.024*
L2011102-QQ-GS-001-SS	*0.533*	*0.713*	*2.330*	*2.820*	*0.019*	*4.300*	*0.361*	*0.014*	*0.595*	*0.014*	*0.772*	*0.039*	*0.111*	*0.045*	*0.017*	*0.036*	*0.026*	*2.880*	*0.026*	*0.034*	*0.021*
L2011102-QQ-GS-002-SB	*0.525*	*0.702*	*3.890*	*2.880*	*0.031*	*3.950*	*0.327*	*0.016*	*0.568*	*0.018*	*0.717*	*0.052*	*0.183*	*0.051*	*0.022*	*0.028*	*0.020*	*1.710*	*0.010*	*0.028*	*0.006*
L2011102-QQ-PA-001-AV					*0.027*			*0.017*		*0.018*		*0.051*	*0.142*	*0.038*					*0.036*		

Note: Bold values indicate concentration greater than MDC. Unbolded values indicate the MDC value. All values in pCi/g. Blank cells indicate that a particular radionuclide was not included in the analysis.

A Radiological Assessment (RA) in survey unit L1-010-107 was performed in June of 2019. Seven (7) soil samples were collected and analyzed by the on-site gamma spectroscopy system. The average SOF of the sample set was 0.04, with a standard deviation 0.014. The RA data was used to design the FSS.

Section 5.1 of the LTP states that the actual Insignificant Contributor (IC) dose will be calculated for each individual sample result using the DCGLs from Table 4 of TSD RS-TD-313196-004, *LACBWR Soil DCGL, Basement Concrete DCGL, and Buried Pipe DCGL*, (Reference 6) for soil. If the IC dose calculated is less than the IC dose assigned for DCGL adjustment, then no further action will be taken. If the actual IC dose calculated from the sample result is greater than the IC dose assigned for DCGL adjustment, then a minimum of five (5) additional investigation samples will be taken around the original sample location. Each investigation sample will be analyzed by the on-site gamma spectroscopy system and sent for HTD analysis (full suite of radionuclides from LTP Table 5-1). As with the original sample, the actual IC dose will be calculated for each investigation sample. In this case, the actual calculated maximum IC dose from an individual sample observed in the survey unit will be used to readjust the DCGLs in that survey unit. If the maximum IC dose exceeds 10%, then the additional radionuclides that were the cause of the IC dose exceeding 10% will be added as additional ROC for that survey unit. The survey unit-specific DCGLs used for compliance, the ROC for that survey unit, and the survey data serving as the basis for the IC dose adjustment will be documented in the release record for the survey unit.

An assessment of the results of continuing characterization confirmed that the IC dose is unchanged (dose fraction less than 10%).

Based upon review of the historical information, the results of the characterization survey data and RA data, and completion of a final Survey Unit Classification Worksheet, the correct final classification of survey unit L1-010-107 was determined to be Class 1.

4. DATA QUALITY OBJECTIVES (DQO)

FSS planning and design relies on a properly executed Data Quality Objective (DQO) process to ensure, through compliance with explicitly defined inputs and boundaries, that the primary objective of the survey is satisfied. The DQO process, utilized in accordance with MARSSIM, is described in the LACBWR LTP. The appropriate design for a given survey was developed using the DQO process as outlined in Appendix D of MARSSIM. A summary of seven steps of the DQO process are outlined as follows.

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 L1-010-107 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).

Energy*Solutions* TSD RS-TD-313196-001, *Radionuclides of Concern during LACBWR Decommissioning* (Reference 7) established the basis for an initial suite of potential ROC for decommissioning. LTP Chapter 2 provides detailed characterization data that describes the results of surveys taken of soil. 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 LACBWR indicate that there is minimal residual radioactivity in soil.

IC were determined consistent with the guidance contained in Section 3.3 of NUREG-1757, Volume 2, Revision 1, *Consolidated Decommissioning Guidance – Characterization, Survey, and Determination of Radiological Criteria, Final Report* (Reference 8). In all soil and concrete scenarios, Cs-137, Co-60, Sr-90, Eu-152 and Eu-154 contribute nearly 100% of the total dose. The remaining radionuclides were designated as IC and were eliminated from further detailed evaluation. Therefore, the final ROCs for LACBWR soil, basement concrete and buried piping are Cs-137, Co-60, Sr-90, Eu-152 and Eu-154.

The LTP, Section 6.14.1 discusses the process used to derive the ROC for the decommissioning of LACBWR, including the elimination of IC from the initial suite. Table 4-1 presents the ROC for the decommissioning of soil at LACBWR and the normalized mixture fractions based on the radionuclide mixture.

Table 4-1 - Dose Significant Radionuclides and Mixture for Soil

Radionuclide	Fraction of Total Activity (normalized)(1)
Co-60	0.064
Sr-90	0.098
Cs-137	0.829
Eu-152	0.005
Eu-154	0.003

(1) Based on maximum percent of total activity from Table 22 of RS-TD-313196-001, normalized to one for the dose significant radionuclides.

The LTP, Section 5.2 states that each radionuclide-specific Base Case DCGL 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/yr to an Average Member of the Critical Group. To ensure that the summation of dose from each source term is 25 mrem/yr or less after all FSS is completed, the Base Case DCGLs are reduced based on an expected, or *a priori*, fraction of the 25 mrem/yr dose limit from each source term. The reduced DCGLs, or "Operational" DCGLs can be related to the Base Case DCGLs 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 Operational DCGL is then used as the DCGL for the FSS design of the survey unit (e.g., calculation of surrogate DCGLs, investigation levels). Details of the Operational DCGLs derived for each dose component and the basis for the applied *a priori* dose fractions are provided in LC-FS-TSD-002, *Operational Derived Concentration Guideline Levels for Final Status Survey* (Reference 9).

Multiple ROCs are known to be present at LACBWR. The dose contribution from each ROC is accounted for using the SOF to ensure that the total dose from all ROC does not exceed the dose criterion. A Base Case DCGL that is established for the average residual radioactivity in a survey unit is equivalent to a $DCGL_W$. In Class 1 land survey units, the $DCGL_W$ can be multiplied by Area Factors to obtain a Base Case DCGL that represents the same dose to an individual for residual radioactivity over a smaller area within a survey unit.

At LACBWR, compliance is demonstrated through the summation of dose from five (5) distinct source terms (i.e., basements, soils, buried pipe, above-ground structures, and groundwater) for the end-state. When applied to soil, the DCGLs are expressed in units of activity per unit of mass (pCi/g).

For LACBWR, soil is defined as a layer of soil beginning at the surface but extending to a depth of 1 m to allow for flexibility in compliance demonstration if contamination deeper than 0.15 m is encountered. Based on characterization data and historical information, there are no expectations of encountering a source term geometry that is comprised of a clean surface layer of soil over a contaminated subsurface soil layer. Energy*Solutions* TSD RS-TD-313196-004 and LTP, Section 6.8 provide the exposure scenarios and modeling parameters that were used to calculate the site-specific soil DCGLs. The adjusted soil DCGLs for the unrestricted release of open land survey units as provided in the LTP, Section 6.16.1 are reproduced in Table 4-2. The IC percentages for the most limiting basement scenario was used to adjust the DCGLs for soil to account for the dose from the eliminated insignificant contributor radionuclides.

Table 4-2 - Base Case DCGLs for Soil

Radionuclide	DCGLs (pCi/g)
Co-60	10.6
Sr-90	5470
Cs-137	48.3
Eu-152	23.6
Eu-154	21.9

The Operational DCGLs are then used as the DCGL for the FSS design of the survey unit (e.g., calculation of surrogate DCGLs, investigation levels). The OpDCGLs for the unrestricted release of soil are provided in Table 4-3.

Table 4-3 - Operational DCGLs for Soil

Radionuclide	OpDCGLs (pCi/g)
Co-60	3.83
Sr-90	1970.45
Cs-137	17.39
Eu-152	8.51
Eu-154	7.89

Instrument DQOs included a verification of the ability of the survey instrument to detect the radiation(s) of interest relative to the Operational DCGL. 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 reported 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." Results were not reported as "less than MDC" (< 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 Operational DCGL were preferable while MDCs up to 50% of the Operational DCGL were acceptable. The minimum acceptable MDC for measurements obtained using field instruments was 50% of the applicable Operational DCGL.

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 LC-FS-PR-002, *Final Status Survey Package Development*.

The DQO process validated that Co-60, Sr-90, Cs-137, Eu-152, and Eu-154 would be the ROC in survey unit L1-010-107 as presented in the LTP Section 5.1. During the data analysis of the FSS results, concentrations for the HTD ROC Sr-90 are inferred using a surrogate approach. Cs-137 is the principle surrogate radionuclide for Sr-90. During characterization, both Sr-90 and Cs-137 was positively detected in all thirty (30) concrete core samples assessed in the Reactor Building, Tunnel, and Waste Treatment Building. The 95% Upper Confidence Limit (UCL) of the Cs-137 fractions was chosen to represent the overall nuclide mix for soils/buried pipe, the Reactor Building, and the Waste Gas Tank Vault. The surrogate ratio for soil is given in Table 5-1.

Table 5-1 – Soil Surrogate Ratio

Radionuclides	Ratio
Sr-90/Cs-137	0.502

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

$DCGL_{2,3...n}$ = 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 Operational DCGLs presented in Table 4-3 and the ratio from Table 5-1, the following surrogate calculation was performed:

Equation 2

$$Surrogate_{DCGL\ (Cs-137)} = \frac{1}{\left[\left(\frac{1}{17.39_{(Cs-137)}}\right) + \left(\frac{0.502}{1970.45_{(Sr-90)}}\right)\right]} = 17.31\ pCi/g$$

The surrogate Operational DCGL that was used for Cs-137 in this survey unit for direct comparison of sample results to demonstrate compliance was 17.31 pCi/g.

The action levels for survey unit L1-010-107 are based on the Operational DCGL and are presented in Table 5-2.

Table 5-2 – Action Levels for Survey Unit L1-010-107

ROC	Action Level (pCi/g)
Co-60	3.83(1)
Cs-137	17.31(2)
Eu-152	8.51(1)
Eu-154	7.89(1)

(1) Based on the Operational DCGL.
(2) Based on the surrogate adjusted DCGL of Cs-137 while inferring Sr-90.

The Sign Test was selected as the non-parametric statistical test. The use of the Sign Test did not require the selection or use of a background reference area, which simplified survey

design and implementation. This approach was conservative since it included background Cs-137 as part of the sample set.

The number of soil samples for FSS was determined in accordance with procedure LC-FS-PR-002. 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), divided by sigma (σ), which is the standard deviation of the data set used for survey design. The optimal value for Δ/σ should range between one (1) and three (3). The largest value the Δ/σ can have is three (3). If the calculated value of Δ/σ exceeds three (3), an adjusted value of three (3) will be used for Δ/σ. The Δ/σ for survey unit L1-010-107, based on the data for surface soil samples collected during the RA of survey unit L1-010-107, was calculated as follows:

Equation 3

$$\Delta/\sigma = (1 - 0.04) / 0.014 = 68.6$$

As the calculated relative shift was greater than three (3), a value of three (3) was used as the adjusted Δ/σ. Both the Type I error (i.e., α value) and the Type II error (i.e., 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 fourteen (14).

A Prospective Power Curve was generated using COMPASS, a software package developed under the sponsorship of the United States Nuclear Regulatory Commission (USNRC) for implementation of the MARSSIM in support of the decommissioning license termination rule (10CFR20, Subpart E). The result of the COMPASS computer run showed adequate power for the survey design.

As the survey unit was classified as Class 1, sample locations were selected based on a systematic triangular grid with a random starting point. The systematic locations of the soil samples were selected using Visual Sample Plan (VSP), in accordance with LC-FS-PR-002. Input parameters included use of aerial photographs and the systematic sampling tool set with a predetermined number (14) of samples. The systematic coordinates generated with VSP were integrated with a GPS to identify sample locations in the field. Table 5-3 lists the systematic samples collected for FSS and the corresponding GPS coordinates, based on the Wisconsin State Plane North American Datum 1983 coordinate system.

Table 5-3 – Systematic Sample Locations

Sample ID	Northing	Easting
L1-010-107-FSPA-001-AV	570863.8884	1642127.8519
L1-010-107-FSPA-002-AV	570863.8884	1642166.4080
L1-010-107-FSGS-003-SS	570897.2790	1642108.5739
L1-010-107-FSGS-004-SS	570897.2790	1642147.1300
L1-010-107-FSGS-005-SS	570897.2790	1642185.6861
L1-010-107-FSGS-006-SS	570897.2790	1642224.2421
L1-010-107-FSGS-007-SS	570897.2790	1642262.7982
L1-010-107-FSGS-008-SS	570930.6695	1642282.0762
L1-010-107-FSGS-009-SS	570997.4506	1642282.0762
L1-010-107-FSGS-010-SS	571030.8411	1642301.3543
L1-010-107-FSGS-011-SS	571064.2317	1642282.0762
L1-010-107-FSGS-012-SS	571097.6222	1642262.7982
L1-010-107-FSGS-013-SS	571131.0128	1642243.5202
L1-010-107-FSGS-014-SS	571164.4033	1642224.2421

In accordance with the sample plan, at least one (1) judgmental sample is required from the survey unit. The number of judgmental samples actually obtained was four (4). In addition, five (5) investigational samples (labeled as judgmental) were collected due to scan alarms, which brings the total number of samples collected for the FSS of survey unit L1-010-107 to twenty-three (23). Table 5-4 lists the judgmental and investigational samples collected for FSS and the corresponding GPS coordinates.

Table 5-4 – Judgmental and Investigational Sample Locations

Sample ID	Northing	Easting
L1-010-107-FJGS-015-SS	570865.2900	1642158.0080
L1-010-107-FJGS-015-SB	570865.2900	1642158.0080
L1-010-107-FJGS-016-SS	570887.1450	1642160.6220
L1-010-107-FJGS-016-SB	570887.1450	1642160.6220
L1-010-107-FJGS-017-SS	570885.2840	1642211.9340
L1-010-107-FSGS-001-SS	570863.8884	1642127.8519
L1-010-107-FSGS-002-SS	570863.8884	1642166.4080
L1-010-107-FSGS-005-SB	570897.2790	1642185.6861
L1-010-107-FSGS-014-SB	571164.4033	1642224.2421

The LACBWR LTP, Section 5.1 states that soil samples will be collected during FSS to confirm the HTD to surrogate radionuclide ratio. Ten percent (10%) of the FSS samples collected from open land survey units will be analyzed for HTD ROC. Only the HTD radionuclide included as ROC (Sr-90) will be analyzed in the FSS confirmatory samples. In addition, if any sample has a SOF of 10% of the Operational DCGL or more, it must be sent for HTD ROC analysis. For samples with positive results for both the HTD ROC and the corresponding surrogate radionuclide (Cs-137), the HTD surrogate ratio will be derived and compared against the 95% UCL ratio (see Table 5-1). If the derived ratio from the confirmatory samples exceeds the 95% UCL ratio, then the area-specific ratio as determined by actual survey data will be used.

The selection of three (3) soil samples (L1-010-107-FSGS-008-SS, L1-010-107-FJGS-005-SS, and L1-010-107-FJGS-016-SS) met the requirement that a minimum of 10% of the samples collected for the FSS of survey unit L1-010-107 be analyzed for HTD ROC.

The implementation of quality control measures as referenced by the LTP, Section 5.9, and LaCrosse*Solutions* LC-QA-PN-001, *Final Status Survey Quality Assurance Project Plan* (QAPP) (Reference 10), 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) soil sample, L1-010-107-FQGS-009-SS, was designated for split sample QC analysis for the FSS of this survey unit.

The LTP, Section 5.6.4.4 and Table 5-15 specifies that for Class 1 open land survey units, surface scans will be performed on 100% of the surface area in the survey unit. For survey unit L1-010-107, 100% scan coverage equates to 1,675 m^2. One hundred and seventy-two (172) scan lanes were established.

For this Class 1 open land survey unit, the "Investigation Levels" for area scanning and soil sample measurement results are those levels specified in LTP, Table 5-16, and are reproduced below in Table 5-5.

Table 5-5 – Investigation Levels

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

Table 5-6 provides a synopsis of the survey design for survey unit L1-010-107.

Table 5-6 – Synopsis of Survey Design

Feature	Design Criteria	Basis
Survey Unit Surface Area	1,675 m^2	GPS
Number of Systematic Samples (N)	14	• σ = 0.014 • UBGR = SOF of 1 • LBGR = SOF of 0.04 • Type I & II error = 0.05 • Δ/σ = 3 (adjusted) • MARSSIM Table 5.5
DCGLS and Action Levels	• Co-60: 3.83 pCi/g • Sr-90: 1970.45 pCi/g • Cs-137: 17.39 pCi/g (Surrogate Cs-137 DCGL: 17.31 pCi/g) • Eu-152: 8.51 pCi/g • Eu-154: 7.89 pCi/g	Operational DCGLs for soil, LTP, Table 5-6, Release Record, Table 5-2
Scan and Direct Investigation Levels	>Operational DCGL	LTP, Table 5-16
Scan Areal Coverage	1,675 m^2, 100% areal coverage	LTP, Table 5-15
Judgmental Samples	1 4	Per Survey Design Actual Number Obtained
HTD ROC Analysis	1 3	LTP, Section 5.1 Actual Number Obtained

Feature	Design Criteria	Basis
QC	1 split sample selected at random 4	LTP, Section 5.9 Actual Number Obtained

6. SURVEY IMPLEMENTATION

For survey unit L1-010-107, compliance with the unrestricted release criteria was demonstrated through a combination of soil scanning with a Ludlum Model 44-10 gamma detector and the sampling of soil for isotopic analysis.

An FSS Supervisor performed a visual inspection and walk-down of the survey unit on August 6, 2019, prior to performing FSS. The purpose of the walk-down was to assess the physical condition of the survey unit, evaluate access points and travel paths, and identify potentially hazardous conditions. At the time of survey, the soil in the survey unit was dry and free of any considerable constraint for the collection of samples and scan measurements.

FSS field activities were conducted under the FSS Sample Plan, which included DQOs, survey design, detailed FSS instructions, job safety analysis, and related procedures for reference. FSS field activities were projected to take four (4) working days to complete. Daily briefings were conducted to discuss the expectations for job performance and to review safety aspects of the job. A “Field Log” was used to document field activities and other information pertaining to the performance of the FSS. FSS field activities commenced on August 6, 2019, and were concluded on August 13, 2019.

A total of one hundred and seventy-two (172) different scan lanes, constituting an areal coverage of 1,675 m^2, were scanned using a Ludlum 2350-1 paired with a Ludlum Model 44-10 (2”x 2”) sodium iodide (NaI) detector. The background was established as the average of five (5) 1-minute static measurements, while maintaining the detector 6” from the soil. In survey unit L1-010-107, background ranged from 3,314 cpm up to 5,078 cpm.

All designated scan areas 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 no more than 3” from the ground and was moved at a scan speed of approximately 0.5 meters per second. In accordance with RS-TD-313196-006, *Ludlum Model 44-10 Detector Sensitivity* (Reference 11), scan MDC was sufficient to detect residual radioactivity at the action level (adjusted surrogate DCGL of 17.31 pCi/g, which was based on the surrogate adjusted DCGL of Cs-137 while inferring Sr-90). Complete scan results are provided in Attachment 2.

The fourteen (14) systematic sample locations were marked with flags based on GPS coordinates provided. Each soil sample consisted of approximately one (1) liter of soil. The soil sample media was sifted to remove stones and other media larger than one (1) centimeter in diameter. All soil samples were collected, controlled, transported, stored, and transferred to the on-site laboratory using the Chain-of-Custody process from LC-FS-PR-012, *Chain of Custody Protocol* (Reference 12), and in accordance with LC-FS-PR-004, *Sample Media Collection for Site Characterization and Final Status Survey* (Reference 13), LC-FS-PR-005, *Sample Media Preparation for Site Characterization and Final Status Survey* (Reference 14), and LC-FS-PR-001, *Sample Storage* (Reference 15).

The LTP, Section 5.7.1.5.2 states that in Class 1 open land survey units, a subsurface soil sample will be taken at 10% of the systematic surface soil sample locations in the survey unit with the location(s) selected at random. In addition, 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 soil Operational DCGL, then biased subsurface soil sample(s) will be taken to the appropriate depth within the area of concern as part of the investigation. Two (2) judgmental subsurface soil samples (L1-010-107-FSGS-005-SB and L1-010-107-FSGS-014-SB) were collected to satisfy the 10% requirement from the LTP. In addition, five (5) investigational surface soil samples (labeled as judgmental) were collected in the survey unit for FSS. Two (2) additional investigational samples collected were collected to a subsurface depth because they exceeded the 75% Operational DCGL threshold for gamma scans from the LTP. Subsurface soil samples were collected using a hand auger.

The survey design specified that a minimum of one (1) sample was required for HTD ROC analysis. In total, three (3) samples (L1-010-107-FSGS-008-SS, L1-010-107-FJGS-005-SS, and L1-010-107-FJGS-016-SS) were selected for HTD radionuclide analysis.

The implementation of survey specific QC measures included the collection of four (4) samples (L1-010-107-FQGS-009-SS, L1-010-107-FQGS-014-SS, L1-010-107-FSGS-002-SS SPLIT, and L1-010-107-FSGS-009-SS SPLIT) for split and duplicate sample analysis.

7. SURVEY RESULTS

All areas identified in the FSS sample plan were scanned for elevated activity levels. A total of nine (9) alarms were verified during scanning, which prompted the collection of three (3) investigational soil samples and two (2) subsurface soil samples. Table 7-1 provides an overview of the scan results for all scan lanes (identified as 01 through 172), the 1 m^2 scan areas around each sample location before and after sample collection (identified with “SP”),

and QC locations (identified with a "QC"). Complete scan results are provided in Attachment 2.

Table 7-1 – Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level(1) (cpm)	# of Scan Alarms	Investigation Samples
01	4,755	6,374	0	0
02	4,645	6,374	0	0
03	4,693	6,374	0	0
04	4,901	6,374	0	0
05	4,461	6,374	0	0
06	4,275	6,374	0	0
07	4,565	6,374	0	0
08	4,408	6,374	0	0
09	4,823	6,374	0	0
10	4,280	6,374	0	0
11	4,571	6,374	0	0
12	5,053	6,374	0	0
13	4,630	6,374	0	0
14	4,590	6,374	0	0
15	4,419	6,374	0	0
16	4,685	6,374	0	0
17	4,823	6,374	0	0
18	5,033	6,374	0	0
19	4,976	6,374	0	0
20	4,894	6,374	0	0
21	5,522	6,374	0	0
22	4,772	6,374	0	0
23	5,000	6,374	0	0
24	4,882	6,374	0	0
25	4,925	6,840	0	0
26	4,994	6,840	0	0
27	4,410	6,840	0	0
28	5,042	6,840	0	0
29	4,817	6,840	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level(1) (cpm)	# of Scan Alarms	Investigation Samples
30	5,347	6,840	0	0
31	4,750	6,840	0	0
32	5,005	6,840	0	0
33	4,807	6,840	0	0
34	4,375	6,840	0	0
35	4,391	6,840	0	0
36	4,434	6,840	0	0
37	4,574	6,840	0	0
38	4,288	6,840	0	0
39	4,202	6,840	0	0
40	4,725	6,840	0	0
41	4,336	6,840	0	0
42	4,472	6,840	0	0
43	4,410	6,840	0	0
44	5,134	6,840	0	0
45	4,663	6,840	0	0
46	4,961	6,840	0	0
47	4,636	6,840	0	0
48	4,782	6,840	0	0
49	4,484	6,840	0	0
50	5,074	6,840	0	0
51	4,997	6,840	0	0
52	4,445	6,840	0	0
53	4,612	6,840	0	0
54	4,901	6,840	0	0
55	5,183	6,840	0	0
56	5,130	6,840	0	0
57	5,337	6,840	0	0
58	5,630	6,840	0	0
59	5,620	6,840	0	0
60	5,653	6,840	0	0
61	5,424	6,840	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level(1) (cpm)	# of Scan Alarms	Investigation Samples
62	5,596	6,840	0	0
63	5,849	6,840	0	0
64	6,286	6,840	0	0
65	6,056	6,840	0	0
66	5,589	6,840	0	0
67	5,558	6,840	0	0
68	5,169	6,840	0	0
69	5,498	6,840	0	0
70	5,760	6,840	0	0
71	4,969	6,840	0	0
72	4,697	6,840	0	0
73	5,241	6,840	0	0
74	5,655	6,840	0	0
75	5,292	6,840	0	0
76	5,084	6,840	0	0
77	5,191	6,840	0	0
78	4,459	6,840	0	0
79	5,314	6,840	0	0
80	4,960	6,840	0	0
81	5,158	6,840	0	0
82	4,893	6,840	0	0
83	4,593	6,840	0	0
84	5,036	6,840	0	0
85	4,795	6,840	0	0
86	5,249	6,840	0	0
87	4,966	6,840	0	0
88	5,030	6,840	0	0
89	5,486	6,840	0	0
90	5,486	6,840	0	0
91	5,669	6,840	0	0
92	5,257	6,840	0	0
93	6,086	6,840	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level(1) (cpm)	# of Scan Alarms	Investigation Samples
94	4,973	6,840	0	0
95	5,619	6,840	0	0
96	4,982	6,840	0	0
97	4,960	6,840	0	0
98	5,264	6,840	0	0
99	5,105	6,840	0	0
100	6,165	6,440	0	0
101	6,039	6,440	0	0
102	6,232	6,440	0	0
103	5,865	6,440	0	0
104	6,093	6,440	0	0
105	3,018	6,440	0	0
106	2,873	6,440	0	0
107	2,681	6,440	0	0
108	3,012	6,440	0	0
109	2,773	6,440	0	0
110	3,105	6,440	0	0
111	3,198	6,440	0	0
112	3,659	6,440	0	0
113	3,890	6,440	0	0
114	3,355	6,440	0	0
115	3,087	6,440	0	0
116	3,486	6,440	0	0
117	3,126	6,440	0	0
118	3,281	6,440	0	0
119	3,459	6,440	0	0
120	3,242	6,440	0	0
121	3,000	6,440	0	0
122	3,233	6,440	0	0
123	3,781	6,440	0	0
124	3,035	6,440	0	0
125	3,720	6,440	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level(1) (cpm)	# of Scan Alarms	Investigation Samples
126	3,645	6,440	0	0
127	3,654	6,440	0	0
128	3,928	6,440	0	0
129	3,601	6,440	0	0
130	3,916	6,440	0	0
131	3,580	6,440	0	0
132	3,389	6,440	0	0
133	3,896	6,440	0	0
134	3,616	6,440	0	0
135	3,839	6,440	0	0
136	5,720	6,537	0	0
137	5,405	6,537	0	0
138	5,452	6,537	0	0
139	5,027	6,537	0	0
140	5,452	6,537	0	0
141	4,610	6,537	0	0
142	4,903	6,537	0	0
143	4,793	6,537	0	0
144	4,868	6,537	0	0
145	5,469	6,537	0	0
146	5,031	6,537	0	0
147	5,256	6,537	0	0
148	5,633	6,537	0	0
149	5,118	6,537	0	0
150	5,686	6,537	0	0
151	5,744	6,537	0	0
152	5,982	6,537	0	0
153	6,099	6,537	0	0
154	6,242	6,537	0	0
155	6,202	6,537	0	0
156	6,303	6,537	0	0
157	6,213	6,537	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level(1) (cpm)	# of Scan Alarms	Investigation Samples
158	6,062	6,537	0	0
159	6,496	6,537	0	0
160	6,199	6,537	0	0
161	7,833	6,537	1	1
162	5,852	6,537	0	0
163	6,631	6,537	1	1
164	6,543	6,537	1	0
165	5,710	6,537	0	0
166	5,768	6,537	0	0
167	5,407	6,537	0	0
168	5,364	6,537	0	0
169	5,348	6,537	0	0
170	5,278	6,537	0	0
171	5,255	6,537	1	1
172	7,576	6,537	2	0
01 SP AV	4,730	6,825	0	0
01 SP SS	4,767	6,825	0	0
02 SP AV	5,469	6,825	0	0
02 SP SS	6,733	6,825	0	0
03 SP	5,077	5,635	0	0
04 SP	4,620	5,635	0	0
05 SP	4,790	5,635	0	0
06 SP	4,695	5,635	0	0
07 SP	4,111	5,635	0	0
08 SP	4,430	5,635	0	0
09 SP	3,970	5,635	0	0
09 SP QC	4,084	5,076	0	0
10 SP	3,976	5,635	0	0
11 SP	3,736	5,635	0	0
11 SP QC	4,962	5,635	0	0
12 SP	3,603	5,635	0	0
13 SP	3,543	5,635	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level(1) (cpm)	# of Scan Alarms	Investigation Samples
14 SP	3,720	5,635	0	0
14 SP QC	4,889	6,532	0	0
15 SP	8,986	6,598	1	1
16 SP	7,391	6,598	2	1
17 SP	6,349	6,598	0	0
25 QC	4,531	5,127	0	0
26 QC	4,644	5,127	0	0
27 QC	4,665	5,127	0	0
28 QC	4,958	5,127	0	0
29 QC	4,697	5,127	0	0
30 QC	4,860	5,127	0	0

(1) Action Level based on the average background plus 1,762 cpm (50% OpDCGL equivalent).

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 results for the fourteen (14) samples collected for non-parametric statistical testing is provided in Table 7-2. Gamma spectroscopy results revealed that Cs-137 was positively identified in five (5) systematic samples. No other ROC were positively identified. The concentration for Sr-90 was inferred based on the ratio specified in Table 5-1. The complete gamma spectroscopy reports are presented in Attachment 7. The basic statistics for the systematic sample population are summarized in Table 7-3.

Table 7-2 - Summary of Gamma Spectroscopy Results for Samples Comprising the Statistical Sample Population

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L1-010-107-FSPA-001-AV	3.47E-02	6.61E-02	0.00E+00	8.11E-02	3.32E-02
L1-010-107-FSPA-002-AV	4.21E-02	1.07E-01	1.23E-02	1.55E-01	5.37E-02
L1-010-107-FSGS-003-SS	6.72E-02	**6.58E-02**	3.54E-01	1.31E-01	3.30E-02
L1-010-107-FSGS-004-SS	9.81E-02	**6.74E-02**	0.00E+00	2.95E-01	3.38E-02
L1-010-107-FSGS-005-SS	3.89E-02	**1.53E-01**	5.36E-02	3.16E-03	7.68E-02
L1-010-107-FSGS-006-SS	0.00E+00	6.20E-02	4.64E-02	6.14E-02	3.11E-02
L1-010-107-FSGS-007-SS	0.00E+00	**3.76E-02**	1.19E-01	0.00E+00	1.89E-02
L1-010-107-FSGS-008-SS	6.00E-02	**8.10E-02**	6.64E-02	4.55E-02	4.07E-02
L1-010-107-FSGS-009-SS	4.46E-02	5.45E-02	1.36E-02	1.57E-01	2.74E-02
L1-010-107-FSGS-010-SS	5.76E-02	7.25E-02	5.89E-03	2.51E-02	3.64E-02
L1-010-107-FSGS-011-SS	6.62E-02	3.58E-02	1.63E-01	1.45E-01	1.80E-02
L1-010-107-FSGS-012-SS	6.51E-02	6.70E-02	0.00E+00	1.78E-03	3.36E-02
L1-010-107-FSGS-013-SS	4.05E-02	1.30E-02	1.82E-01	1.72E-01	6.53E-03
L1-010-107-FSGS-014-SS	9.11E-02	0.00E+00	5.40E-02	1.48E-02	0.00E+00

Note: Bold values indicate concentrations greater than MDC.

Table 7-3 - Basic Statistical Properties of Systematic Sample Population

ROC	Mean (pCi/g)	Median (pCi/g)	Max (pCi/g)	Min (pCi/g)	Std. Dev. (pCi/g)	BcDCGL (pCi/g)	Avg. SOF per ROC	Avg. Dose Per ROC
Co-60	5.04E-02	5.11E-02	9.81E-02	0.00E+00	2.84E-02	1.06E+01	0.0048	0.1190
Cs-137	6.31E-02	6.60E-02	1.53E-01	0.00E+00	3.77E-02	4.83E+01	0.0013	0.0326
Eu-152	7.64E-02	5.00E-02	3.54E-01	0.00E+00	1.00E-01	2.36E+01	0.0032	0.0810
Eu-154	9.20E-02	7.13E-02	2.95E-01	0.00E+00	8.69E-02	2.19E+01	0.0042	0.1050
Sr-90	3.17E-02	3.31E-02	7.68E-02	0.00E+00	1.89E-02	5.47E+03	0.0000	0.0001

The off-site laboratory, GEL Laboratories, processed the three (3) samples selected for HTD ROC analysis. Samples L1-010-107-FSGS-008-SS, L1-010-107-FJGS-005-SS, and L1-010-107-FJGS-016-SS were selected. Only the HTD ROC Sr-90 was included in the analysis. All analyses met the required MDC.

Sr-90 was not detected in the off-site analysis of samples L1-010-107-FSGS-008-SS, L1-010-107-FJGS-005-SS, and L1-010-107-FJGS-016-SS. The results are provided in Table 7-4.

Table 7-4 - Off-Site Analysis Results

Sample ID	ROC	Result (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)	>MDC
L1-010-107-FSGS-008-SS	Sr-90	-2.95E-02	7.66E-02	1.51E-01	No
L1-010-107-FJGS-005-SS	Sr-90	3.30E-02	8.03E-02	1.45E-01	No
L1-010-107-FJGS-016-SS	Sr-90	-5.05E-02	8.35E-02	1.67E-01	No

The on-site laboratory analyzed the four (4) judgmental soil samples and the five (5) investigational samples using the on-site gamma spectroscopy system. A summary of the analytical results for the judgmental and investigational soil samples is provided in Table 7-5. Gamma spectroscopy results revealed that Cs-137 was positively identified in one (1) judgmental/investigational sample. No other ROC were positively identified. The concentrations for Sr-90 were inferred based on the ratio specified in Table 5-1. The complete gamma spectroscopy reports are presented in Attachment 7.

Table 7-5 - Summary of Gamma Spectroscopy Results for Judgmental and Investigational Samples

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L1-010-107-FJGS-015-SS	6.34E-02	9.45E-02	0.00E+00	7.87E-02	4.74E-02
L1-010-107-FJGS-015-SB	7.19E-02	6.90E-02	1.36E-01	2.55E-02	3.46E-02
L1-010-107-FJGS-016-SS	3.12E-03	**1.17E-01**	2.07E-02	4.15E-01	5.87E-02
L1-010-107-FJGS-016-SB	4.28E-02	2.11E-02	8.13E-02	4.56E-02	1.06E-02
L1-010-107-FJGS-017-SS	5.22E-03	7.04E-02	8.49E-02	7.02E-02	3.53E-02
L1-010-107-FSGS-001-SS	0.00E+00	8.88E-02	2.61E-04	1.06E-01	4.46E-02
L1-010-107-FSGS-002-SS	5.48E-02	1.03E-01	4.43E-02	8.26E-02	5.17E-02
L1-010-107-FSGS-005-SB	0.00E+00	0.00E+00	5.09E-02	2.74E-02	0.00E+00
L1-010-107-FSGS-014-SB	1.04E-03	5.97E-02	7.46E-02	1.00E-01	3.00E-02

Note: Bold values indicate concentrations greater than MDC.

The implementation of survey specific QC measures included the collection of four (4) samples (L1-010-107-FQGS-009-SS, L1-010-107-FQGS-014-SS, L1-010-107-FSGS-002-SS SPLIT, and L1-010-107-FSGS-009-SS SPLIT) for split and duplicate sample analysis. The on-site laboratory analyzed the QC samples using the on-site gamma spectroscopy system. A summary of the analytical results for the QC sample is provided in Table 7-6. Gamma spectroscopy results revealed that no ROC were positively identified in any QC sample. The concentration for Sr-90 was inferred based on the ratio specified in Table 5-1.

Table 7-6 - Summary of Gamma Spectroscopy Results for QC Samples

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L1-010-107-FQGS-009-SS	8.12E-03	5.41E-02	1.42E-02	1.38E-01	2.72E-02
L1-010-107-FQGS-014-SS	0.00E+00	4.33E-02	0.00E+00	2.87E-03	2.17E-02
L1-010-107-FSGS-002-SS SPLIT	7.52E-02	6.53E-02	1.24E-03	3.76E-02	3.28E-02
L1-010-107-FSGS-009-SS SPLIT	3.84E-02	1.47E-02	8.02E-02	8.58E-03	7.38E-03

Note: Bold values indicate concentrations greater than MDC.

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 4

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

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 systematic sample population for survey unit L1-010-107 are provided in Table 7-7.

Table 7-7 - Sum-of-Fractions for Systematic and QC Samples

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L1-010-107-FSPA-001-AV	0.0091	0.0038	0.0000	0.0103	0.0000	0.0232
L1-010-107-FSPA-002-AV	0.0110	0.0062	0.0014	0.0196	0.0000	0.0383
L1-010-107-FSGS-003-SS	0.0175	0.0038	0.0416	0.0166	0.0000	0.0795
L1-010-107-FSGS-004-SS	0.0256	0.0039	0.0000	0.0374	0.0000	0.0669
L1-010-107-FSGS-005-SS	0.0102	0.0088	0.0063	0.0004	0.0000	0.0257
L1-010-107-FSGS-006-SS	0.0000	0.0036	0.0055	0.0078	0.0000	0.0168
L1-010-107-FSGS-007-SS	0.0000	0.0022	0.0140	0.0000	0.0000	0.0162
L1-010-107-FSGS-008-SS	0.0157	0.0047	0.0078	0.0058	0.0000	0.0339
L1-010-107-FSGS-009-SS	0.0116	0.0031	0.0016	0.0199	0.0000	0.0363
L1-010-107-FSGS-010-SS	0.0150	0.0042	0.0007	0.0032	0.0000	0.0231
L1-010-107-FSGS-011-SS	0.0173	0.0021	0.0192	0.0184	0.0000	0.0569

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L1-010-107-FSGS-012-SS	0.0170	0.0039	0.0000	0.0002	0.0000	0.0211
L1-010-107-FSGS-013-SS	0.0106	0.0007	0.0214	0.0218	0.0000	0.0545
L1-010-107-FSGS-014-SS	0.0238	0.0000	0.0063	0.0019	0.0000	0.0320
L1-010-107-FQGS-009-SS	0.0021	0.0031	0.0017	0.0175	0.0000	0.0244
L1-010-107-FQGS-014-SS	0.0000	0.0025	0.0000	0.0004	0.0000	0.0029
L1-010-107-FSGS-002-SS SPLIT	0.0196	0.0038	0.0001	0.0048	0.0000	0.0283
L1-010-107-FSGS-009-SS SPLIT	0.0100	0.0008	0.0094	0.0011	0.0000	0.0214

Systematic Samples

Number of Systematic Samples = 14

# of Systematic Samples with SOF $\geq$ 1 = 0

# of Systematic Samples with SOF > 0.1 (HTD Assessment) = 0

Max Individual Systematic Sample SOF = 0.0795

Mean Systematic Sample SOF = 0.0375

The results of the unity rule calculation for the ROC in the judgmental and investigational sample populations for survey unit L1-010-107 are provided in Table 7-8.

Table 7-8 – Sum-of-Fractions for Judgmental and Investigational Samples

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L1-010-107-FJGS-015-SS	0.0166	0.0054	0.0000	0.0100	0.0000	0.0320
L1-010-107-FJGS-015-SB	0.0188	0.0040	0.0160	0.0032	0.0000	0.0420
L1-010-107-FJGS-016-SS	0.0008	0.0067	0.0024	0.0526	0.0000	0.0626
L1-010-107-FJGS-016-SB	0.0112	0.0012	0.0096	0.0058	0.0000	0.0277
L1-010-107-FJGS-017-SS	0.0014	0.0040	0.0100	0.0089	0.0000	0.0243
L1-010-107-FSGS-001-SS	0.0000	0.0051	0.0000	0.0134	0.0000	0.0186
L1-010-107-FSGS-002-SS	0.0143	0.0059	0.0052	0.0105	0.0000	0.0359
L1-010-107-FSGS-005-SB	0.0000	0.0000	0.0060	0.0035	0.0000	0.0095
L1-010-107-FSGS-014-SB	0.0003	0.0034	0.0088	0.0127	0.0000	0.0252

Judgmental/Investigational Samples

Number of Judgmental/Investigational Samples = 9

# of Judgmental/Investigational Samples with SOF $\geq$ 1 = 0

# of Judgmental/Investigational Samples with SOF > 0.1 (HTD Assessment) = 0

Max Individual Judgmental/Investigational Sample SOF = 0.0626

8. QUALITY CONTROL

The on-site laboratory processed four (4) split and duplicate samples (L1-010-107-FQGS-009-SS, L1-010-107-FQGS-014-SS, L1-010-107-FSGS-002-SS SPLIT, and L1-010-107-FSGS-009-SS SPLIT) 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 16). K-40 was substituted for the assessment because Cs-137 was not identified in either the standard or comparison sample. There was acceptable agreement between field split and duplicate results. Refer to Attachment 4 for data and quality control analysis results.

9. INVESTIGATIONS AND RESULTS

Five (5) soil samples were collected to investigate alarms in scan lanes 162, 163, 171, and 172 and sample locations 15, 16, and 17. The samples (L1-010-107-FJGS-015-SS, L1-010-107-FJGS-015-SB, L1-010-107-FJGS-016-SS, L1-010-107-FJGS-016-SB, and L1-010-107-FJGS-017-SS) were analyzed using the on-site gamma spectroscopy system. Gamma spectroscopy results revealed that Cs-137 was positively identified in one (1) investigational sample. The maximum SOF for investigational samples, when compared to the Operational DCGL, is 0.0626.

10. REMEDIATION AND RESULTS

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 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

There were no addendums to the FSS plan.

12. DATA QUALITY ASSESSMENT (DQA)

The DQO sample design and data were reviewed in accordance with LC-FS-PR-008, *Final Status Survey Data Assessment* (Reference 17) for completeness and consistency. Documentation was complete and legible. Surveys and the collection of samples were consistent with the DQOs and were sufficient to ensure that the survey unit was properly

designated as Class 1. The survey design had adequate power as indicated by the Retrospective Power Curve (see Attachment 6).

The measurement results indicated that all samples were less than a SOF of one (1) when compared to the $OpDCGL_S$.

Although MARSSIM states that the Sign Test need not be performed in the instance that no measurements surpass the Operational 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 results of the Sign Test are presented in Attachment 3.

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 that exceeded two standard deviations. The mean and median values for each ROC were well below the respective Operational DCGLs. 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 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 5 of this release record.

The data for Cs-137 is presented graphically through a frequency plot and quantile plot. All graphical presentations are provided in Attachment 6.

13. ANOMALIES

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

14. CONCLUSION

Survey unit L1-010-107 has met the DQOs of the FSS plan. The ALARA criteria as specified in Chapter 4 of the LTP were achieved. The Elevated Measurement Comparison 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 systematic ROC concentration

values exceeds the $OpDCGL_S$; therefore, in accordance with LTP Section 5.11, the survey unit meets the release criteria.

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 1.

The dose contribution from soil in survey unit L1-010-107 is 0.3377 mrem/yr TEDE, based on the average concentration of the ROC in samples used for non-parametric statistical sampling.

Survey unit L1-010-107 is acceptable for unrestricted release.

15. REFERENCES

1. LC-FS-PR-009, Final Status Survey Data Reporting
2. *La Crosse Boiling Water Reactor License Termination Plan*
3. LC-FS-PR-002, *Final Status Survey Package Development*
4. NUREG-1575, Revision 1, *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM)
5. *La Crosse Boiling Water Reactor Historical Site Assessment*
6. RS-TD-313196-004, *LACBWR Soil DCGL, Basement Concrete DCGL, and Buried Pipe DCGL*
7. RS-TD-313196-001, *Radionuclides of Concern during LACBWR Decommissioning*
8. NUREG-1757, Volume 2, Revision 1, *Consolidated Decommissioning Guidance – Characterization, Survey, and Determination of Radiological Criteria, Final Report*
9. LC-FS-TSD-002, *Operational Derived Concentration Guideline Levels for Final Status Survey*
10. LC-QA-PN-001, *Final Status Survey Quality Assurance Project Plan*
11. RS-TD-313196-006, *Ludlum Model 44-10 Detector Sensitivity*
12. LC-FS-PR-012, *Chain of Custody Protocol*
13. LC-FS-PR-004, *Sample Media Collection for Site Characterization and Final Status Survey*
14. LC-FS-PR-005, *Sample Media Preparation for Site Characterization and Final Status Survey*
15. LC-FS-PR-001, *Sample Storage*
16. USNRC Inspection Procedure No. 84750, *Radioactive Waste Treatment, and Effluent and Environmental Monitoring*
17. LC-FS-PR-008, *Final Status Survey Data Assessment*

16. ATTACHMENTS

Attachment 1 – Figure

Attachment 2 – Scan Data

Attachment 3 – Sign Test

Attachment 4 – Quality Control Assessment

Attachment 5 – Consultation Triggers for Residential Soil Concentrations

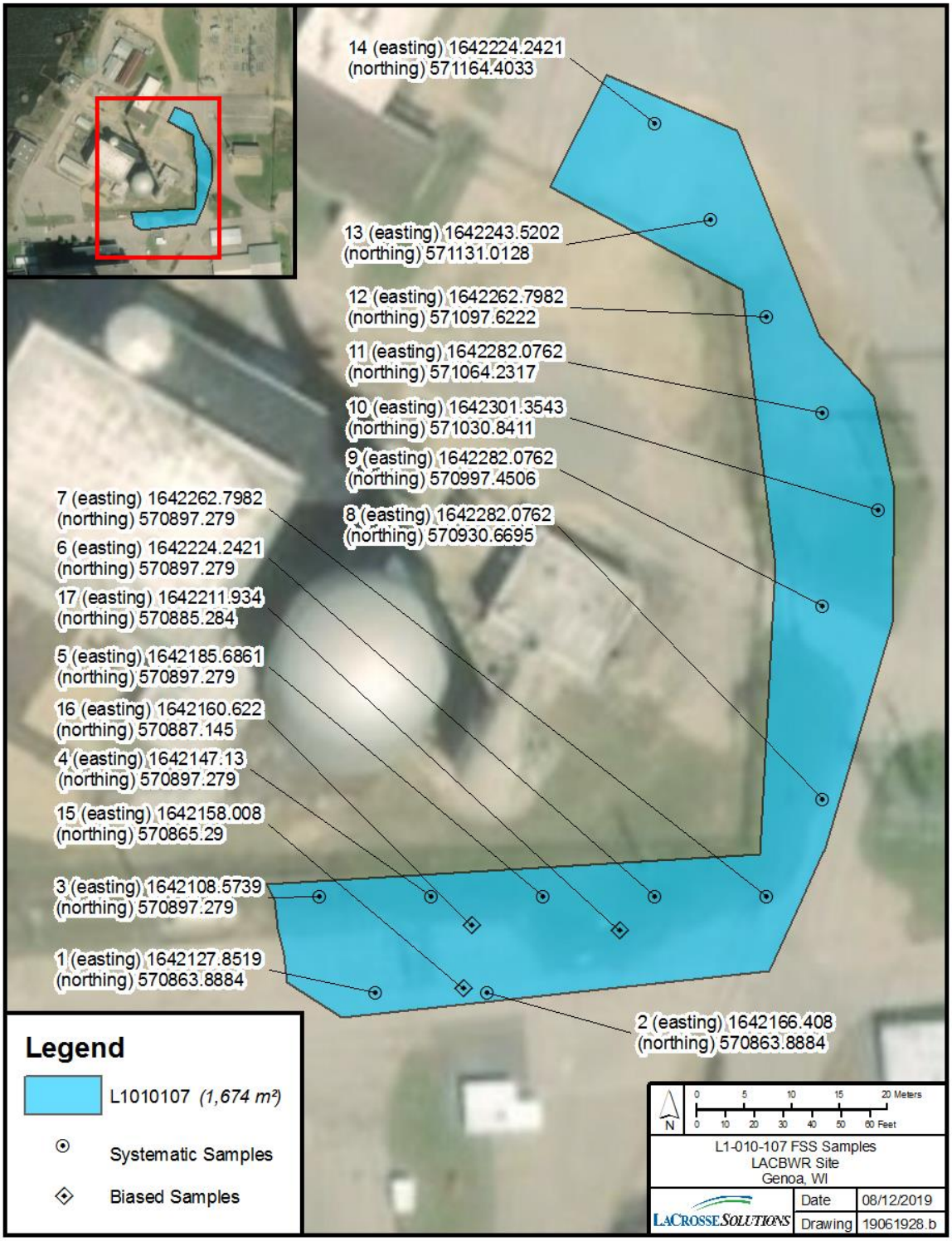
Attachment 6 – Graphical Presentations

Attachment 7 – Sample Analytical Reports

Attachment 8 – GEL Laboratories Analytical Reports

ATTACHMENT 1
FIGURE

Figure 16-1 - Survey Unit L1-010-107 Systematic and Judgmental Sample Locations Map



ATTACHMENT 2
SCAN DATA

Table 16-1 – Survey Unit L1-010-107 Complete Scan Data

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	226940	117014	01	4,755	4,612	6,374	0
44-10	226940	117014	02	4,645	4,612	6,374	0
44-10	226940	117014	03	4,693	4,612	6,374	0
44-10	226940	117014	04	4,901	4,612	6,374	0
44-10	226940	117014	05	4,461	4,612	6,374	0
44-10	226940	117014	06	4,275	4,612	6,374	0
44-10	226940	117014	07	4,565	4,612	6,374	0
44-10	226940	117014	08	4,408	4,612	6,374	0
44-10	226940	117014	09	4,823	4,612	6,374	0
44-10	226940	117014	10	4,280	4,612	6,374	0
44-10	226940	117014	11	4,571	4,612	6,374	0
44-10	226940	117014	12	5,053	4,612	6,374	0
44-10	226940	117014	13	4,630	4,612	6,374	0
44-10	226940	117014	14	4,590	4,612	6,374	0
44-10	226940	117014	15	4,419	4,612	6,374	0
44-10	226940	117014	16	4,685	4,612	6,374	0
44-10	226940	117014	17	4,823	4,612	6,374	0
44-10	226940	117014	18	5,033	4,612	6,374	0
44-10	226940	117014	19	4,976	4,612	6,374	0
44-10	226940	117014	20	4,894	4,612	6,374	0
44-10	226940	117014	21	5,522	4,612	6,374	0
44-10	226940	117014	22	4,772	4,612	6,374	0
44-10	226940	117014	23	5,000	4,612	6,374	0
44-10	226940	117014	24	4,882	4,612	6,374	0
44-10	226940	117014	25	4,925	5,078	6,840	0
44-10	226940	117014	26	4,994	5,078	6,840	0
44-10	226940	117014	27	4,410	5,078	6,840	0
44-10	226940	117014	28	5,042	5,078	6,840	0
44-10	226940	117014	29	4,817	5,078	6,840	0
44-10	226940	117014	30	5,347	5,078	6,840	0
44-10	226940	117014	31	4,750	5,078	6,840	0

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	226940	117014	32	5,005	5,078	6,840	0
44-10	226940	117014	33	4,807	5,078	6,840	0
44-10	226940	117014	34	4,375	5,078	6,840	0
44-10	226940	117014	35	4,391	5,078	6,840	0
44-10	226940	117014	36	4,434	5,078	6,840	0
44-10	226940	117014	37	4,574	5,078	6,840	0
44-10	226940	117014	38	4,288	5,078	6,840	0
44-10	226940	117014	39	4,202	5,078	6,840	0
44-10	226940	117014	40	4,725	5,078	6,840	0
44-10	226940	117014	41	4,336	5,078	6,840	0
44-10	226940	117014	42	4,472	5,078	6,840	0
44-10	226940	117014	43	4,410	5,078	6,840	0
44-10	226940	117014	44	5,134	5,078	6,840	0
44-10	226940	117014	45	4,663	5,078	6,840	0
44-10	226940	117014	46	4,961	5,078	6,840	0
44-10	226940	117014	47	4,636	5,078	6,840	0
44-10	226940	117014	48	4,782	5,078	6,840	0
44-10	226940	117014	49	4,484	5,078	6,840	0
44-10	226940	117014	50	5,074	5,078	6,840	0
44-10	226940	117014	51	4,997	5,078	6,840	0
44-10	226940	117014	52	4,445	5,078	6,840	0
44-10	226940	117014	53	4,612	5,078	6,840	0
44-10	226940	117014	54	4,901	5,078	6,840	0
44-10	226940	117014	55	5,183	5,078	6,840	0
44-10	226940	117014	56	5,130	5,078	6,840	0
44-10	226940	117014	57	5,337	5,078	6,840	0
44-10	226940	117014	58	5,630	5,078	6,840	0
44-10	226940	117014	59	5,620	5,078	6,840	0
44-10	226940	117014	60	5,653	5,078	6,840	0
44-10	226940	117014	61	5,424	5,078	6,840	0
44-10	226940	117014	62	5,596	5,078	6,840	0
44-10	226940	117014	63	5,849	5,078	6,840	0

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	226940	117014	64	6,286	5,078	6,840	0
44-10	226940	117014	65	6,056	5,078	6,840	0
44-10	226940	117014	66	5,589	5,078	6,840	0
44-10	226940	117014	67	5,558	5,078	6,840	0
44-10	226940	117014	68	5,169	5,078	6,840	0
44-10	226940	117014	69	5,498	5,078	6,840	0
44-10	226940	117014	70	5,760	5,078	6,840	0
44-10	226940	117014	71	4,969	5,078	6,840	0
44-10	226940	117014	72	4,697	5,078	6,840	0
44-10	226940	117014	73	5,241	5,078	6,840	0
44-10	226940	117014	74	5,655	5,078	6,840	0
44-10	226940	117014	75	5,292	5,078	6,840	0
44-10	226940	117014	76	5,084	5,078	6,840	0
44-10	226940	117014	77	5,191	5,078	6,840	0
44-10	226940	117014	78	4,459	5,078	6,840	0
44-10	226940	117014	79	5,314	5,078	6,840	0
44-10	226940	117014	80	4,960	5,078	6,840	0
44-10	226940	117014	81	5,158	5,078	6,840	0
44-10	226940	117014	82	4,893	5,078	6,840	0
44-10	226940	117014	83	4,593	5,078	6,840	0
44-10	226940	117014	84	5,036	5,078	6,840	0
44-10	226940	117014	85	4,795	5,078	6,840	0
44-10	226940	117014	86	5,249	5,078	6,840	0
44-10	226940	117014	87	4,966	5,078	6,840	0
44-10	226940	117014	88	5,030	5,078	6,840	0
44-10	226940	117014	89	5,486	5,078	6,840	0
44-10	226940	117014	90	5,486	5,078	6,840	0
44-10	226940	117014	91	5,669	5,078	6,840	0
44-10	226940	117014	92	5,257	5,078	6,840	0
44-10	226940	117014	93	6,086	5,078	6,840	0
44-10	226940	117014	94	4,973	5,078	6,840	0
44-10	226940	117014	95	5,619	5,078	6,840	0

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	226940	117014	96	4,982	5,078	6,840	0
44-10	226940	117014	97	4,960	5,078	6,840	0
44-10	226940	117014	98	5,264	5,078	6,840	0
44-10	226940	117014	99	5,105	5,078	6,840	0
44-10	162398	126195	100	6,165	4,678	6,440	0
44-10	162398	126195	101	6,039	4,678	6,440	0
44-10	162398	126195	102	6,232	4,678	6,440	0
44-10	162398	126195	103	5,865	4,678	6,440	0
44-10	162398	126195	104	6,093	4,678	6,440	0
44-10	162398	126195	105	3,018	4,678	6,440	0
44-10	162398	126195	106	2,873	4,678	6,440	0
44-10	162398	126195	107	2,681	4,678	6,440	0
44-10	162398	126195	108	3,012	4,678	6,440	0
44-10	162398	126195	109	2,773	4,678	6,440	0
44-10	162398	126195	110	3,105	4,678	6,440	0
44-10	162398	126195	111	3,198	4,678	6,440	0
44-10	162398	126195	112	3,659	4,678	6,440	0
44-10	162398	126195	113	3,890	4,678	6,440	0
44-10	162398	126195	114	3,355	4,678	6,440	0
44-10	162398	126195	115	3,087	4,678	6,440	0
44-10	162398	126195	116	3,486	4,678	6,440	0
44-10	162398	126195	117	3,126	4,678	6,440	0
44-10	162398	126195	118	3,281	4,678	6,440	0
44-10	162398	126195	119	3,459	4,678	6,440	0
44-10	162398	126195	120	3,242	4,678	6,440	0
44-10	162398	126195	121	3,000	4,678	6,440	0
44-10	162398	126195	122	3,233	4,678	6,440	0
44-10	162398	126195	123	3,781	4,678	6,440	0
44-10	162398	126195	124	3,035	4,678	6,440	0
44-10	162398	126195	125	3,720	4,678	6,440	0
44-10	162398	126195	126	3,645	4,678	6,440	0
44-10	162398	126195	127	3,654	4,678	6,440	0

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	162398	126195	128	3,928	4,678	6,440	0
44-10	162398	126195	129	3,601	4,678	6,440	0
44-10	162398	126195	130	3,916	4,678	6,440	0
44-10	162398	126195	131	3,580	4,678	6,440	0
44-10	162398	126195	132	3,389	4,678	6,440	0
44-10	162398	126195	133	3,896	4,678	6,440	0
44-10	162398	126195	134	3,616	4,678	6,440	0
44-10	162398	126195	135	3,839	4,678	6,440	0
44-10	357783	325261	136	5,720	4,775	6,537	0
44-10	357783	325261	137	5,405	4,775	6,537	0
44-10	357783	325261	138	5,452	4,775	6,537	0
44-10	357783	325261	139	5,027	4,775	6,537	0
44-10	357783	325261	140	5,452	4,775	6,537	0
44-10	357783	325261	141	4,610	4,775	6,537	0
44-10	357783	325261	142	4,903	4,775	6,537	0
44-10	357783	325261	143	4,793	4,775	6,537	0
44-10	357783	325261	144	4,868	4,775	6,537	0
44-10	357783	325261	145	5,469	4,775	6,537	0
44-10	357783	325261	146	5,031	4,775	6,537	0
44-10	357783	325261	147	5,256	4,775	6,537	0
44-10	357783	325261	148	5,633	4,775	6,537	0
44-10	357783	325261	149	5,118	4,775	6,537	0
44-10	357783	325261	150	5,686	4,775	6,537	0
44-10	357783	325261	151	5,744	4,775	6,537	0
44-10	357783	325261	152	5,982	4,775	6,537	0
44-10	357783	325261	153	6,099	4,775	6,537	0
44-10	357783	325261	154	6,242	4,775	6,537	0
44-10	357783	325261	155	6,202	4,775	6,537	0
44-10	357783	325261	156	6,303	4,775	6,537	0
44-10	357783	325261	157	6,213	4,775	6,537	0
44-10	357783	325261	158	6,062	4,775	6,537	0
44-10	357783	325261	159	6,496	4,775	6,537	0

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	357783	325261	160	6,199	4,775	6,537	0
44-10	357783	325261	161	7,833	4,775	6,537	1
44-10	357783	325261	161	5,576	4,775	6,537	0
44-10	357783	325261	162	5,852	4,775	6,537	0
44-10	357783	325261	163	6,631	4,775	6,537	1
44-10	357783	325261	163	5,399	4,775	6,537	0
44-10	357783	325261	164	6,543	4,775	6,537	1
44-10	357783	325261	164	5,710	4,775	6,537	0
44-10	357783	325261	165	5,768	4,775	6,537	0
44-10	357783	325261	166	5,407	4,775	6,537	0
44-10	357783	325261	167	5,364	4,775	6,537	0
44-10	357783	325261	168	5,348	4,775	6,537	0
44-10	357783	325261	169	5,278	4,775	6,537	0
44-10	357783	325261	170	5,255	4,775	6,537	0
44-10	357783	325261	171	7,576	4,775	6,537	1
44-10	357783	325261	171	5,213	4,775	6,537	0
44-10	357783	325261	172	8,569	4,775	6,537	1
44-10	357783	325261	172	6,889	4,775	6,537	1
44-10	357783	325261	172	4,892	4,775	6,537	0
44-10	215123	216185	01 SP AV	4,730	5,063	6,825	0
44-10	215123	216185	01 SP AV	4,680	5,063	6,825	0
44-10	215123	216185	01 SP SS	4,767	5,063	6,825	0
44-10	215123	216185	02 SP AV	5,105	5,063	6,825	0
44-10	215123	216185	02 SP AV	5,469	5,063	6,825	0
44-10	215123	216185	02 SP SS	6,733	5,063	6,825	0
44-10	215123	216185	03 SP	5,077	3,873	5,635	0
44-10	215123	216185	03 SP	4,975	3,873	5,635	0
44-10	215123	216185	04 SP	4,610	3,873	5,635	0
44-10	215123	216185	04 SP	4,620	3,873	5,635	0
44-10	215123	216185	05 SP	4,790	3,873	5,635	0
44-10	215123	216185	05 SP	4,779	3,873	5,635	0
44-10	215123	216185	06 SP	4,200	3,873	5,635	0

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	215123	216185	06 SP	4,695	3,873	5,635	0
44-10	215123	216185	07 SP	4,070	3,873	5,635	0
44-10	215123	216185	07 SP	4,111	3,873	5,635	0
44-10	215123	216185	08 SP	4,190	3,873	5,635	0
44-10	215123	216185	08 SP	4,430	3,873	5,635	0
44-10	215123	216185	09 SP	3,970	3,873	5,635	0
44-10	215123	216185	09 SP	3,370	3,873	5,635	0
44-10	357783	325261	09 SP QC	3,766	3,314	5,076	0
44-10	357783	325261	09 SP QC	4,084	3,314	5,076	0
44-10	215123	216185	10 SP	3,970	3,873	5,635	0
44-10	215123	216185	10 SP	3,976	3,873	5,635	0
44-10	215123	216185	11 SP	3,736	3,873	5,635	0
44-10	215123	216185	11 SP	3,592	3,873	5,635	0
44-10	215123	216185	11 SP QC	4,962	3,873	5,635	0
44-10	215123	216185	11 SP QC	3,155	3,873	5,635	0
44-10	215123	216185	12 SP	3,603	3,873	5,635	0
44-10	215123	216185	12 SP	3,412	3,873	5,635	0
44-10	215123	216185	13 SP	3,543	3,873	5,635	0
44-10	215123	216185	13 SP	3,428	3,873	5,635	0
44-10	215123	216185	14 SP	3,720	3,873	5,635	0
44-10	215123	216185	14 SP	3,290	3,873	5,635	0
44-10	357783	325261	14 SP QC	4,871	4,770	6,532	0
44-10	357783	325261	14 SP QC	4,889	4,770	6,532	0
44-10	162398	126195	15 SP	8,986	4,836	6,598	1
44-10	162398	126195	16 SP	7,391	4,836	6,598	1
44-10	162398	126195	16 SP	7,198	4,836	6,598	1
44-10	162398	126195	17 SP	6,349	4,836	6,598	0
44-10	162398	126195	17 SP	6,112	4,836	6,598	0
44-10	357783	325261	25 QC	4,531	3,365	5,127	0
44-10	357783	325261	26 QC	4,644	3,365	5,127	0
44-10	357783	325261	27 QC	4,665	3,365	5,127	0
44-10	357783	325261	28 QC	4,958	3,365	5,127	0

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	357783	325261	29 QC	4,697	3,365	5,127	0
44-10	357783	325261	30 QC	4,860	3,365	5,127	0

ATTACHMENT 3
SIGN TEST

Table 16-2 – Survey Unit L1-010-107 Sign Test

#	SOF (W_s)	1-W_s	Sign
1	0.0232	0.98	+1
2	0.0383	0.96	+1
3	0.0795	0.92	+1
4	0.0669	0.93	+1
5	0.0257	0.97	+1
6	0.0168	0.98	+1
7	0.0162	0.98	+1
8	0.0339	0.97	+1
9	0.0363	0.96	+1
10	0.0231	0.98	+1
11	0.0569	0.94	+1
12	0.0211	0.98	+1
13	0.0545	0.95	+1
14	0.0320	0.97	+1

Number of positive differences (S+) 14

Critical Value 10

Survey Unit Meets the Acceptance Criteria

ATTACHMENT 4
QUALITY CONTROL ASSESSMENT

Table 16-3 – Survey Unit L1-010-107 QC Assessment

STANDARD							COMPARISON			
Sample ID	**Radionuclide**	**Activity Value**	**Standard Error**	**Resolution**	**Agreement Range (Low to High)**		**Sample ID**	**Activity Value**	**Comparison Ratio**	**Acceptable (Y/N)**
L1-010-107-FSGS-014-SS	K-40	5.31E+00	8.51E-01	6	0.5	2	L1-010-107-FQGS-014-SS	5.24E+00	0.99	Y
L1-010-107-FSGS-009-SS	K-40	3.39E+00	6.88E-01	5	0.5	2	L1-010-107-FQGS-009-SS	2.92E+00	0.86	Y
							L1-010-107-FSGS-009-SS SPLIT	3.66E+00	1.08	Y
L1-010-107-FSGS-002-SS	K-40	9.44E+00	1.25E+00	8	0.6	1.66	L1-010-107-FSGS-002-SS SPLIT	7.15E+00	0.76	Y

Comments/Corrective Actions: K-40 was substituted for the assessment because Cs-137 was not identified in either the standard or comparison sample.

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

Resolution	Acceptable Ratio
<4	0.4-2.5
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.80-1.25
>200	0.85-1.18

ATTACHMENT 5
CONSULTATION TRIGGERS FOR RESIDENTIAL SOIL CONCENTRATION

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 6
GRAPHICAL PRESENTATIONS

Figure 16-2 – Quantile Plot for Cs-137 Concentration

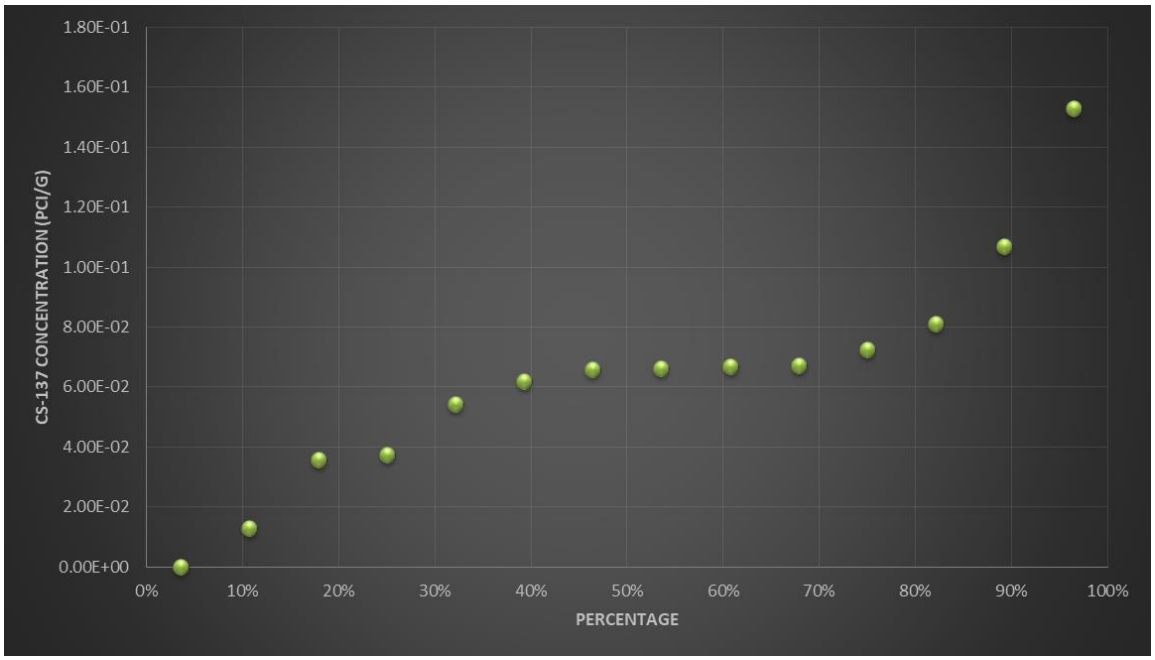


Figure 16-3 - Histogram for Cs-137 Concentration

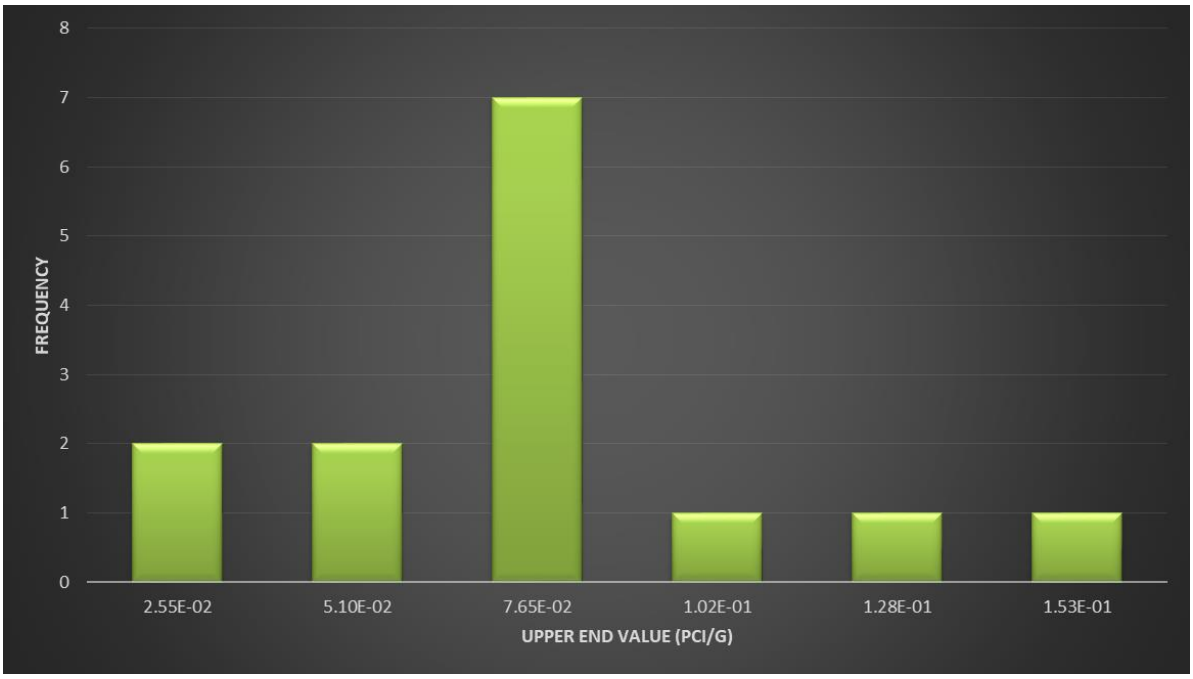
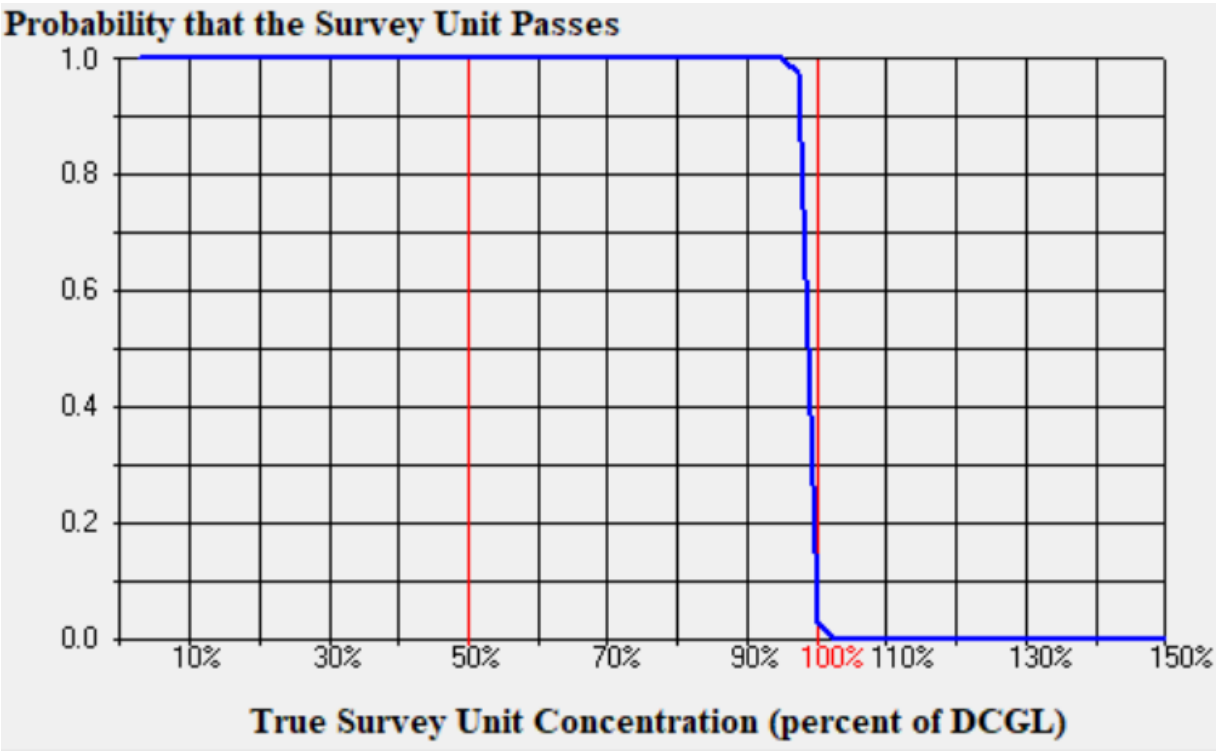


Figure 16-4 - Retrospective Power Curve for Survey Unit L1-010-107



ATTACHMENT 7
SAMPLE ANALYTICAL REPORTS

Apex-Gamma

Analysis Report for L1-010-107-FSPA-001-AV
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSPA-001-AV
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.774E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/9/2019 10:29:00AM
Acquisition Started	: 8/12/2019 3:49:04PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.1 seconds
Dead Time	: 0.28 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7247

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/13/2019 9:38:49AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSPA-001-AV

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.65	470 -	485	477.78	8.72E+01	27.24	3.26E+02	1.77
F	2	351.88	700 -	708	704.19	8.98E+01	22.87	7.97E+01	1.63
F	3	583.25	1161 -	1173	1166.85	3.37E+01	15.09	5.70E+01	1.96
F	4	609.41	1214 -	1225	1219.15	5.84E+01	17.33	3.79E+01	1.80
F	5	1460.62	2913 -	2929	2921.36	2.24E+02	30.44	1.26E+01	2.64

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/13/2019 9:38:49AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.65	8.72E+01	27.24			8.72E+01	2.72E+01
F	2	351.88	8.98E+01	22.87	4.18E+01	1.86E+01	4.81E+01	2.95E+01
F	3	583.25	3.37E+01	15.09			3.37E+01	1.51E+01
F	4	609.41	5.84E+01	17.33	2.06E+01	1.21E+01	3.78E+01	2.11E+01
F	5	1460.62	2.24E+02	30.44	2.82E+01	8.57E+00	1.96E+02	3.16E+01

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\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Analysis Report for L1-010-107-FSPA-001-AV

L1-010-107

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.50E+00	9.37E-01
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.16E-01	3.66E-02
BI-214	0.34	609.31	*	46.30	1.12E-01	6.30E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.997	5.50E+00	9.37E-01	
PB-212	0.560	1.16E-01	3.66E-02	
BI-214	0.349	1.12E-01	6.30E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FSPA-001-AV

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/13/2019 9:38:49AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	2	351.88	2.66947E-02	30.68	Tol.	PB-214
F	3	583.25	1.87172E-02	22.39		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.50E+00	8.26E-01	8.26E-01
+	AR-41	1293.64		99.16	-1.01E+11	4.12E+11	4.12E+11
+	CO-60	1173.22		100.00	3.47E-02	7.92E-02	8.90E-02
		1332.49		100.00	1.59E-02		7.92E-02
+	KR-85	513.99		0.43	5.23E+00	1.41E+01	1.41E+01
+	Y-88	898.04		93.70	-3.84E-02	6.21E-02	7.14E-02
		1836.06		99.20	-4.28E-02		6.21E-02
+	NB-94	702.63		100.00	3.89E-03	6.05E-02	6.05E-02
		871.10		100.00	-6.20E-02		6.24E-02
+	I-131	284.30		6.06	-3.19E-01	7.37E-02	9.69E-01
		364.48		81.20	4.19E-04		7.37E-02
		636.97		7.27	1.34E-01		9.58E-01
+	CS-134	604.70		97.60	-3.32E-02	7.18E-02	7.18E-02
		795.84		85.40	3.96E-02		7.90E-02
+	CS-137	661.65		85.12	6.61E-02	7.29E-02	7.29E-02

Analysis Report for L1-010-107-FSPA-001-AV

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12		1.36	-2.36E+00	3.86E-01	4.82E+00
		133.51		11.09	-2.95E-02		3.86E-01
+	EU-152	121.78		28.40	-1.10E-01	1.48E-01	1.48E-01
		344.28		26.60	-2.00E-01		1.94E-01
		1408.00		20.74	-2.10E-02		3.14E-01
+	EU-154	123.07		40.40	-5.64E-02	1.04E-01	1.04E-01
		723.30		19.70	8.11E-02		3.11E-01
		1274.51		35.50	-3.00E-02		2.27E-01
+	EU-155	86.54		32.80	-1.04E-02	1.71E-01	1.71E-01
		105.31		21.80	-9.18E-02		2.05E-01
+	BI-214	609.31	*	46.30	1.12E-01	1.08E-01	1.08E-01
		1120.29		15.10	3.68E-01		5.65E-01
		1238.11		5.94	7.19E-01		1.64E+00
		1377.67		4.11	1.43E-01		1.59E+00
		1407.98		2.48	-1.75E-01		2.62E+00
		1509.19		2.19	-9.06E-01		2.91E+00
		1764.49		15.80	4.88E-01		5.44E-01
+	PB-214	77.11		10.70	5.31E-01	1.58E-01	6.54E-01
		295.21		19.20	3.13E-01		2.80E-01
		351.92		37.20	2.12E-01		1.58E-01
+	PA-228	89.95		22.00	2.85E+00	1.68E+00	2.87E+00
		93.35		35.00	-5.46E-01		1.68E+00
		105.00		16.30	-1.41E+00		3.17E+00
		129.22		2.97	-3.73E-01		1.65E+01
		338.32		5.30	3.87E+00		1.06E+01
		463.00		13.80	3.18E+00		4.50E+00
		911.23		16.70	6.65E+00		5.86E+00
+	AM-241	59.54		36.30	-3.38E-02	3.13E-01	3.13E-01
+	CM-243	103.76		23.00	8.87E-02	2.00E-01	2.00E-01
		228.18		10.60	4.39E-02		4.11E-01
		277.60		14.00	6.30E-02		3.22E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-001-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-001-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.225E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/9/2019 10:37:00AM
Acquisition Started	: 8/13/2019 6:27:47AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.6 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7239

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/13/2019 6:58:01AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-001-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.94	147 -	161	154.43	5.87E+01	28.01	6.20E+02	1.29
F	2	238.36	471 -	482	477.19	5.05E+01	22.87	2.94E+02	1.21
F	3	294.69	586 -	594	589.84	3.35E+01	16.71	1.38E+02	0.89
F	4	351.69	699 -	707	703.81	9.41E+01	23.13	8.25E+01	1.41
F	5	583.24	1163 -	1173	1166.81	2.52E+01	13.35	5.50E+01	1.42
F	6	609.17	1213 -	1224	1218.66	6.53E+01	18.51	4.34E+01	1.91
F	7	910.78	1817 -	1826	1821.80	1.80E+01	10.61	2.86E+01	1.34
F	8	1460.56	2913 -	2929	2921.23	2.50E+02	32.12	1.67E+01	2.47

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/13/2019 6:58:01AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.94	5.87E+01	28.01			5.87E+01	2.80E+01
F	2	238.36	5.05E+01	22.87			5.05E+01	2.29E+01
F	3	294.69	3.35E+01	16.71			3.35E+01	1.67E+01
F	4	351.69	9.41E+01	23.13	4.18E+01	1.86E+01	5.24E+01	2.97E+01
F	5	583.24	2.52E+01	13.35			2.52E+01	1.34E+01
F	6	609.17	6.53E+01	18.51	2.06E+01	1.21E+01	4.47E+01	2.21E+01
F	7	910.78	1.80E+01	10.61			1.80E+01	1.06E+01
F	8	1460.56	2.50E+02	32.12	2.82E+01	8.57E+00	2.22E+02	3.32E+01

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

Analysis Report for L1-010-107-FSGS-001-SS

L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.88E+00	9.39E-01
PB-212	0.99	77.11	*	17.50	2.02E-01	9.71E-02
		238.63	*	44.60	6.33E-02	2.88E-02
BI-214	0.34	609.31	*	46.30	1.25E-01	6.23E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.98	77.11	*	10.70	3.30E-01	1.59E-01
		295.21	*	19.20	1.16E-01	5.83E-02
		351.92	*	37.20	1.10E-01	6.26E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.994	5.88E+00	9.39E-01	
PB-212	0.991	6.86E-02	2.77E-02	
BI-214	0.348	1.25E-01	6.23E-02	

Analysis Report for L1-010-107-FSGS-001-SS

L1-010-107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.982	1.20E-01	4.13E-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 L1-010-107-FSGS-001-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/13/2019 6:58:01AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	5	583.24	1.40093E-02	26.48		
F	7	910.78	9.98092E-03	29.52	Tol.	AC-228 PA-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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.88E+00	8.13E-01	8.13E-01
+	AR-41	1293.64		99.16	-7.87E+13	9.77E+13	9.77E+13
+	CO-60	1173.22		100.00	-1.76E-02	7.15E-02	8.64E-02
		1332.49		100.00	-2.68E-02		7.15E-02
+	KR-85	513.99		0.43	3.19E+00	1.29E+01	1.29E+01
+	Y-88	898.04		93.70	-2.52E-02	5.89E-02	7.38E-02
		1836.06		99.20	-2.71E-02		5.89E-02
+	NB-94	702.63		100.00	1.61E-02	5.90E-02	5.90E-02
		871.10		100.00	4.59E-03		6.39E-02
+	I-131	284.30		6.06	6.05E-01	8.07E-02	1.07E+00
		364.48		81.20	1.73E-02		8.07E-02
		636.97		7.27	8.85E-01		1.05E+00
+	CS-134	604.70		97.60	-2.23E-03	7.46E-02	7.46E-02
		795.84		85.40	3.08E-03		7.53E-02

Analysis Report for L1-010-107-FSGS-001-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65		85.12	8.88E-02	7.41E-02	7.41E-02
+	CE-144	80.12		1.36	-3.23E+00	3.56E-01	4.69E+00
		133.51		11.09	-6.54E-02		3.56E-01
+	EU-152	121.78		28.40	-9.95E-02	1.40E-01	1.40E-01
		344.28		26.60	2.61E-04		1.73E-01
		1408.00		20.74	2.00E-01		3.11E-01
+	EU-154	123.07		40.40	-4.70E-02	9.94E-02	9.94E-02
		723.30		19.70	5.73E-02		3.01E-01
		1274.51		35.50	1.06E-01		2.38E-01
+	EU-155	86.54		32.80	-2.11E-01	1.64E-01	1.64E-01
		105.31		21.80	-2.74E-02		1.97E-01
+	BI-214	609.31	*	46.30	1.25E-01	1.05E-01	1.05E-01
		1120.29		15.10	2.68E-01		5.53E-01
		1238.11		5.94	-3.23E-01		1.64E+00
		1377.67		4.11	2.94E-01		1.32E+00
		1407.98		2.48	1.67E+00		2.60E+00
		1509.19		2.19	1.86E+00		2.67E+00
		1764.49		15.80	7.56E-02		4.22E-01
+	PB-214	77.11	*	10.70	3.30E-01	1.07E-01	5.67E-01
		295.21	*	19.20	1.16E-01		1.49E-01
		351.92	*	37.20	1.10E-01		1.07E-01
+	PA-228	89.95		22.00	3.24E+00	2.55E+00	4.39E+00
		93.35		35.00	-1.44E+00		2.55E+00
		105.00		16.30	-8.18E-01		4.80E+00
		129.22		2.97	1.43E+01		2.52E+01
		338.32		5.30	3.09E+00		1.56E+01
		463.00		13.80	1.97E-03		6.57E+00
		911.23		16.70	6.26E+00		8.48E+00
+	AM-241	59.54		36.30	-8.26E-02	3.11E-01	3.11E-01
+	CM-243	103.76		23.00	-1.39E-02	1.87E-01	1.87E-01
		228.18		10.60	1.88E-01		3.78E-01
		277.60		14.00	-2.23E-01		3.26E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSPA-002-AV
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSPA-002-AV
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.176E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/9/2019 10:54:00AM
Acquisition Started	: 8/13/2019 7:00:20AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.7 seconds
Dead Time	: 0.32 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7250

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/13/2019 9:42:18AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSPA-002-AV

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.38	472 -	481	477.24	1.02E+02	29.89	2.54E+02	1.65
F	2	295.56	587 -	597	591.56	3.27E+01	15.87	1.63E+02	0.68
F	3	351.84	698 -	711	704.10	9.43E+01	23.45	1.04E+02	2.01
F	4	609.23	1213 -	1223	1218.80	5.15E+01	17.67	6.05E+01	1.67
F	5	1460.57	2912 -	2929	2921.26	2.19E+02	29.98	1.36E+01	2.30

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/13/2019 9:42:18AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.38	1.02E+02	29.89			1.02E+02	2.99E+01
F	2	295.56	3.27E+01	15.87			3.27E+01	1.59E+01
F	3	351.84	9.43E+01	23.45	4.18E+01	1.86E+01	5.25E+01	2.99E+01
F	4	609.23	5.15E+01	17.67	2.06E+01	1.21E+01	3.09E+01	2.14E+01
F	5	1460.57	2.19E+02	29.98	2.82E+01	8.57E+00	1.91E+02	3.12E+01

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\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Analysis Report for L1-010-107-FSPA-002-AV

L1-010-107

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.79E+00	1.00E+00
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.47E-01	4.36E-02
BI-214	0.34	609.31	*	46.30	9.91E-02	6.90E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.71	77.11		10.70		
		295.21	*	19.20	1.30E-01	6.37E-02
		351.92	*	37.20	1.26E-01	7.23E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.995	5.79E+00	1.00E+00	
PB-212	0.553	1.47E-01	4.36E-02	
BI-214	0.349	9.91E-02	6.90E-02	
PB-214	0.715	1.29E-01	4.78E-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 L1-010-107-FSPA-002-AV

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/13/2019 9:42:18AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.79E+00	9.10E-01	9.10E-01
+	AR-41	1293.64		99.16	-1.22E+13	1.39E+14	1.39E+14
+	CO-60	1173.22		100.00	4.21E-02	8.95E-02	1.01E-01
		1332.49		100.00	-3.13E-02		8.95E-02
+	KR-85	513.99		0.43	2.09E+01	1.65E+01	1.65E+01
+	Y-88	898.04		93.70	1.14E-02	6.43E-02	7.51E-02
		1836.06		99.20	3.24E-02		6.43E-02
+	NB-94	702.63		100.00	-2.79E-02	6.61E-02	6.61E-02
		871.10		100.00	-1.46E-02		7.25E-02
+	I-131	284.30		6.06	-5.02E-01	8.78E-02	1.12E+00
		364.48		81.20	7.57E-02		8.78E-02
		636.97		7.27	-1.54E-01		1.14E+00
+	CS-134	604.70		97.60	7.21E-02	8.36E-02	8.46E-02
		795.84		85.40	4.68E-02		8.36E-02
+	CS-137	661.65		85.12	1.07E-01	9.49E-02	9.49E-02
+	CE-144	80.12		1.36	5.35E+00	4.19E-01	5.41E+00
		133.51		11.09	-1.69E-01		4.19E-01
+	EU-152	121.78		28.40	-5.39E-02	1.62E-01	1.62E-01

Analysis Report for L1-010-107-FSPA-002-AV

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	EU-152	344.28		26.60	1.23E-02	1.62E-01	2.11E-01
		1408.00		20.74	5.44E-02		3.23E-01
+	EU-154	123.07		40.40	-2.95E-02	1.13E-01	1.13E-01
		723.30		19.70	9.24E-02		3.42E-01
		1274.51		35.50	1.55E-01		2.73E-01
+	EU-155	86.54		32.80	-1.33E-01	1.87E-01	1.87E-01
		105.31		21.80	1.23E-01		2.32E-01
+	BI-214	609.31	*	46.30	9.91E-02	1.29E-01	1.29E-01
		1120.29		15.10	1.95E-01		6.95E-01
		1238.11		5.94	5.67E-01		1.70E+00
		1377.67		4.11	5.54E-01		2.05E+00
		1407.98		2.48	4.55E-01		2.70E+00
		1509.19		2.19	1.06E+00		3.41E+00
		1764.49		15.80	3.78E-01		6.35E-01
+	PB-214	77.11		10.70	3.48E-01	1.37E-01	7.22E-01
		295.21	*	19.20	1.30E-01		1.94E-01
		351.92	*	37.20	1.26E-01		1.37E-01
+	PA-228	89.95		22.00	4.92E+00	2.94E+00	4.97E+00
		93.35		35.00	9.09E-02		2.94E+00
		105.00		16.30	4.76E+00		5.69E+00
		129.22		2.97	9.86E+00		2.90E+01
		338.32		5.30	6.71E+00		1.88E+01
		463.00		13.80	-3.70E+00		7.76E+00
		911.23		16.70	1.32E+00		9.60E+00
+	AM-241	59.54		36.30	6.66E-02	3.50E-01	3.50E-01
+	CM-243	103.76		23.00	9.87E-02	2.20E-01	2.20E-01
		228.18		10.60	-5.33E-02		4.38E-01
		277.60		14.00	-4.98E-02		3.63E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-002-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-002-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.287E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/9/2019 10:57:00AM
Acquisition Started	: 8/13/2019 5:57:11AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.6 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7238

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/13/2019 6:27:20AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-002-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.37	469 -	485	477.22	1.46E+02	31.04	2.71E+02	2.19
F	2	295.24	584 -	595	590.94	4.09E+01	20.35	1.59E+02	1.73
F	3	338.14	673 -	680	676.71	1.89E+01	13.07	1.00E+02	0.68
F	4	351.95	697 -	711	704.32	8.82E+01	23.23	1.72E+02	1.46
F	5	583.01	1161 -	1171	1166.36	3.92E+01	15.26	5.39E+01	1.28
F	6	609.36	1213 -	1223	1219.06	4.53E+01	16.83	6.32E+01	1.51
F	7	911.00	1817 -	1829	1822.25	3.92E+01	14.78	3.73E+01	1.81
F	8	1460.43	2913 -	2930	2920.97	3.44E+02	37.16	4.01E+00	2.75

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/13/2019 6:27:20AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.37	1.46E+02	31.04			1.46E+02	3.10E+01
F	2	295.24	4.09E+01	20.35			4.09E+01	2.03E+01
F	3	338.14	1.89E+01	13.07			1.89E+01	1.31E+01
F	4	351.95	8.82E+01	23.23	4.18E+01	1.86E+01	4.64E+01	2.98E+01
F	5	583.01	3.92E+01	15.26			3.92E+01	1.53E+01
F	6	609.36	4.53E+01	16.83	2.06E+01	1.21E+01	2.47E+01	2.07E+01
F	7	911.00	3.92E+01	14.78			3.92E+01	1.48E+01
F	8	1460.43	3.44E+02	37.16	2.82E+01	8.57E+00	3.16E+02	3.81E+01

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

Analysis Report for L1-010-107-FSGS-002-SS

L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	9.44E+00	1.25E+00
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	2.06E-01	4.52E-02
BI-214	0.34	609.31	*	46.30	7.82E-02	6.57E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.61E-01	8.03E-02
		351.92	*	37.20	1.10E-01	7.08E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.984	9.44E+00	1.25E+00	
PB-212	0.553	2.06E-01	4.52E-02	
BI-214	0.349	7.82E-02	6.57E-02	

Analysis Report for L1-010-107-FSGS-002-SS

L1-010-107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.721	1.32E-01	5.31E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FSGS-002-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/13/2019 6:27:20AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	3	338.14	1.04779E-02	34.66	Tol.	AC-228 PA-228
F	5	583.01	2.17949E-02	19.45		
F	7	911.00	2.17661E-02	18.86	Tol.	AC-228 PA-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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	9.44E+00	7.94E-01	7.94E-01
+	AR-41	1293.64		99.16	-1.05E+14	1.09E+14	1.09E+14
+	CO-60	1173.22		100.00	5.48E-02	9.38E-02	1.08E-01
		1332.49		100.00	-4.21E-02		9.38E-02
+	KR-85	513.99		0.43	2.21E+01	1.57E+01	1.57E+01
+	Y-88	898.04		93.70	1.44E-02	6.95E-02	8.75E-02
		1836.06		99.20	-4.07E-02		6.95E-02
+	NB-94	702.63		100.00	5.24E-02	7.47E-02	7.60E-02
		871.10		100.00	2.40E-02		7.47E-02
+	I-131	284.30		6.06	-8.22E-01	9.35E-02	1.14E+00
		364.48		81.20	2.51E-03		9.35E-02

Analysis Report for L1-010-107-FSGS-002-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	636.97		7.27	7.70E-01	9.35E-02	1.23E+00
+	CS-134	604.70		97.60	5.54E-02	7.86E-02	7.86E-02
		795.84		85.40	-1.83E-02		8.88E-02
+	CS-137	661.65		85.12	1.03E-01	9.84E-02	9.84E-02
+	CE-144	80.12		1.36	4.74E-01	4.25E-01	5.57E+00
		133.51		11.09	-8.22E-02		4.25E-01
+	EU-152	121.78		28.40	-2.92E-02	1.63E-01	1.63E-01
		344.28		26.60	-5.42E-02		2.15E-01
		1408.00		20.74	4.43E-02		3.35E-01
+	EU-154	123.07		40.40	-3.45E-02	1.14E-01	1.14E-01
		723.30		19.70	8.26E-02		3.64E-01
		1274.51		35.50	-1.24E-01		2.79E-01
+	EU-155	86.54		32.80	-5.72E-02	1.93E-01	1.93E-01
		105.31		21.80	1.11E-01		2.40E-01
+	BI-214	609.31	*	46.30	7.82E-02	1.28E-01	1.28E-01
		1120.29		15.10	3.93E-01		6.94E-01
		1238.11		5.94	1.90E+00		2.19E+00
		1377.67		4.11	4.61E-01		1.57E+00
		1407.98		2.48	3.71E-01		2.80E+00
		1509.19		2.19	2.20E+00		3.44E+00
		1764.49		15.80	3.33E-01		5.44E-01
+	PB-214	77.11		10.70	4.44E-01	1.58E-01	7.69E-01
		295.21	*	19.20	1.61E-01		1.93E-01
		351.92	*	37.20	1.10E-01		1.58E-01
+	PA-228	89.95		22.00	2.52E+00	2.89E+00	4.89E+00
		93.35		35.00	7.36E-01		2.89E+00
		105.00		16.30	-3.16E-01		5.63E+00
		129.22		2.97	-5.67E+00		2.81E+01
		338.32		5.30	7.33E+00		1.84E+01
		463.00		13.80	-3.82E+00		7.25E+00
		911.23		16.70	1.78E+01		1.10E+01
+	AM-241	59.54		36.30	-7.13E-02	3.44E-01	3.44E-01
+	CM-243	103.76		23.00	1.64E-02	2.27E-01	2.27E-01
		228.18		10.60	1.12E-01		4.42E-01
		277.60		14.00	-3.84E-01		3.75E-01

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

Analysis Report for L1-010-107-FSGS-002-SS

L1-010-107

Apex-Gamma

Analysis Report for L1-010-107-FSGS-003-SS
L1-010-107-FSGS-003-SS SOIL SAMPLE FSS UNIT 107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-003-SS
Sample Description	: L1-010-107-FSGS-003-SS SOIL SAMPLE FSS UNIT 107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.006E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 3:38:51PM
Acquisition Started	: 8/9/2019 8:43:48AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.5 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7211

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/9/2019 9:13:57AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-003-SS

L1-010-107-FSGS-003-SS SOIL SAMPLE FSS UNIT 107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.60	469 -	485	477.68	2.20E+02	39.63	3.57E+02	3.01
F	2	338.37	672 -	683	677.18	5.67E+01	20.18	1.36E+02	2.77
F	3	351.73	698 -	711	703.88	1.40E+02	28.46	1.19E+02	2.57
F	4	583.08	1161 -	1172	1166.50	4.60E+01	17.83	6.73E+01	1.99
F	5	609.01	1213 -	1224	1218.35	6.48E+01	20.57	7.73E+01	2.23
F	6	661.39	1316 -	1331	1323.10	7.21E+01	21.92	9.51E+01	2.68
F	7	968.72	1933 -	1942	1937.66	1.69E+01	4.14	5.50E+01	0.64
F	8	1459.98	2910 -	2928	2920.07	3.32E+02	36.95	1.79E+01	2.74

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/9/2019 9:13:57AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.60	2.20E+02	39.63			2.20E+02	3.96E+01
F	2	338.37	5.67E+01	20.18			5.67E+01	2.02E+01
F	3	351.73	1.40E+02	28.46	4.18E+01	1.86E+01	9.86E+01	3.40E+01
F	4	583.08	4.60E+01	17.83			4.60E+01	1.78E+01
F	5	609.01	6.48E+01	20.57	2.06E+01	1.21E+01	4.42E+01	2.39E+01
F	6	661.39	7.21E+01	21.92	3.31E+01	1.27E+01	3.90E+01	2.53E+01
F	7	968.72	1.69E+01	4.14			1.69E+01	4.14E+00
F	8	1459.98	3.32E+02	36.95	2.82E+01	8.57E+00	3.04E+02	3.79E+01

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

Analysis Report for L1-010-107-FSGS-003-SS

L1-010-107-FSGS-003-SS SOIL SAMPLE FSS UNIT 107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.90	1460.75	*	10.67	8.27E+00	1.13E+00
CS-137	0.99	661.65	*	85.12	6.58E-02	4.29E-02
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	2.83E-01	5.31E-02
BI-214	0.34	609.31	*	46.30	1.27E-01	6.90E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.909	8.27E+00	1.13E+00	
CS-137	0.990	6.58E-02	4.29E-02	
PB-212	0.560	2.83E-01	5.31E-02	
BI-214	0.342	1.27E-01	6.90E-02	

Analysis Report for L1-010-107-FSGS-003-SS

L1-010-107-FSGS-003-SS SOIL SAMPLE FSS UNIT 107

? = 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 L1-010-107-FSGS-003-SS

L1-010-107-FSGS-003-SS SOIL SAMPLE FSS UNIT 107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/9/2019 9:13:57AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	2	338.37	3.14769E-02	17.80	Tol.	AC-228 PA-228
F	3	351.73	5.47651E-02	17.25	Tol.	PB-214
F	4	583.08	2.55633E-02	19.38		
F	7	968.72	9.36689E-03	12.27	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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	8.27E+00	8.52E-01	8.52E-01
+	AR-41	1293.64		99.16	-5.24E+01	5.71E+01	5.71E+01
+	CO-60	1173.22		100.00	6.72E-02	8.82E-02	1.11E-01
		1332.49		100.00	3.42E-02		8.82E-02
+	KR-85	513.99		0.43	7.81E+00	1.59E+01	1.59E+01
+	Y-88	898.04		93.70	6.69E-02	6.93E-02	8.68E-02
		1836.06		99.20	4.63E-02		6.93E-02
+	NB-94	702.63		100.00	-5.73E-02	6.76E-02	6.76E-02
		871.10		100.00	-2.66E-02		7.25E-02
+	I-131	284.30		6.06	-1.70E+00	6.38E-02	8.49E-01

Analysis Report for L1-010-107-FSGS-003-SS

L1-010-107-FSGS-003-SS SOIL SAMPLE FSS UNIT 107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	364.48		81.20	1.89E-02	6.38E-02	6.38E-02
		636.97		7.27	1.37E-01		9.05E-01
+	CS-134	604.70		97.60	-2.79E-02	8.06E-02	8.32E-02
		795.84		85.40	1.86E-02		8.06E-02
+	CS-137	661.65	*	85.12	6.58E-02	8.62E-02	8.62E-02
+	CE-144	80.12		1.36	3.01E+00	4.19E-01	5.56E+00
		133.51		11.09	-1.57E-01		4.19E-01
+	EU-152	121.78		28.40	-9.90E-02	1.65E-01	1.65E-01
		344.28		26.60	-1.20E-01		2.30E-01
		1408.00		20.74	3.54E-01		4.16E-01
+	EU-154	123.07		40.40	-6.88E-02	1.17E-01	1.17E-01
		723.30		19.70	1.31E-01		3.38E-01
		1274.51		35.50	-6.49E-02		2.68E-01
+	EU-155	86.54		32.80	1.01E-01	1.96E-01	1.96E-01
		105.31		21.80	2.18E-02		2.26E-01
+	BI-214	609.31	*	46.30	1.27E-01	1.26E-01	1.26E-01
		1120.29		15.10	-5.15E-01		6.27E-01
		1238.11		5.94	6.66E-01		1.98E+00
		1377.67		4.11	-8.40E-02		1.84E+00
		1407.98		2.48	2.96E+00		3.47E+00
		1509.19		2.19	-4.39E-01		3.06E+00
		1764.49		15.80	2.29E-01		5.17E-01
+	PB-214	77.11		10.70	7.23E-01	1.74E-01	7.56E-01
		295.21		19.20	3.56E-01		2.94E-01
		351.92		37.20	2.16E-01		1.74E-01
+	PA-228	89.95		22.00	5.07E-01	2.79E-01	4.82E-01
		93.35		35.00	-4.14E-02		2.79E-01
		105.00		16.30	-3.06E-03		5.23E-01
		129.22		2.97	-3.64E-01		2.72E+00
		338.32		5.30	1.73E+00		1.88E+00
		463.00		13.80	4.81E-01		7.00E-01
		911.23		16.70	7.39E-01		9.49E-01
+	AM-241	59.54		36.30	2.65E-02	3.41E-01	3.41E-01
+	CM-243	103.76		23.00	-4.25E-02	2.15E-01	2.15E-01
		228.18		10.60	1.42E-01		4.43E-01
		277.60		14.00	8.67E-02		3.67E-01

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

Analysis Report for L1-010-107-FSGS-003-SS

L1-010-107-FSGS-003-SS SOIL SAMPLE FSS UNIT 107

Apex-Gamma

Analysis Report for L1-010-107-FSGS-004-SS

L1-010-107-FSGS-004-SS SOIL FSS UNIT 107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-004-SS
Sample Description	: L1-010-107-FSGS-004-SS SOIL FSS UNIT 107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.643E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 3:34:45PM
Acquisition Started	: 8/9/2019 9:29:49AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.6 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7212

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/9/2019 9:59:59AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-004-SS

L1-010-107-FSGS-004-SS SOIL FSS UNIT 107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.33	470 -	484	477.13	1.91E+02	38.62	3.27E+02	3.25
F	2	295.27	583 -	597	591.00	5.94E+01	25.05	2.08E+02	2.42
F	3	351.84	698 -	711	704.11	1.06E+02	28.29	1.78E+02	2.72
F	4	609.16	1213 -	1225	1218.65	9.04E+01	22.33	6.51E+01	2.32
F	5	661.15	1316 -	1330	1322.62	7.62E+01	21.17	7.16E+01	2.54
F	6	1459.99	2911 -	2928	2920.08	2.39E+02	31.64	1.80E+01	3.00

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/9/2019 9:59:59AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.33	1.91E+02	38.62			1.91E+02	3.86E+01
F	2	295.27	5.94E+01	25.05			5.94E+01	2.50E+01
F	3	351.84	1.06E+02	28.29	4.18E+01	1.86E+01	6.43E+01	3.39E+01
F	4	609.16	9.04E+01	22.33	2.06E+01	1.21E+01	6.98E+01	2.54E+01
F	5	661.15	7.62E+01	21.17	3.31E+01	1.27E+01	4.32E+01	2.47E+01
F	6	1459.99	2.39E+02	31.64	2.82E+01	8.57E+00	2.10E+02	3.28E+01

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

Analysis Report for L1-010-107-FSGS-004-SS

L1-010-107-FSGS-004-SS SOIL FSS UNIT 107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.91	1460.75	*	10.67	5.30E+00	8.77E-01
CS-137	0.96	661.65	*	85.12	6.74E-02	3.87E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	2.28E-01	4.75E-02
BI-214	0.34	609.31	*	46.30	1.86E-01	6.85E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.97E-01	8.35E-02
		351.92	*	37.20	1.29E-01	6.80E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.911	5.30E+00	8.77E-01	
CS-137	0.961	6.74E-02	3.87E-02	

Analysis Report for L1-010-107-FSGS-004-SS

L1-010-107-FSGS-004-SS SOIL FSS UNIT 107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-212	0.550	2.28E-01	4.75E-02	
BI-214	0.348	1.86E-01	6.85E-02	
PB-214	0.721	1.56E-01	5.27E-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 L1-010-107-FSGS-004-SS

L1-010-107-FSGS-004-SS SOIL FSS UNIT 107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/9/2019 9:59:59AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.30E+00	7.91E-01	7.91E-01
+	AR-41	1293.64		99.16	7.11E+01	8.07E+01	8.07E+01
+	CO-60	1173.22		100.00	8.22E-02	9.41E-02	1.12E-01
		1332.49		100.00	9.81E-02		9.41E-02
+	KR-85	513.99		0.43	5.27E+00	1.25E+01	1.25E+01
+	Y-88	898.04		93.70	-1.40E-02	6.21E-02	8.14E-02
		1836.06		99.20	-1.40E-02		6.21E-02
+	NB-94	702.63		100.00	-5.77E-02	5.45E-02	5.45E-02
		871.10		100.00	-6.69E-02		6.56E-02
+	I-131	284.30		6.06	-4.07E-01	6.21E-02	7.74E-01
		364.48		81.20	-1.14E-02		6.21E-02
		636.97		7.27	-3.61E-02		8.98E-01
+	CS-134	604.70		97.60	-7.75E-03	8.08E-02	8.22E-02
		795.84		85.40	1.96E-02		8.08E-02
+	CS-137	661.65	*	85.12	6.74E-02	7.26E-02	7.26E-02
+	CE-144	80.12		1.36	-8.30E-01	3.98E-01	4.89E+00
		133.51		11.09	1.30E-01		3.98E-01
+	EU-152	121.78		28.40	-1.22E-02	1.48E-01	1.48E-01

Analysis Report for L1-010-107-FSGS-004-SS

L1-010-107-FSGS-004-SS SOIL FSS UNIT 107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	EU-152	344.28		26.60	-5.44E-02	1.48E-01	2.12E-01
		1408.00		20.74	-4.14E-01		3.08E-01
+	EU-154	123.07		40.40	-6.04E-02	1.04E-01	1.04E-01
		723.30		19.70	2.95E-01		3.41E-01
		1274.51		35.50	-1.85E-02		2.31E-01
+	EU-155	86.54		32.80	-3.49E-03	1.72E-01	1.72E-01
		105.31		21.80	-2.59E-02		2.07E-01
+	BI-214	609.31	*	46.30	1.86E-01	1.12E-01	1.12E-01
		1120.29		15.10	5.06E-01		6.52E-01
		1238.11		5.94	1.61E+00		1.69E+00
		1377.67		4.11	-2.33E-02		1.70E+00
		1407.98		2.48	-3.46E+00		2.58E+00
		1509.19		2.19	7.26E-01		2.69E+00
		1764.49		15.80	5.58E-01		5.45E-01
+	PB-214	77.11		10.70	1.90E-01	1.33E-01	6.70E-01
		295.21	*	19.20	1.97E-01		1.99E-01
		351.92	*	37.20	1.29E-01		1.33E-01
+	PA-228	89.95		22.00	2.85E-01	2.53E-01	4.38E-01
		93.35		35.00	-1.42E-01		2.53E-01
		105.00		16.30	4.59E-02		4.96E-01
		129.22		2.97	2.57E+00		2.65E+00
		338.32		5.30	1.41E-01		1.71E+00
		463.00		13.80	2.02E-02		6.65E-01
		911.23		16.70	5.04E-02		9.02E-01
+	AM-241	59.54		36.30	-2.77E-02	3.07E-01	3.07E-01
+	CM-243	103.76		23.00	-2.61E-02	1.98E-01	1.98E-01
		228.18		10.60	-1.79E-01		4.16E-01
		277.60		14.00	1.13E-01		3.43E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-005-SS

L1-010-107-FSGS-005-SS SOIL FSS UNIT 107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-005-SS
Sample Description	: L1-010-107-FSGS-005-SS SOIL FSS UNIT 107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.741E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 3:29:38PM
Acquisition Started	: 8/9/2019 10:09:33AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.8 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7213

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/9/2019 11:09:46AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-005-SS

L1-010-107-FSGS-005-SS SOIL FSS UNIT 107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.81	470 -	485	478.10	3.13E+02	52.00	7.61E+02	2.88
F	2	295.09	585 -	594	590.63	1.20E+02	34.41	3.29E+02	2.13
F	3	351.71	695 -	710	703.84	2.55E+02	39.63	3.02E+02	2.49
F	4	582.84	1160 -	1171	1166.02	6.92E+01	24.18	1.57E+02	2.06
F	5	608.96	1211 -	1225	1218.25	1.82E+02	32.29	1.44E+02	2.62
F	6	661.29	1315 -	1330	1322.90	2.64E+02	37.71	1.80E+02	2.62
F	7	1119.55	2234 -	2244	2239.29	3.92E+01	17.35	7.18E+01	1.86
F	8	1460.16	2911 -	2928	2920.43	5.67E+02	48.42	3.24E+01	2.97

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/9/2019 11:09:46AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.81	3.13E+02	52.00			3.13E+02	5.20E+01
F	2	295.09	1.20E+02	34.41			1.20E+02	3.44E+01
F	3	351.71	2.55E+02	39.63	8.36E+01	3.72E+01	1.72E+02	5.44E+01
F	4	582.84	6.92E+01	24.18			6.92E+01	2.42E+01
F	5	608.96	1.82E+02	32.29	4.12E+01	2.42E+01	1.40E+02	4.04E+01
F	6	661.29	2.64E+02	37.71	6.61E+01	2.54E+01	1.98E+02	4.55E+01
F	7	1119.55	3.92E+01	17.35			3.92E+01	1.73E+01
F	8	1460.16	5.67E+02	48.42	5.63E+01	1.71E+01	5.11E+02	5.14E+01

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

Analysis Report for L1-010-107-FSGS-005-SS

L1-010-107-FSGS-005-SS SOIL FSS UNIT 107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.75	*	10.67	6.37E+00	7.31E-01
CS-137	0.98	661.65	*	85.12	1.53E-01	3.61E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.85E-01	3.22E-02
BI-214	0.56	609.31	*	46.30	1.85E-01	5.41E-02
		1120.29	*	15.10	2.74E-01	1.22E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.71	77.11		10.70		
		295.21	*	19.20	1.97E-01	5.71E-02
		351.92	*	37.20	1.70E-01	5.43E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.946	6.37E+00	7.31E-01	
CS-137	0.980	1.53E-01	3.61E-02	

Analysis Report for L1-010-107-FSGS-005-SS

L1-010-107-FSGS-005-SS SOIL FSS UNIT 107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-212	0.556	1.85E-01	3.22E-02	
BI-214	0.561	2.00E-01	4.95E-02	
PB-214	0.717	1.83E-01	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 L1-010-107-FSGS-005-SS

L1-010-107-FSGS-005-SS SOIL FSS UNIT 107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/9/2019 11:09:46AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	4	582.84	1.92094E-02	17.49		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	6.37E+00	5.89E-01	5.89E-01
+	AR-41	1293.64		99.16	-1.10E+01	7.70E+01	7.70E+01
+	CO-60	1173.22		100.00	8.42E-04	5.29E-02	6.16E-02
		1332.49		100.00	3.89E-02		5.29E-02
+	KR-85	513.99		0.43	7.11E+00	9.57E+00	9.57E+00
+	Y-88	898.04		93.70	-2.10E-02	3.57E-02	4.77E-02
		1836.06		99.20	4.10E-03		3.57E-02
+	NB-94	702.63		100.00	1.55E-02	3.92E-02	3.92E-02
		871.10		100.00	4.22E-05		4.62E-02
+	I-131	284.30		6.06	3.65E-02	4.36E-02	5.80E-01
		364.48		81.20	2.79E-02		4.36E-02
		636.97		7.27	1.05E-01		5.48E-01
+	CS-134	604.70		97.60	-7.56E-03	5.01E-02	5.43E-02
		795.84		85.40	-1.19E-02		5.01E-02
+	CS-137	661.65	*	85.12	1.53E-01	5.88E-02	5.88E-02
+	CE-144	80.12		1.36	1.77E+00	2.61E-01	3.44E+00
		133.51		11.09	-1.57E-01		2.61E-01

Analysis Report for L1-010-107-FSGS-005-SS

L1-010-107-FSGS-005-SS SOIL FSS UNIT 107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	EU-152	121.78		28.40	-3.56E-02	1.03E-01	1.03E-01
		344.28		26.60	5.36E-02		1.35E-01
		1408.00		20.74	5.09E-02		2.25E-01
+	EU-154	123.07		40.40	-6.37E-02	7.22E-02	7.22E-02
		723.30		19.70	7.54E-02		2.31E-01
		1274.51		35.50	3.16E-03		1.67E-01
+	EU-155	86.54		32.80	-6.73E-02	1.22E-01	1.22E-01
		105.31		21.80	-2.79E-02		1.43E-01
+	BI-214	609.31	*	46.30	1.85E-01	9.00E-02	9.00E-02
		1120.29	*	15.10	2.74E-01		2.32E-01
		1238.11		5.94	1.03E+00		1.16E+00
		1377.67		4.11	2.92E-02		1.10E+00
		1407.98		2.48	4.26E-01		1.88E+00
		1509.19		2.19	-9.12E-01		1.91E+00
		1764.49		15.80	4.06E-01		3.67E-01
+	PB-214	77.11		10.70	3.34E-01	9.93E-02	4.62E-01
		295.21	*	19.20	1.97E-01		1.08E-01
		351.92	*	37.20	1.70E-01		9.93E-02
+	PA-228	89.95		22.00	4.84E-01	1.88E-01	3.23E-01
		93.35		35.00	6.50E-02		1.88E-01
		105.00		16.30	-1.33E-02		3.51E-01
		129.22		2.97	4.14E-01		1.79E+00
		338.32		5.30	4.23E-01		1.14E+00
		463.00		13.80	-5.02E-02		5.20E-01
		911.23		16.70	7.30E-01		6.00E-01
+	AM-241	59.54		36.30	2.41E-01	2.18E-01	2.18E-01
+	CM-243	103.76		23.00	3.01E-02	1.38E-01	1.38E-01
		228.18		10.60	-1.32E-01		2.80E-01
		277.60		14.00	-1.49E-01		2.40E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-005-SB
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-005-SB
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.606E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 3:39:00PM
Acquisition Started	: 8/12/2019 3:12:06PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.5 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7234

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 3:42:16PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-005-SB

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	77.27	153 -	160	155.09	3.60E+01	23.35	3.89E+02	0.74
F	2	238.46	473 -	481	477.40	1.00E+02	27.54	2.19E+02	1.33
F	3	294.96	587 -	595	590.37	3.34E+01	16.42	1.27E+02	0.88
F	4	582.95	1162 -	1172	1166.25	3.22E+01	14.23	3.73E+01	1.81
F	5	609.02	1213 -	1223	1218.37	4.56E+01	17.01	5.50E+01	1.71
F	6	910.88	1817 -	1827	1822.01	2.59E+01	13.03	3.24E+01	1.97
F	7	1460.43	2915 -	2929	2920.98	2.23E+02	30.35	8.95E+00	2.33

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/12/2019 3:42:16PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	77.27	3.60E+01	23.35			3.60E+01	2.34E+01
F	2	238.46	1.00E+02	27.54			1.00E+02	2.75E+01
F	3	294.96	3.34E+01	16.42			3.34E+01	1.64E+01
F	4	582.95	3.22E+01	14.23			3.22E+01	1.42E+01
F	5	609.02	4.56E+01	17.01	2.06E+01	1.21E+01	2.50E+01	2.09E+01
F	6	910.88	2.59E+01	13.03			2.59E+01	1.30E+01
F	7	1460.43	2.23E+02	30.35	2.82E+01	8.57E+00	1.95E+02	3.15E+01

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

Analysis Report for L1-010-107-FSGS-005-SB
L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	4.93E+00	8.44E-01
PB-212	0.99	77.11	*	17.50	1.17E-01	7.65E-02
		238.63	*	44.60	1.20E-01	3.36E-02
BI-214	0.34	609.31	*	46.30	6.70E-02	5.60E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.984	4.93E+00	8.44E-01	
PB-212	0.996	1.20E-01	3.07E-02	
BI-214	0.343	6.70E-02	5.60E-02	

Analysis Report for L1-010-107-FSGS-005-SB

L1-010-107

? = 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 L1-010-107-FSGS-005-SB

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 3:42:16PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	3	294.96	1.85547E-02	24.58	Tol.	PB-214
F	4	582.95	1.78716E-02	22.12		
F	6	910.88	1.44081E-02	25.12	Tol.	AC-228 PA-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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	4.93E+00	7.02E-01	7.02E-01
+	AR-41	1293.64		99.16	2.62E+14	4.69E+14	4.69E+14
+	CO-60	1173.22		100.00	-5.10E-02	5.88E-02	6.94E-02
		1332.49		100.00	-1.24E-02		5.88E-02
+	KR-85	513.99		0.43	9.65E+00	1.28E+01	1.28E+01
+	Y-88	898.04		93.70	-2.07E-02	5.08E-02	6.27E-02
		1836.06		99.20	7.73E-03		5.08E-02
+	NB-94	702.63		100.00	-7.45E-03	4.88E-02	4.88E-02
		871.10		100.00	2.39E-02		6.54E-02
+	I-131	284.30		6.06	4.06E-01	7.42E-02	1.04E+00
		364.48		81.20	-2.03E-03		7.42E-02
		636.97		7.27	4.86E-01		1.03E+00
+	CS-134	604.70		97.60	6.34E-02	6.43E-02	6.68E-02

Analysis Report for L1-010-107-FSGS-005-SB

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CS-134	795.84		85.40	-1.63E-02	6.43E-02	6.43E-02
+	CS-137	661.65		85.12	-1.55E-02	7.00E-02	7.00E-02
+	CE-144	80.12		1.36	3.95E+00	3.54E-01	4.64E+00
		133.51		11.09	-3.55E-03		3.54E-01
+	EU-152	121.78		28.40	5.09E-02	1.42E-01	1.42E-01
		344.28		26.60	-5.46E-01		1.72E-01
		1408.00		20.74	-3.61E-03		2.54E-01
+	EU-154	123.07		40.40	-1.36E-04	9.85E-02	9.85E-02
		723.30		19.70	-1.38E-01		2.92E-01
		1274.51		35.50	2.74E-02		2.13E-01
+	EU-155	86.54		32.80	2.00E-02	1.61E-01	1.61E-01
		105.31		21.80	4.88E-02		1.86E-01
+	BI-214	609.31	*	46.30	6.70E-02	1.05E-01	1.05E-01
		1120.29		15.10	3.52E-01		5.15E-01
		1238.11		5.94	-6.48E-01		1.36E+00
		1377.67		4.11	4.72E-01		1.68E+00
		1407.98		2.48	-3.02E-02		2.12E+00
		1509.19		2.19	-2.05E+00		1.90E+00
		1764.49		15.80	7.51E-02		4.03E-01
+	PB-214	77.11		10.70	4.00E-01	1.35E-01	6.16E-01
		295.21		19.20	1.31E-01		2.53E-01
		351.92		37.20	9.55E-02		1.35E-01
+	PA-228	89.95		22.00	2.18E+00	2.84E+00	4.79E+00
		93.35		35.00	1.83E+00		2.84E+00
		105.00		16.30	-1.44E+00		5.03E+00
		129.22		2.97	-5.75E+00		2.64E+01
		338.32		5.30	1.19E+01		1.76E+01
		463.00		13.80	-8.83E-01		6.95E+00
		911.23		16.70	8.17E+00		9.10E+00
+	AM-241	59.54		36.30	1.34E-01	2.95E-01	2.95E-01
+	CM-243	103.76		23.00	-1.41E-01	1.74E-01	1.74E-01
		228.18		10.60	-1.67E-01		3.63E-01
		277.60		14.00	1.38E-01		3.16E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-006-SS

L1-010-107-FSGS-006-SS SOIL FSS UNIT 107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-006-SS
Sample Description	: L1-010-107-FSGS-006-SS SOIL FSS UNIT 107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.040E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 3:10:38PM
Acquisition Started	: 8/9/2019 11:15:25AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.4 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7214

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/9/2019 11:45:35AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-006-SS

L1-010-107-FSGS-006-SS SOIL FSS UNIT 107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.42	472 -	485	477.32	1.38E+02	34.22	3.53E+02	2.38
F	2	294.77	585 -	595	589.99	3.89E+01	21.33	1.94E+02	1.57
F	3	351.47	696 -	708	703.37	7.37E+01	24.19	1.62E+02	2.01
F	4	582.63	1159 -	1172	1165.61	5.43E+01	18.81	6.67E+01	2.37
F	5	608.95	1211 -	1225	1218.23	8.33E+01	22.13	7.90E+01	2.37
F	6	741.42	1479 -	1487	1483.13	1.06E+01	8.02	2.69E+01	0.74
F	7	1274.78	2545 -	2554	2549.72	1.01E+01	7.13	7.96E+00	1.08
F	8	1460.32	2913 -	2929	2920.76	2.63E+02	33.18	2.38E+01	2.75

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/9/2019 11:45:35AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.42	1.38E+02	34.22			1.38E+02	3.42E+01
F	2	294.77	3.89E+01	21.33			3.89E+01	2.13E+01
F	3	351.47	7.37E+01	24.19	4.18E+01	1.86E+01	3.19E+01	3.05E+01
F	4	582.63	5.43E+01	18.81			5.43E+01	1.88E+01
F	5	608.95	8.33E+01	22.13	2.06E+01	1.21E+01	6.28E+01	2.52E+01
F	6	741.42	1.06E+01	8.02			1.06E+01	8.02E+00
F	7	1274.78	1.01E+01	7.13			1.01E+01	7.13E+00
F	8	1460.32	2.63E+02	33.18	2.82E+01	8.57E+00	2.35E+02	3.43E+01

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

Analysis Report for L1-010-107-FSGS-006-SS

L1-010-107-FSGS-006-SS SOIL FSS UNIT 107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.75	*	10.67	6.36E+00	9.94E-01
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.76E-01	4.48E-02
BI-214	0.33	609.31	*	46.30	1.80E-01	7.29E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.69	77.11		10.70		
		295.21	*	19.20	1.38E-01	7.61E-02
		351.92	*	37.20	6.85E-02	6.56E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.971	6.36E+00	9.94E-01	
PB-212	0.556	1.76E-01	4.48E-02	
BI-214	0.339	1.80E-01	7.29E-02	

Analysis Report for L1-010-107-FSGS-006-SS

L1-010-107-FSGS-006-SS SOIL FSS UNIT 107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.695	9.82E-02	4.97E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FSGS-006-SS

L1-010-107-FSGS-006-SS SOIL FSS UNIT 107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/9/2019 11:45:35AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	4	582.63	3.01873E-02	17.31		
F	6	741.42	5.90797E-03	37.72		
F	7	1274.78	5.62596E-03	35.21	Tol.	EU-154

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	6.36E+00	8.84E-01	8.84E-01
+	AR-41	1293.64		99.16	1.45E+01	1.77E+02	1.77E+02
+	CO-60	1173.22		100.00	-2.27E-02	7.42E-02	9.62E-02
		1332.49		100.00	-1.50E-02		7.42E-02
+	KR-85	513.99		0.43	6.77E+00	1.40E+01	1.40E+01
+	Y-88	898.04		93.70	-4.23E-02	4.26E-02	7.00E-02
		1836.06		99.20	-5.85E-02		4.26E-02
+	NB-94	702.63		100.00	2.66E-02	5.76E-02	6.33E-02
		871.10		100.00	-7.48E-02		5.76E-02
+	I-131	284.30		6.06	-1.59E-01	6.51E-02	8.57E-01
		364.48		81.20	-1.91E-02		6.51E-02
		636.97		7.27	5.00E-02		8.16E-01
+	CS-134	604.70		97.60	-1.43E-02	7.44E-02	8.16E-02
		795.84		85.40	-2.02E-02		7.44E-02
+	CS-137	661.65		85.12	6.20E-02	8.39E-02	8.39E-02

Analysis Report for L1-010-107-FSGS-006-SS

L1-010-107-FSGS-006-SS SOIL FSS UNIT 107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12		1.36	4.28E+00	3.92E-01	5.22E+00
		133.51		11.09	-3.12E-01		3.92E-01
+	EU-152	121.78		28.40	-1.16E-01	1.52E-01	1.52E-01
		344.28		26.60	4.64E-02		2.06E-01
		1408.00		20.74	-5.73E-03		3.38E-01
+	EU-154	123.07		40.40	-2.67E-02	1.08E-01	1.08E-01
		723.30		19.70	-1.56E-01		3.32E-01
		1274.51		35.50	6.14E-02		2.38E-01
+	EU-155	86.54		32.80	-1.49E-01	1.81E-01	1.81E-01
		105.31		21.80	6.22E-02		2.22E-01
+	BI-214	609.31	*	46.30	1.80E-01	1.31E-01	1.31E-01
		1120.29		15.10	4.26E-01		6.33E-01
		1238.11		5.94	-4.27E-01		1.73E+00
		1377.67		4.11	-1.76E-01		1.74E+00
		1407.98		2.48	-4.79E-02		2.83E+00
		1509.19		2.19	9.70E-03		2.73E+00
		1764.49		15.80	2.31E-01		5.15E-01
+	PB-214	77.11		10.70	5.57E-01	1.36E-01	7.03E-01
		295.21	*	19.20	1.38E-01		1.88E-01
		351.92	*	37.20	6.85E-02		1.36E-01
+	PA-228	89.95		22.00	2.94E-01	2.92E-01	4.93E-01
		93.35		35.00	8.92E-02		2.92E-01
		105.00		16.30	2.10E-01		5.67E-01
		129.22		2.97	1.36E+00		2.80E+00
		338.32		5.30	7.10E-01		1.84E+00
		463.00		13.80	-1.32E-02		7.48E-01
		911.23		16.70	1.27E+00		1.08E+00
+	AM-241	59.54		36.30	2.10E-01	3.32E-01	3.32E-01
+	CM-243	103.76		23.00	4.47E-02	2.13E-01	2.13E-01
		228.18		10.60	-1.70E-02		4.19E-01
		277.60		14.00	9.06E-02		3.57E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-007-SS

L1-010-107-FSGS-007-SS SOIL FSS UNIT 107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-007-SS
Sample Description	: L1-010-107-FSGS-007-SS SOIL FSS UNIT 107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.230E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 3:05:37PM
Acquisition Started	: 8/9/2019 1:34:10PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.5 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7217

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/9/2019 2:04:20PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-007-SS

L1-010-107-FSGS-007-SS SOIL FSS UNIT 107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.45	471 -	484	477.37	1.93E+02	39.91	4.02E+02	2.70
F	2	294.36	585 -	595	589.18	6.14E+01	23.65	1.67E+02	2.03
F	3	351.70	697 -	711	703.83	1.48E+02	30.93	1.79E+02	2.54
F	4	583.41	1160 -	1172	1167.16	4.18E+01	17.46	7.14E+01	2.10
F	5	608.97	1211 -	1224	1218.28	1.08E+02	24.11	7.66E+01	2.17
F	6	661.19	1314 -	1328	1322.71	5.60E+01	19.13	8.25E+01	2.19
F	7	910.74	1817 -	1828	1821.71	3.63E+01	14.17	3.00E+01	1.88
F	8	969.11	1934 -	1944	1938.44	2.16E+01	11.96	3.72E+01	1.49
F	9	1460.08	2912 -	2929	2920.26	2.55E+02	32.95	2.70E+01	2.92

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/9/2019 2:04:20PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.45	1.93E+02	39.91			1.93E+02	3.99E+01
F	2	294.36	6.14E+01	23.65			6.14E+01	2.37E+01
F	3	351.70	1.48E+02	30.93	4.18E+01	1.86E+01	1.07E+02	3.61E+01
F	4	583.41	4.18E+01	17.46			4.18E+01	1.75E+01
F	5	608.97	1.08E+02	24.11	2.06E+01	1.21E+01	8.75E+01	2.70E+01
F	6	661.19	5.60E+01	19.13	3.31E+01	1.27E+01	2.29E+01	2.30E+01
F	7	910.74	3.63E+01	14.17			3.63E+01	1.42E+01
F	8	969.11	2.16E+01	11.96			2.16E+01	1.20E+01
F	9	1460.08	2.55E+02	32.95	2.82E+01	8.57E+00	2.27E+02	3.40E+01

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

Analysis Report for L1-010-107-FSGS-007-SS

L1-010-107-FSGS-007-SS SOIL FSS UNIT 107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.93	1460.75	*	10.67	6.01E+00	9.61E-01
CS-137	0.96	661.65	*	85.12	3.76E-02	3.77E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	2.42E-01	5.15E-02
BI-214	0.34	609.31	*	46.30	2.45E-01	7.67E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.68	77.11		10.70		
		295.21	*	19.20	2.13E-01	8.27E-02
		351.92	*	37.20	2.24E-01	7.65E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.930	6.01E+00	9.61E-01	
CS-137	0.967	3.76E-02	3.77E-02	

Analysis Report for L1-010-107-FSGS-007-SS

L1-010-107-FSGS-007-SS SOIL FSS UNIT 107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-212	0.557	2.42E-01	5.15E-02	
BI-214	0.341	2.45E-01	7.67E-02	
PB-214	0.685	2.19E-01	5.62E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FSGS-007-SS

L1-010-107-FSGS-007-SS SOIL FSS UNIT 107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/9/2019 2:04:20PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	4	583.41	2.32147E-02	20.89		
F	7	910.74	2.01534E-02	19.52	Tol.	AC-228 PA-228
F	8	969.11	1.20266E-02	27.64	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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	6.01E+00	9.00E-01	9.00E-01
+	AR-41	1293.64		99.16	1.25E+02	4.36E+02	4.36E+02
+	CO-60	1173.22		100.00	-2.81E-02	8.10E-02	8.47E-02
		1332.49		100.00	-3.07E-02		8.10E-02
+	KR-85	513.99		0.43	9.23E+00	1.45E+01	1.45E+01
+	Y-88	898.04		93.70	1.06E-02	5.78E-02	7.30E-02
		1836.06		99.20	1.59E-02		5.78E-02
+	NB-94	702.63		100.00	8.30E-03	5.98E-02	5.98E-02
		871.10		100.00	3.88E-02		6.89E-02
+	I-131	284.30		6.06	-2.25E-01	6.39E-02	9.07E-01
		364.48		81.20	-1.07E-02		6.39E-02
		636.97		7.27	-1.61E-01		8.50E-01

Analysis Report for L1-010-107-FSGS-007-SS

L1-010-107-FSGS-007-SS SOIL FSS UNIT 107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-134	604.70		97.60	-1.20E-02	7.90E-02	8.59E-02
		795.84		85.40	1.11E-02		7.90E-02
+	CS-137	661.65	*	85.12	3.76E-02	7.93E-02	7.93E-02
+	CE-144	80.12		1.36	-4.79E+00	4.27E-01	5.14E+00
		133.51		11.09	-1.05E-03		4.27E-01
+	EU-152	121.78		28.40	-5.56E-02	1.63E-01	1.63E-01
		344.28		26.60	1.19E-01		2.26E-01
		1408.00		20.74	1.75E-01		3.55E-01
+	EU-154	123.07		40.40	-5.61E-02	1.15E-01	1.15E-01
		723.30		19.70	-1.56E-02		3.14E-01
		1274.51		35.50	-9.91E-02		2.25E-01
+	EU-155	86.54		32.80	-5.64E-02	1.86E-01	1.86E-01
		105.31		21.80	2.29E-01		2.29E-01
+	BI-214	609.31	*	46.30	2.45E-01	1.25E-01	1.25E-01
		1120.29		15.10	4.60E-01		6.47E-01
		1238.11		5.94	-1.26E-01		1.72E+00
		1377.67		4.11	-2.88E-01		1.54E+00
		1407.98		2.48	1.46E+00		2.97E+00
		1509.19		2.19	8.62E-01		2.41E+00
		1764.49		15.80	4.14E-01		5.90E-01
+	PB-214	77.11		10.70	4.41E-01	1.41E-01	7.07E-01
		295.21	*	19.20	2.13E-01		1.71E-01
		351.92	*	37.20	2.24E-01		1.41E-01
+	PA-228	89.95		22.00	8.03E-01	3.24E-01	5.65E-01
		93.35		35.00	-1.76E-01		3.24E-01
		105.00		16.30	3.51E-01		6.24E-01
		129.22		2.97	-5.85E-01		3.23E+00
		338.32		5.30	1.04E+00		2.14E+00
		463.00		13.80	1.68E-01		7.75E-01
		911.23		16.70	4.22E-01		1.00E+00
+	AM-241	59.54		36.30	-9.25E-02	3.25E-01	3.25E-01
+	CM-243	103.76		23.00	4.13E-02	2.16E-01	2.16E-01
		228.18		10.60	9.22E-02		4.34E-01
		277.60		14.00	-2.69E-01		3.60E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-008-SS

L1-010-107-FSGS-008-SS SOIL FSS UNIT 107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-008-SS
Sample Description	: L1-010-107-FSGS-008-SS SOIL FSS UNIT 107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.774E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 3:00:52PM
Acquisition Started	: 8/9/2019 2:10:40PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1900.0 seconds
Real Time	: 1905.4 seconds
Dead Time	: 0.28 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7218

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/9/2019 2:42:30PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-008-SS

L1-010-107-FSGS-008-SS SOIL FSS UNIT 107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.70	469 -	485	477.88	2.35E+02	41.39	4.25E+02	2.81
F	2	294.58	584 -	593	589.60	5.94E+01	23.74	1.70E+02	1.74
F	3	351.82	697 -	712	704.06	1.30E+02	29.40	1.93E+02	2.48
F	4	609.01	1212 -	1223	1218.36	9.79E+01	23.08	6.01E+01	2.36
F	5	661.32	1317 -	1330	1322.96	8.41E+01	22.36	7.52E+01	2.72
F	6	1120.10	2236 -	2245	2240.37	1.90E+01	11.47	3.14E+01	1.58
F	7	1460.18	2912 -	2929	2920.47	2.98E+02	35.22	1.80E+01	2.93

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/9/2019 2:42:30PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.70	2.35E+02	41.39			2.35E+02	4.14E+01
F	2	294.58	5.94E+01	23.74			5.94E+01	2.37E+01
F	3	351.82	1.30E+02	29.40	4.41E+01	1.96E+01	8.60E+01	3.54E+01
F	4	609.01	9.79E+01	23.08	2.17E+01	1.28E+01	7.62E+01	2.64E+01
F	5	661.32	8.41E+01	22.36	3.49E+01	1.34E+01	4.92E+01	2.61E+01
F	6	1120.10	1.90E+01	11.47			1.90E+01	1.15E+01
F	7	1460.18	2.98E+02	35.22	2.97E+01	9.04E+00	2.69E+02	3.64E+01

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

Analysis Report for L1-010-107-FSGS-008-SS

L1-010-107-FSGS-008-SS SOIL FSS UNIT 107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.75	*	10.67	7.13E+00	1.04E+00
CS-137	0.98	661.65	*	85.12	8.10E-02	4.31E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	2.96E-01	5.43E-02
BI-214	0.57	609.31	*	46.30	2.14E-01	7.50E-02
		1120.29	*	15.10	2.82E-01	1.71E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.70	77.11		10.70		
		295.21	*	19.20	2.07E-01	8.32E-02
		351.92	*	37.20	1.81E-01	7.50E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.949	7.13E+00	1.04E+00	
CS-137	0.983	8.10E-02	4.31E-02	

Analysis Report for L1-010-107-FSGS-008-SS

L1-010-107-FSGS-008-SS SOIL FSS UNIT 107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-212	0.559	2.96E-01	5.43E-02	
BI-214	0.577	2.25E-01	6.87E-02	
PB-214	0.702	1.93E-01	5.57E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FSGS-008-SS

L1-010-107-FSGS-008-SS SOIL FSS UNIT 107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/9/2019 2:42:30PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	7.13E+00	8.51E-01	8.51E-01
+	AR-41	1293.64		99.16	-1.80E+02	5.91E+02	5.91E+02
+	CO-60	1173.22		100.00	6.00E-02	8.51E-02	1.01E-01
		1332.49		100.00	7.97E-03		8.51E-02
+	KR-85	513.99		0.43	1.60E+01	1.53E+01	1.53E+01
+	Y-88	898.04		93.70	2.46E-02	5.22E-02	8.21E-02
		1836.06		99.20	-1.49E-03		5.22E-02
+	NB-94	702.63		100.00	2.50E-02	6.10E-02	7.11E-02
		871.10		100.00	-7.79E-02		6.10E-02
+	I-131	284.30		6.06	-4.58E-01	7.28E-02	8.50E-01
		364.48		81.20	4.27E-02		7.28E-02
		636.97		7.27	5.54E-01		9.88E-01
+	CS-134	604.70		97.60	1.69E-01	8.46E-02	8.82E-02
		795.84		85.40	2.21E-02		8.46E-02
+	CS-137	661.65	*	85.12	8.10E-02	7.78E-02	7.78E-02
+	CE-144	80.12		1.36	7.46E-01	4.32E-01	5.53E+00
		133.51		11.09	2.47E-01		4.32E-01
+	EU-152	121.78		28.40	6.64E-02	1.67E-01	1.67E-01

Analysis Report for L1-010-107-FSGS-008-SS

L1-010-107-FSGS-008-SS SOIL FSS UNIT 107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	EU-152	344.28		26.60	2.52E-02	1.67E-01	2.26E-01
		1408.00		20.74	-9.09E-02		2.90E-01
+	EU-154	123.07		40.40	4.55E-02	1.17E-01	1.17E-01
		723.30		19.70	-2.91E-02		3.56E-01
		1274.51		35.50	-4.34E-02		2.57E-01
+	EU-155	86.54		32.80	-5.83E-02	1.95E-01	1.95E-01
		105.31		21.80	9.56E-02		2.28E-01
+	BI-214	609.31	*	46.30	2.14E-01	1.17E-01	1.17E-01
		1120.29	*	15.10	2.82E-01		3.40E-01
		1238.11		5.94	1.47E+00		1.86E+00
		1377.67		4.11	9.05E-01		1.79E+00
		1407.98		2.48	-7.60E-01		2.42E+00
		1509.19		2.19	1.86E+00		2.68E+00
		1764.49		15.80	2.26E-01		5.05E-01
+	PB-214	77.11		10.70	4.41E-01	1.49E-01	7.50E-01
		295.21	*	19.20	2.07E-01		1.68E-01
		351.92	*	37.20	1.81E-01		1.49E-01
+	PA-228	89.95		22.00	5.85E-01	3.43E-01	5.94E-01
		93.35		35.00	-6.26E-02		3.43E-01
		105.00		16.30	1.53E-02		6.34E-01
		129.22		2.97	1.66E+00		3.40E+00
		338.32		5.30	2.15E+00		2.31E+00
		463.00		13.80	2.39E-01		8.71E-01
		911.23		16.70	9.48E-01		1.14E+00
+	AM-241	59.54		36.30	-7.35E-02	3.37E-01	3.37E-01
+	CM-243	103.76		23.00	-1.50E-02	2.15E-01	2.15E-01
		228.18		10.60	2.57E-02		4.24E-01
		277.60		14.00	-2.50E-01		3.45E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-009-SS

L1-010-107-FSGS-009-SS SOIL FSS UNIT 107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-009-SS
Sample Description	: L1-010-107-FSGS-009-SS SOIL FSS UNIT 107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.057E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 2:56:18PM
Acquisition Started	: 8/9/2019 2:43:15PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.1 seconds
Dead Time	: 0.28 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7219

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/9/2019 3:13:24PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-009-SS

L1-010-107-FSGS-009-SS SOIL FSS UNIT 107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	351.73	700 -	708	703.89	1.24E+02	26.13	8.16E+01	2.14
F	2	609.16	1213 -	1227	1218.65	9.21E+01	22.70	7.97E+01	2.32
F	3	1460.10	2911 -	2929	2920.31	1.69E+02	26.16	0.00E+00	3.50

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/9/2019 3:13:24PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	351.73	1.24E+02	26.13	4.18E+01	1.86E+01	8.27E+01	3.21E+01
F	2	609.16	9.21E+01	22.70	2.06E+01	1.21E+01	7.15E+01	2.57E+01
F	3	1460.10	1.69E+02	26.16	2.82E+01	8.57E+00	1.41E+02	2.75E+01

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\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Analysis Report for L1-010-107-FSGS-009-SS

L1-010-107-FSGS-009-SS SOIL FSS UNIT 107

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.93	1460.75	*	10.67	3.39E+00	6.88E-01
BI-214	0.34	609.31	*	46.30	1.82E-01	6.62E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.935	3.39E+00	6.88E-01	
BI-214	0.348	1.82E-01	6.62E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FSGS-009-SS

L1-010-107-FSGS-009-SS SOIL FSS UNIT 107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/9/2019 3:13:24PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	1	351.73	4.59416E-02	19.40	Tol.	PB-214

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	3.39E+00	6.05E-01	6.05E-01
+	AR-41	1293.64		99.16	-1.52E+02	4.76E+02	4.76E+02
+	CO-60	1173.22		100.00	1.89E-02	6.05E-02	7.97E-02
		1332.49		100.00	4.46E-02		6.05E-02
+	KR-85	513.99		0.43	3.72E+00	1.22E+01	1.22E+01
+	Y-88	898.04		93.70	-4.65E-02	5.58E-02	5.58E-02
		1836.06		99.20	2.68E-02		6.14E-02
+	NB-94	702.63		100.00	-2.47E-02	4.91E-02	4.91E-02
		871.10		100.00	1.59E-02		4.99E-02
+	I-131	284.30		6.06	-4.26E-01	4.91E-02	7.02E-01
		364.48		81.20	-8.36E-03		4.91E-02
		636.97		7.27	-3.30E-01		7.61E-01
+	CS-134	604.70		97.60	-2.64E-02	6.38E-02	7.43E-02
		795.84		85.40	1.53E-02		6.38E-02
+	CS-137	661.65		85.12	5.45E-02	6.84E-02	6.84E-02
+	CE-144	80.12		1.36	2.39E-01	3.33E-01	4.27E+00

Analysis Report for L1-010-107-FSGS-009-SS

L1-010-107-FSGS-009-SS SOIL FSS UNIT 107

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CE-144	133.51	11.09	1.66E-01	3.33E-01	3.33E-01
+	EU-152	121.78	28.40	-7.00E-02	1.28E-01	1.28E-01
		344.28	26.60	-4.81E-01		1.74E-01
		1408.00	20.74	1.36E-02		2.94E-01
+	EU-154	123.07	40.40	-4.94E-02	9.14E-02	9.14E-02
		723.30	19.70	-1.23E-01		2.58E-01
		1274.51	35.50	1.57E-01		1.79E-01
+	EU-155	86.54	32.80	-1.07E-01	1.49E-01	1.49E-01
		105.31	21.80	8.88E-02		1.82E-01
+	BI-214	609.31 *	46.30	1.82E-01	1.17E-01	1.17E-01
		1120.29	15.10	7.09E-02		5.62E-01
		1238.11	5.94	1.33E+00		1.39E+00
		1377.67	4.11	5.30E-01		1.60E+00
		1407.98	2.48	1.14E-01		2.46E+00
		1509.19	2.19	-8.44E-01		2.57E+00
		1764.49	15.80	2.66E-01		3.83E-01
+	PB-214	77.11	10.70	7.55E-01	1.46E-01	5.91E-01
		295.21	19.20	2.49E-01		2.42E-01
		351.92	37.20	2.05E-01		1.46E-01
+	PA-228	89.95	22.00	2.94E-01	2.69E-01	4.56E-01
		93.35	35.00	4.35E-02		2.69E-01
		105.00	16.30	8.93E-02		5.20E-01
		129.22	2.97	-4.02E-01		2.66E+00
		338.32	5.30	1.93E+00		1.74E+00
		463.00	13.80	-3.36E-01		6.03E-01
		911.23	16.70	5.53E-01		8.13E-01
+	AM-241	59.54	36.30	4.96E-03	2.74E-01	2.74E-01
+	CM-243	103.76	23.00	9.95E-03	1.73E-01	1.73E-01
		228.18	10.60	-1.78E-01		3.31E-01
		277.60	14.00	-1.73E-01		2.71E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-010-SS
L1-010-107-FSGS-010-SS SOIL FSS UNIT 107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-010-SS
Sample Description	: L1-010-107-FSGS-010-SS SOIL FSS UNIT 107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.099E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019. 2:50:52PM
Acquisition Started	: 8/12/2019 7:30:39AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.1 seconds
Dead Time	: 0.28 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7224

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 8:00:49AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-010-SS

L1-010-107-FSGS-010-SS SOIL FSS UNIT 107

? = 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 L1-010-107-FSGS-010-SS

L1-010-107-FSGS-010-SS SOIL FSS UNIT 107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 8:00:49AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	3.41E+00	9.20E-01	9.20E-01
+	AR-41	1293.64		99.16	-9.47E+12	3.57E+13	3.57E+13
+	CO-60	1173.22		100.00	5.76E-02	8.80E-02	9.57E-02
		1332.49		100.00	2.37E-02		8.80E-02
+	KR-85	513.99		0.43	1.13E+01	1.53E+01	1.53E+01
+	Y-88	898.04		93.70	1.45E-02	4.91E-02	8.00E-02
		1836.06		99.20	-2.56E-02		4.91E-02
+	NB-94	702.63		100.00	6.22E-03	6.04E-02	6.04E-02
		871.10		100.00	-2.97E-02		6.20E-02
+	I-131	284.30		6.06	8.11E-01	8.23E-02	1.13E+00
		364.48		81.20	-5.21E-02		8.23E-02
		636.97		7.27	4.37E-01		1.11E+00
+	CS-134	604.70		97.60	-6.08E-02	7.63E-02	8.83E-02
		795.84		85.40	-2.29E-03		7.63E-02
+	CS-137	661.65		85.12	7.25E-02	8.19E-02	8.19E-02
+	CE-144	80.12		1.36	1.08E+00	3.89E-01	5.16E+00
		133.51		11.09	-3.27E-01		3.89E-01
+	EU-152	121.78		28.40	-1.85E-02	1.57E-01	1.57E-01

Analysis Report for L1-010-107-FSGS-010-SS

L1-010-107-FSGS-010-SS SOIL FSS UNIT 107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	EU-152	344.28		26.60	5.89E-03	1.57E-01	1.88E-01
		1408.00		20.74	1.75E-02		3.26E-01
+	EU-154	123.07		40.40	2.51E-02	1.11E-01	1.11E-01
		723.30		19.70	-1.78E-01		3.00E-01
		1274.51		35.50	3.90E-02		2.45E-01
+	EU-155	86.54		32.80	-1.08E-01	1.74E-01	1.74E-01
		105.31		21.80	-1.13E-01		2.20E-01
+	BI-214	609.31	*	46.30	2.39E-01	1.24E-01	1.24E-01
		1120.29	*	15.10	1.89E-01		3.40E-01
		1238.11		5.94	2.01E-01		1.33E+00
		1377.67		4.11	6.21E-01		1.48E+00
		1407.98		2.48	1.46E-01		2.73E+00
		1509.19		2.19	2.77E+00		3.45E+00
		1764.49		15.80	3.18E-01		5.45E-01
+	PB-214	77.11		10.70	8.02E-01	1.31E-01	7.09E-01
		295.21	*	19.20	2.73E-01		1.86E-01
		351.92	*	37.20	1.29E-01		1.31E-01
+	PA-228	89.95		22.00	5.71E-01	2.55E+00	4.15E+00
		93.35		35.00	2.30E+00		2.55E+00
		105.00		16.30	-9.23E-02		4.89E+00
		129.22		2.97	-1.50E+01		2.40E+01
		338.32		5.30	1.15E+01		1.59E+01
		463.00		13.80	3.57E+00		6.55E+00
		911.23		16.70	-2.64E+00		7.81E+00
+	AM-241	59.54		36.30	4.66E-02	3.29E-01	3.29E-01
+	CM-243	103.76		23.00	7.17E-02	2.14E-01	2.14E-01
		228.18		10.60	-6.34E-02		4.23E-01
		277.60		14.00	-2.98E-01		3.40E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-011-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-011-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 6.582E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 2:45:00PM
Acquisition Started	: 8/12/2019 9:15:55AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.3 seconds
Dead Time	: 0.29 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7227

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 9:46:04AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-011-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	93.07	182 -	192	186.69	4.49E+01	25.90	3.90E+02	1.30
F	2	238.52	472 -	485	477.51	1.20E+02	27.68	2.57E+02	1.40
F	3	295.31	586 -	598	591.06	4.30E+01	19.14	1.74E+02	1.30
F	4	351.76	699 -	708	703.95	9.09E+01	23.13	1.09E+02	1.40
F	5	608.90	1213 -	1224	1218.13	6.10E+01	17.83	5.22E+01	1.46
F	6	910.66	1815 -	1826	1821.55	2.35E+01	12.03	2.95E+01	1.58
F	7	1460.26	2913 -	2928	2920.64	2.00E+02	28.70	8.38E+00	2.38

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/12/2019 9:46:04AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	93.07	4.49E+01	25.90			4.49E+01	2.59E+01
F	2	238.52	1.20E+02	27.68			1.20E+02	2.77E+01
F	3	295.31	4.30E+01	19.14			4.30E+01	1.91E+01
F	4	351.76	9.09E+01	23.13	4.18E+01	1.86E+01	4.91E+01	2.97E+01
F	5	608.90	6.10E+01	17.83	2.06E+01	1.21E+01	4.04E+01	2.16E+01
F	6	910.66	2.35E+01	12.03			2.35E+01	1.20E+01
F	7	1460.26	2.00E+02	28.70	2.82E+01	8.57E+00	1.72E+02	3.00E+01

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

Analysis Report for L1-010-107-FSGS-011-SS
L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.96	1460.75	*	10.67	5.70E+00	1.04E+00
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.88E-01	4.45E-02
BI-214	0.33	609.31	*	46.30	1.41E-01	7.58E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.71	77.11		10.70		
		295.21	*	19.20	1.87E-01	8.37E-02
		351.92	*	37.20	1.29E-01	7.82E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.963	5.70E+00	1.04E+00	
PB-212	0.559	1.88E-01	4.45E-02	
BI-214	0.336	1.41E-01	7.58E-02	

Analysis Report for L1-010-107-FSGS-011-SS

L1-010-107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.719	1.56E-01	5.71E-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 L1-010-107-FSGS-011-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 9:46:04AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	1	93.07	2.49302E-02	28.86	Tol.	PA-228
F	6	910.66	1.30813E-02	25.54	Tol.	AC-228 PA-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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.70E+00	9.30E-01	9.30E-01
+	AR-41	1293.64		99.16	-1.83E+13	8.51E+13	8.51E+13
+	CO-60	1173.22		100.00	4.70E-02	9.22E-02	1.03E-01
		1332.49		100.00	6.62E-02		9.22E-02
+	KR-85	513.99		0.43	2.83E+01	1.76E+01	1.76E+01
+	Y-88	898.04		93.70	5.63E-02	8.31E-02	9.61E-02
		1836.06		99.20	2.66E-02		8.31E-02
+	NB-94	702.63		100.00	3.26E-03	7.15E-02	7.15E-02
		871.10		100.00	-2.35E-02		7.37E-02
+	I-131	284.30		6.06	5.24E-01	9.24E-02	1.37E+00
		364.48		81.20	-4.18E-02		9.24E-02
		636.97		7.27	-5.50E-01		1.31E+00

Analysis Report for L1-010-107-FSGS-011-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-134	604.70		97.60	-3.36E-02	8.88E-02	9.09E-02
		795.84		85.40	-1.65E-02		8.88E-02
+	CS-137	661.65		85.12	3.58E-02	1.02E-01	1.02E-01
+	CE-144	80.12		1.36	-1.49E+00	4.43E-01	5.85E+00
		133.51		11.09	-4.13E-03		4.43E-01
+	EU-152	121.78		28.40	-9.88E-02	1.72E-01	1.72E-01
		344.28		26.60	-1.07E-01		2.33E-01
		1408.00		20.74	1.63E-01		3.88E-01
+	EU-154	123.07		40.40	-7.31E-02	1.21E-01	1.21E-01
		723.30		19.70	-1.54E-02		3.49E-01
		1274.51		35.50	1.45E-01		2.85E-01
+	EU-155	86.54		32.80	9.14E-02	2.08E-01	2.08E-01
		105.31		21.80	1.17E-02		2.43E-01
+	BI-214	609.31	*	46.30	1.41E-01	1.38E-01	1.38E-01
		1120.29		15.10	-2.99E-01		6.61E-01
		1238.11		5.94	6.73E-01		1.95E+00
		1377.67		4.11	-3.13E-01		1.96E+00
		1407.98		2.48	1.36E+00		3.25E+00
		1509.19		2.19	2.10E+00		3.63E+00
		1764.49		15.80	3.82E-01		6.16E-01
+	PB-214	77.11		10.70	2.75E-01	1.44E-01	7.83E-01
		295.21	*	19.20	1.87E-01		2.31E-01
		351.92	*	37.20	1.29E-01		1.44E-01
+	PA-228	89.95		22.00	1.79E+00	3.01E+00	5.29E+00
		93.35		35.00	3.02E-01		3.01E+00
		105.00		16.30	4.84E-01		5.68E+00
		129.22		2.97	8.71E+00		2.90E+01
		338.32		5.30	-4.66E-01		1.90E+01
		463.00		13.80	5.45E+00		7.53E+00
		911.23		16.70	9.82E+00		1.05E+01
+	AM-241	59.54		36.30	1.82E-01	3.68E-01	3.68E-01
+	CM-243	103.76		23.00	1.31E-01	2.34E-01	2.34E-01
		228.18		10.60	7.85E-02		4.87E-01
		277.60		14.00	2.64E-01		4.25E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-012-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-012-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.061E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 2:42:00PM
Acquisition Started	: 8/12/2019 10:30:50AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.3 seconds
Dead Time	: 0.29 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7229

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 11:01:04AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-012-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.54	470 -	485	477.55	1.03E+02	26.65	2.40E+02	1.86
F	2	295.33	586 -	596	591.11	4.89E+01	18.86	1.46E+02	1.12
F	3	351.80	698 -	710	704.03	1.28E+02	27.09	1.53E+02	1.64
F	4	608.96	1211 -	1224	1218.25	6.91E+01	18.72	5.20E+01	1.59
F	5	1460.58	2913 -	2928	2921.28	1.50E+02	25.22	1.21E+01	2.94

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/12/2019 11:01:04AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.54	1.03E+02	26.65			1.03E+02	2.67E+01
F	2	295.33	4.89E+01	18.86			4.89E+01	1.89E+01
F	3	351.80	1.28E+02	27.09	4.18E+01	1.86E+01	8.64E+01	3.29E+01
F	4	608.96	6.91E+01	18.72	2.06E+01	1.21E+01	4.85E+01	2.23E+01
F	5	1460.58	1.50E+02	25.22	2.82E+01	8.57E+00	1.22E+02	2.66E+01

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\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Analysis Report for L1-010-107-FSGS-012-SS

L1-010-107

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	3.29E+00	7.43E-01
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.32E-01	3.48E-02
BI-214	0.34	609.31	*	46.30	1.38E-01	6.41E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.74E-01	6.75E-02
		351.92	*	37.20	1.85E-01	7.10E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.996	3.29E+00	7.43E-01	
PB-212	0.559	1.32E-01	3.48E-02	
BI-214	0.340	1.38E-01	6.41E-02	
PB-214	0.720	1.79E-01	4.89E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FSGS-012-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 11:01:04AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	3.29E+00	7.89E-01	7.89E-01
+	AR-41	1293.64		99.16	-2.73E+13	9.66E+13	9.66E+13
+	CO-60	1173.22		100.00	6.51E-02	7.52E-02	8.89E-02
		1332.49		100.00	1.29E-02		7.52E-02
+	KR-85	513.99		0.43	4.63E+00	1.42E+01	1.42E+01
+	Y-88	898.04		93.70	-3.41E-02	6.54E-02	7.19E-02
		1836.06		99.20	2.70E-03		6.54E-02
+	NB-94	702.63		100.00	7.99E-03	5.42E-02	5.42E-02
		871.10		100.00	4.12E-03		6.27E-02
+	I-131	284.30		6.06	-4.83E-01	7.24E-02	9.89E-01
		364.48		81.20	-3.73E-02		7.24E-02
		636.97		7.27	7.67E-01		1.01E+00
+	CS-134	604.70		97.60	1.23E-02	7.61E-02	7.61E-02
		795.84		85.40	3.64E-02		7.80E-02
+	CS-137	661.65		85.12	6.70E-02	7.60E-02	7.60E-02
+	CE-144	80.12		1.36	9.18E-01	3.64E-01	4.54E+00
		133.51		11.09	-4.26E-02		3.64E-01
+	EU-152	121.78		28.40	-1.65E-02	1.42E-01	1.42E-01

Analysis Report for L1-010-107-FSGS-012-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	EU-152	344.28		26.60	-6.80E-03	1.42E-01	1.74E-01
		1408.00		20.74	-5.44E-02		2.71E-01
+	EU-154	123.07		40.40	1.78E-03	9.98E-02	9.98E-02
		723.30		19.70	-9.24E-02		2.69E-01
		1274.51		35.50	-7.92E-02		1.66E-01
+	EU-155	86.54		32.80	-1.99E-02	1.64E-01	1.64E-01
		105.31		21.80	7.88E-03		1.96E-01
+	BI-214	609.31	*	46.30	1.38E-01	1.15E-01	1.15E-01
		1120.29		15.10	-2.40E-02		5.69E-01
		1238.11		5.94	1.69E-01		1.40E+00
		1377.67		4.11	1.00E-01		1.60E+00
		1407.98		2.48	-4.55E-01		2.27E+00
		1509.19		2.19	9.04E-01		2.36E+00
		1764.49		15.80	4.28E-01		5.03E-01
+	PB-214	77.11		10.70	4.76E-01	1.34E-01	6.05E-01
		295.21	*	19.20	1.74E-01		1.64E-01
		351.92	*	37.20	1.85E-01		1.34E-01
+	PA-228	89.95		22.00	1.70E+00	2.47E+00	4.29E+00
		93.35		35.00	8.01E-01		2.47E+00
		105.00		16.30	-9.28E-01		4.78E+00
		129.22		2.97	-1.25E+01		2.44E+01
		338.32		5.30	1.75E+00		1.47E+01
		463.00		13.80	1.51E+00		7.06E+00
		911.23		16.70	6.32E+00		7.85E+00
+	AM-241	59.54		36.30	2.31E-02	3.00E-01	3.00E-01
+	CM-243	103.76		23.00	-1.37E-01	1.84E-01	1.84E-01
		228.18		10.60	-3.79E-03		4.01E-01
		277.60		14.00	-1.31E-01		3.22E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-013-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-013-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 6.634E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 2:37:00PM
Acquisition Started	: 8/12/2019 8:06:27AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.5 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7225

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 8:36:37AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-013-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.42	474 -	482	477.32	4.84E+01	20.02	1.75E+02	1.04
F	2	608.84	1212 -	1225	1218.01	8.13E+01	19.94	3.68E+01	2.24
F	3	1460.18	2914 -	2928	2920.48	1.19E+02	23.60	3.75E+01	2.28
F	4	1763.77	3522 -	3532	3527.61	2.07E+01	9.55	0.00E+00	2.71

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/12/2019 8:36:37AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.42	4.84E+01	20.02			4.84E+01	2.00E+01
F	2	608.84	8.13E+01	19.94	2.06E+01	1.21E+01	6.08E+01	2.33E+01
F	3	1460.18	1.19E+02	23.60	2.82E+01	8.57E+00	9.08E+01	2.51E+01
F	4	1763.77	2.07E+01	9.55	7.59E+00	4.90E+00	1.31E+01	1.07E+01

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\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Analysis Report for L1-010-107-FSGS-013-SS

L1-010-107

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.95	1460.75	*	10.67	2.98E+00	8.41E-01
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	7.52E-02	3.14E-02
BI-214	0.52	609.31	*	46.30	2.11E-01	8.18E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49	*	15.80	3.41E-01	2.80E-01

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.950	2.98E+00	8.41E-01	
PB-212	0.555	7.52E-02	3.14E-02	
BI-214	0.521	2.21E-01	7.85E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FSGS-013-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 8:36:37AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	2.98E+00	1.17E+00	1.17E+00
+	AR-41	1293.64		99.16	-4.86E+12	4.67E+13	4.67E+13
+	CO-60	1173.22		100.00	4.05E-02	8.72E-02	1.01E-01
		1332.49		100.00	2.27E-02		8.72E-02
+	KR-85	513.99		0.43	7.70E+00	1.55E+01	1.55E+01
+	Y-88	898.04		93.70	-3.89E-02	6.18E-02	7.65E-02
		1836.06		99.20	-4.01E-02		6.18E-02
+	NB-94	702.63		100.00	2.56E-02	6.64E-02	6.64E-02
		871.10		100.00	-2.63E-02		7.23E-02
+	I-131	284.30		6.06	9.37E-01	8.53E-02	1.22E+00
		364.48		81.20	3.78E-02		8.53E-02
		636.97		7.27	-1.50E-01		1.23E+00
+	CS-134	604.70		97.60	-4.07E-02	9.12E-02	9.12E-02
		795.84		85.40	-1.69E-02		9.55E-02
+	CS-137	661.65		85.12	1.30E-02	8.13E-02	8.13E-02
+	CE-144	80.12		1.36	-1.03E+00	4.56E-01	5.59E+00
		133.51		11.09	2.20E-01		4.56E-01
+	EU-152	121.78		28.40	-1.15E-01	1.66E-01	1.66E-01

Analysis Report for L1-010-107-FSGS-013-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	EU-152	344.28		26.60	-6.63E-01	1.66E-01	2.11E-01
		1408.00		20.74	1.82E-01		3.94E-01
+	EU-154	123.07		40.40	-4.44E-02	1.18E-01	1.18E-01
		723.30		19.70	3.73E-01		3.92E-01
		1274.51		35.50	1.72E-01		2.62E-01
+	EU-155	86.54		32.80	-5.69E-02	1.90E-01	1.90E-01
		105.31		21.80	-1.95E-02		2.36E-01
+	BI-214	609.31	*	46.30	2.11E-01	1.28E-01	1.28E-01
		1120.29		15.10	-1.30E-01		5.85E-01
		1238.11		5.94	1.15E-01		1.84E+00
		1377.67		4.11	5.88E-01		1.78E+00
		1407.98		2.48	1.52E+00		3.29E+00
		1509.19		2.19	1.70E+00		3.51E+00
		1764.49	*	15.80	3.41E-01		3.85E-01
+	PB-214	77.11		10.70	8.59E-01	1.73E-01	7.66E-01
		295.21		19.20	1.51E-01		3.14E-01
		351.92		37.20	1.35E-01		1.73E-01
+	PA-228	89.95		22.00	4.87E+00	2.70E+00	4.66E+00
		93.35		35.00	-2.19E+00		2.70E+00
		105.00		16.30	-1.80E+00		5.30E+00
		129.22		2.97	2.34E+01		2.80E+01
		338.32		5.30	-1.27E+01		1.71E+01
		463.00		13.80	-1.72E+00		6.85E+00
		911.23		16.70	6.29E+00		8.27E+00
+	AM-241	59.54		36.30	-2.62E-02	3.45E-01	3.45E-01
+	CM-243	103.76		23.00	1.49E-02	2.26E-01	2.26E-01
		228.18		10.60	3.32E-01		4.62E-01
		277.60		14.00	-3.78E-01		3.48E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-014-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-014-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.145E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 2:30:00PM
Acquisition Started	: 8/12/2019 11:07:15AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.3 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7230

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 11:37:24AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-014-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	185.58	368 -	377	371.66	6.85E+01	26.60	2.97E+02	1.41
M	2	238.55	472 -	489	477.57	1.11E+02	27.83	2.23E+02	1.63
m	3	241.92	472 -	489	484.31	4.76E+01	21.13	2.13E+02	1.64
F	4	295.06	584 -	596	590.58	9.23E+01	24.77	1.82E+02	1.57
F	5	351.99	699 -	712	704.40	1.39E+02	27.36	1.40E+02	1.65
F	6	609.12	1214 -	1226	1218.57	1.03E+02	22.42	6.27E+01	1.50
F	7	1460.42	2913 -	2928	2920.96	2.51E+02	32.42	2.37E+01	2.47

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/12/2019 11:37:24AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	185.58	6.85E+01	26.60			6.85E+01	2.66E+01
M	2	238.55	1.11E+02	27.83			1.11E+02	2.78E+01
m	3	241.92	4.76E+01	21.13			4.76E+01	2.11E+01
F	4	295.06	9.23E+01	24.77			9.23E+01	2.48E+01
F	5	351.99	1.39E+02	27.36	4.18E+01	1.86E+01	9.73E+01	3.31E+01
F	6	609.12	1.03E+02	22.42	2.06E+01	1.21E+01	8.27E+01	2.55E+01
F	7	1460.42	2.51E+02	32.42	2.82E+01	8.57E+00	2.23E+02	3.35E+01

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

Analysis Report for L1-010-107-FSGS-014-SS

L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.31E+00	8.51E-01
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.25E-01	3.21E-02
BI-214	0.34	609.31	*	46.30	2.08E-01	6.52E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	2.89E-01	7.88E-02
		351.92	*	37.20	1.84E-01	6.32E-02
RA-226	0.93	186.21	*	3.28	8.82E-01	3.46E-01

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.983	5.31E+00	8.51E-01	
PB-212	0.559	1.25E-01	3.21E-02	

Analysis Report for L1-010-107-FSGS-014-SS

L1-010-107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BI-214	0.347	2.08E-01	6.52E-02	
PB-214	0.720	2.25E-01	4.93E-02	
RA-226	0.938	8.82E-01	3.46E-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 L1-010-107-FSGS-014-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 11:37:24AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m	3	241.92	2.64192E-02	22.21		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.31E+00	7.74E-01	7.74E-01
+	AR-41	1293.64		99.16	-8.16E+12	1.36E+14	1.36E+14
+	CO-60	1173.22		100.00	9.11E-02	7.73E-02	9.11E-02
		1332.49		100.00	7.06E-03		7.73E-02
+	KR-85	513.99		0.43	4.76E+00	1.29E+01	1.29E+01
+	Y-88	898.04		93.70	2.22E-02	3.82E-02	7.03E-02
		1836.06		99.20	-5.13E-02		3.82E-02
+	NB-94	702.63		100.00	2.36E-02	5.99E-02	5.99E-02
		871.10		100.00	-5.04E-02		6.15E-02
+	I-131	284.30		6.06	1.24E-01	7.30E-02	9.89E-01
		364.48		81.20	2.34E-02		7.30E-02
		636.97		7.27	-2.52E-01		9.31E-01
+	CS-134	604.70		97.60	-3.89E-02	7.03E-02	8.14E-02
		795.84		85.40	-6.37E-03		7.03E-02
+	CS-137	661.65		85.12	-1.12E-03	7.51E-02	7.51E-02

Analysis Report for L1-010-107-FSGS-014-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12		1.36	4.53E+00	3.67E-01	4.77E+00
		133.51		11.09	2.89E-02		3.67E-01
+	EU-152	121.78		28.40	5.40E-02	1.44E-01	1.44E-01
		344.28		26.60	-1.38E-01		1.76E-01
		1408.00		20.74	1.13E-01		3.30E-01
+	EU-154	123.07		40.40	1.48E-02	1.01E-01	1.01E-01
		723.30		19.70	4.64E-02		2.90E-01
		1274.51		35.50	-1.05E-01		1.77E-01
+	EU-155	86.54		32.80	-7.07E-02	1.64E-01	1.64E-01
		105.31		21.80	-1.39E-01		1.91E-01
+	BI-214	609.31	*	46.30	2.08E-01	1.05E-01	1.05E-01
		1120.29		15.10	4.63E-01		5.45E-01
		1238.11		5.94	5.18E-02		1.60E+00
		1377.67		4.11	-2.49E-01		1.41E+00
		1407.98		2.48	9.44E-01		2.76E+00
		1509.19		2.19	-3.77E-01		2.33E+00
		1764.49		15.80	5.47E-01		5.23E-01
+	PB-214	77.11		10.70	2.05E-01	1.17E-01	6.25E-01
		295.21	*	19.20	2.89E-01		1.68E-01
		351.92	*	37.20	1.84E-01		1.17E-01
+	PA-228	89.95		22.00	1.84E+00	2.52E+00	4.31E+00
		93.35		35.00	1.63E+00		2.52E+00
		105.00		16.30	-9.86E-01		4.80E+00
		129.22		2.97	6.51E+00		2.54E+01
		338.32		5.30	-4.42E+00		1.55E+01
		463.00		13.80	2.65E+00		6.75E+00
		911.23		16.70	-2.09E+00		7.71E+00
+	AM-241	59.54		36.30	-3.22E-02	2.78E-01	2.78E-01
+	CM-243	103.76		23.00	1.67E-02	1.85E-01	1.85E-01
		228.18		10.60	1.28E-01		3.70E-01
		277.60		14.00	5.08E-03		3.14E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-014-SB
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-014-SB
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.226E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 3:50:00PM
Acquisition Started	: 8/12/2019 4:19:35PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1806.1 seconds
Dead Time	: 0.34 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7254

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/13/2019 9:50:12AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-014-SB

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.44	470 -	481	477.36	9.06E+01	26.37	2.64E+02	1.22
F	2	294.93	585 -	596	590.31	3.29E+01	19.61	1.72E+02	1.61
F	3	583.32	1163 -	1172	1166.98	2.98E+01	13.25	3.30E+01	1.41
F	4	609.43	1215 -	1225	1219.18	5.58E+01	17.16	4.06E+01	1.63
F	5	1460.39	2914 -	2929	2920.89	2.36E+02	31.20	1.15E+01	2.53

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/13/2019 9:50:12AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.44	9.06E+01	26.37			9.06E+01	2.64E+01
F	2	294.93	3.29E+01	19.61			3.29E+01	1.96E+01
F	3	583.32	2.98E+01	13.25			2.98E+01	1.32E+01
F	4	609.43	5.58E+01	17.16	2.06E+01	1.21E+01	3.52E+01	2.10E+01
F	5	1460.39	2.36E+02	31.20	2.82E+01	8.57E+00	2.08E+02	3.24E+01

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\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Analysis Report for L1-010-107-FSGS-014-SB

L1-010-107

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.75	*	10.67	4.92E+00	8.11E-01
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.01E-01	2.99E-02
BI-214	0.34	609.31	*	46.30	8.80E-02	5.27E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.979	4.92E+00	8.11E-01	
PB-212	0.556	1.01E-01	2.99E-02	
BI-214	0.349	8.80E-02	5.27E-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 L1-010-107-FSGS-014-SB

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/13/2019 9:50:12AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	2	294.93	1.82830E-02	29.79	Tol.	PB-214
F	3	583.32	1.65279E-02	22.26		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	4.92E+00	6.83E-01	6.83E-01
+	AR-41	1293.64		99.16	-2.42E+14	5.26E+14	5.26E+14
+	CO-60	1173.22		100.00	1.04E-03	6.47E-02	7.83E-02
		1332.49		100.00	-5.83E-04		6.47E-02
+	KR-85	513.99		0.43	6.92E+00	1.29E+01	1.29E+01
+	Y-88	898.04		93.70	-3.53E-02	5.26E-02	6.47E-02
		1836.06		99.20	-1.16E-02		5.26E-02
+	NB-94	702.63		100.00	-3.75E-02	4.90E-02	4.90E-02
		871.10		100.00	-5.46E-02		5.25E-02
+	I-131	284.30		6.06	-5.98E-01	6.62E-02	9.24E-01
		364.48		81.20	3.97E-02		6.62E-02
		636.97		7.27	-6.53E-03		9.15E-01
+	CS-134	604.70		97.60	-5.22E-02	6.23E-02	6.23E-02
		795.84		85.40	2.78E-02		6.76E-02
+	CS-137	661.65		85.12	5.97E-02	6.86E-02	6.86E-02
+	CE-144	80.12		1.36	1.18E+00	3.28E-01	4.23E+00

Analysis Report for L1-010-107-FSGS-014-SB

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CE-144	133.51		11.09	2.47E-02	3.28E-01	3.28E-01
+	EU-152	121.78		28.40	-1.07E-01	1.29E-01	1.29E-01
		344.28		26.60	-1.84E-01		1.67E-01
		1408.00		20.74	7.46E-02		2.22E-01
+	EU-154	123.07		40.40	-3.68E-02	9.11E-02	9.11E-02
		723.30		19.70	1.92E-01		2.76E-01
		1274.51		35.50	1.00E-01		1.93E-01
+	EU-155	86.54		32.80	-1.35E-01	1.47E-01	1.47E-01
		105.31		21.80	1.24E-01		1.84E-01
+	BI-214	609.31	*	46.30	8.80E-02	9.16E-02	9.16E-02
		1120.29		15.10	-7.27E-02		4.49E-01
		1238.11		5.94	1.17E+00		1.49E+00
		1377.67		4.11	4.90E-01		1.34E+00
		1407.98		2.48	6.24E-01		1.85E+00
		1509.19		2.19	8.88E-02		2.15E+00
		1764.49		15.80	2.80E-01		4.30E-01
+	PB-214	77.11		10.70	3.04E-01	1.29E-01	5.72E-01
		295.21		19.20	7.66E-02		2.19E-01
		351.92		37.20	1.13E-01		1.29E-01
+	PA-228	89.95		22.00	4.56E+00	2.65E+00	4.55E+00
		93.35		35.00	5.97E-01		2.65E+00
		105.00		16.30	6.54E-01		5.12E+00
		129.22		2.97	2.26E+01		2.62E+01
		338.32		5.30	-9.46E+00		1.56E+01
		463.00		13.80	3.43E+00		6.84E+00
		911.23		16.70	2.63E+00		8.75E+00
+	AM-241	59.54		36.30	-1.88E-01	2.70E-01	2.70E-01
+	CM-243	103.76		23.00	7.42E-02	1.74E-01	1.74E-01
		228.18		10.60	1.94E-01		3.51E-01
		277.60		14.00	4.26E-02		2.95E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FJGS-015-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FJGS-015-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 6.981E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/9/2019 1:49:00PM
Acquisition Started	: 8/12/2019 9:50:29AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.6 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7228

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 10:20:39AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FJGS-015-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	75.72	147 -	158	151.99	1.76E+02	56.86	1.13E+03	3.45
F	2	238.52	473 -	485	477.51	3.87E+02	48.65	5.09E+02	1.78
F	3	295.18	582 -	604	590.81	1.05E+02	29.28	6.17E+02	1.51
F	4	338.16	671 -	681	676.75	5.07E+01	23.75	2.58E+02	1.44
F	5	351.69	696 -	708	703.80	1.41E+02	30.87	2.90E+02	1.59
F	6	583.03	1159 -	1174	1166.40	1.16E+02	27.91	2.09E+02	2.13
F	7	608.82	1211 -	1224	1217.96	9.91E+01	26.80	1.54E+02	2.59
F	8	910.79	1816 -	1828	1821.82	6.00E+01	20.68	1.18E+02	1.86
F	9	968.53	1930 -	1942	1937.29	5.23E+01	21.02	1.36E+02	1.98
F	10	1119.15	2233 -	2244	2238.48	2.40E+01	14.99	1.51E+02	0.95
F	11	1460.39	2911 -	2931	2920.90	1.53E+03	79.39	1.97E+01	2.61

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/12/2019 10:20:39AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	75.72	1.76E+02	56.86			1.76E+02	5.69E+01
F	2	238.52	3.87E+02	48.65			3.87E+02	4.87E+01
F	3	295.18	1.05E+02	29.28			1.05E+02	2.93E+01
F	4	338.16	5.07E+01	23.75			5.07E+01	2.38E+01
F	5	351.69	1.41E+02	30.87	4.18E+01	1.86E+01	9.91E+01	3.60E+01
F	6	583.03	1.16E+02	27.91			1.16E+02	2.79E+01
F	7	608.82	9.91E+01	26.80	2.06E+01	1.21E+01	7.85E+01	2.94E+01
F	8	910.79	6.00E+01	20.68			6.00E+01	2.07E+01
F	9	968.53	5.23E+01	21.02			5.23E+01	2.10E+01
F	10	1119.15	2.40E+01	14.99			2.40E+01	1.50E+01
F	11	1460.39	1.53E+03	79.39	2.82E+01	8.57E+00	1.50E+03	7.99E+01

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

Analysis Report for L1-010-107-FJGS-015-SS

L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	4.69E+01	3.60E+00
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	5.72E-01	7.77E-02
BI-214	0.33	609.31	*	46.30	2.59E-01	9.80E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.71	77.11		10.70		
		295.21	*	19.20	4.31E-01	1.22E-01
		351.92	*	37.20	2.45E-01	9.00E-02
AC-228	0.57	209.28		4.40		
		338.32	*	11.40	3.95E-01	1.86E-01
		794.70		4.60		
		911.60	*	27.70	4.76E-01	1.65E-01
		964.60		5.20		
		969.11	*	16.60	7.32E-01	2.96E-01

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

INTERFERENCE CORRECTED REPORT

Analysis Report for L1-010-107-FJGS-015-SS

L1-010-107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.980	4.69E+01	3.60E+00	
PB-212	0.559	5.72E-01	7.77E-02	
BI-214	0.330	2.59E-01	9.80E-02	
PB-214	0.716	3.11E-01	7.24E-02	
AC-228	0.579	4.84E-01	1.14E-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 L1-010-107-FJGS-015-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 10:20:39AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	1	75.72	9.78665E-02	16.14		
F	6	583.03	6.44833E-02	12.02		
F	10	1119.15	1.33525E-02	31.19		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	4.69E+01	1.01E+00	1.01E+00
+	AR-41	1293.64		99.16	3.70E+08	3.20E+10	3.20E+10
+	CO-60	1173.22		100.00	6.34E-02	1.55E-01	2.08E-01
		1332.49		100.00	3.42E-02		1.55E-01
+	KR-85	513.99		0.43	2.21E+01	2.46E+01	2.46E+01
+	Y-88	898.04		93.70	-6.62E-02	9.06E-02	1.49E-01
		1836.06		99.20	-4.41E-02		9.06E-02
+	NB-94	702.63		100.00	1.27E-01	1.15E-01	1.15E-01
		871.10		100.00	3.21E-02		1.30E-01
+	I-131	284.30		6.06	8.25E-01	1.20E-01	1.56E+00
		364.48		81.20	1.99E-02		1.20E-01
		636.97		7.27	4.34E-01		1.70E+00
+	CS-134	604.70		97.60	-1.52E-02	1.22E-01	1.22E-01
		795.84		85.40	-4.01E-02		1.49E-01

Analysis Report for L1-010-107-FJGS-015-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65		85.12	9.45E-02	1.30E-01	1.30E-01
+	CE-144	80.12		1.36	-6.32E+00	6.42E-01	8.07E+00
		133.51		11.09	2.26E-01		6.42E-01
+	EU-152	121.78		28.40	-2.77E-01	2.43E-01	2.43E-01
		344.28		26.60	-3.17E-02		3.26E-01
		1408.00		20.74	-3.13E-01		5.06E-01
+	EU-154	123.07		40.40	-3.37E-02	1.72E-01	1.72E-01
		723.30		19.70	3.43E-01		5.94E-01
		1274.51		35.50	7.87E-02		5.11E-01
+	EU-155	86.54		32.80	-7.03E-02	2.86E-01	2.86E-01
		105.31		21.80	-9.07E-02		3.35E-01
+	BI-214	609.31	*	46.30	2.59E-01	1.87E-01	1.87E-01
		1120.29		15.10	5.09E-01		1.34E+00
		1238.11		5.94	4.45E-01		3.84E+00
		1377.67		4.11	-1.16E+00		2.59E+00
		1407.98		2.48	-2.62E+00		4.23E+00
		1509.19		2.19	-7.84E-01		3.42E+00
		1764.49		15.80	6.19E-01		7.47E-01
+	PB-214	77.11		10.70	1.49E+00	1.91E-01	1.10E+00
		295.21	*	19.20	4.31E-01		4.79E-01
		351.92	*	37.20	2.45E-01		1.91E-01
+	PA-228	89.95		22.00	4.95E+00	2.09E+00	3.58E+00
		93.35		35.00	5.25E-01		2.09E+00
		105.00		16.30	1.38E+00		3.89E+00
		129.22		2.97	-1.02E+01		2.01E+01
		338.32		5.30	1.27E+01		1.37E+01
		463.00		13.80	1.86E+00		5.63E+00
		911.23		16.70	1.18E+01		8.42E+00
+	AM-241	59.54		36.30	-1.94E-01	4.94E-01	4.94E-01
+	CM-243	103.76		23.00	8.13E-02	3.24E-01	3.24E-01
		228.18		10.60	-3.74E-01		6.63E-01
		277.60		14.00	2.63E-01		5.56E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FJGS-015-SB
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FJGS-015-SB
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.448E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/9/2019 1:57:00PM
Acquisition Started	: 8/12/2019 12:15:56PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.6 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7231

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 12:46:06PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FJGS-015-SB

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.51	474 -	485	477.49	1.63E+02	31.41	2.37E+02	1.50
F	2	351.79	700 -	709	704.00	1.13E+02	24.30	8.62E+01	1.40
F	3	583.12	1162 -	1171	1166.58	4.35E+01	16.27	5.66E+01	1.40
F	4	609.26	1212 -	1226	1218.85	5.23E+01	18.02	8.52E+01	1.78
F	5	726.82	1450 -	1458	1453.94	2.07E+01	11.97	2.95E+01	1.68
F	6	910.58	1817 -	1826	1821.40	2.22E+01	12.27	4.31E+01	1.28
F	7	1460.48	2913 -	2930	2921.07	2.68E+02	33.30	2.11E+01	2.49

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/12/2019 12:46:06PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.51	1.63E+02	31.41			1.63E+02	3.14E+01
F	2	351.79	1.13E+02	24.30	4.18E+01	1.86E+01	7.15E+01	3.06E+01
F	3	583.12	4.35E+01	16.27			4.35E+01	1.63E+01
F	4	609.26	5.23E+01	18.02	2.06E+01	1.21E+01	3.17E+01	2.17E+01
F	5	726.82	2.07E+01	11.97			2.07E+01	1.20E+01
F	6	910.58	2.22E+01	12.27			2.22E+01	1.23E+01
F	7	1460.48	2.68E+02	33.30	2.82E+01	8.57E+00	2.40E+02	3.44E+01

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

Analysis Report for L1-010-107-FJGS-015-SB

L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	6.18E+00	9.51E-01
BI-212	0.59	727.17	*	11.80	2.60E-01	1.51E-01
		785.42		2.00		
		1620.56		2.75		
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.99E-01	3.97E-02
BI-214	0.34	609.31	*	46.30	8.64E-02	5.94E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.988	6.18E+00	9.51E-01	
BI-212	0.592	2.60E-01	1.51E-01	
PB-212	0.559	1.99E-01	3.97E-02	

Analysis Report for L1-010-107-FJGS-015-SB

L1-010-107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BI-214	0.349	8.64E-02	5.94E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FJGS-015-SB

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 12:46:06PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	2	351.79	3.97265E-02	21.40	Tol.	PB-214
F	3	583.12	2.41930E-02	18.68		
F	6	910.58	1.23068E-02	27.71	Tol.	PA-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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	6.18E+00	8.28E-01	8.28E-01
+	AR-41	1293.64		99.16	2.32E+10	3.62E+10	3.62E+10
+	CO-60	1173.22		100.00	-3.33E-02	7.99E-02	8.48E-02
		1332.49		100.00	7.19E-02		7.99E-02
+	KR-85	513.99		0.43	-1.37E+00	1.38E+01	1.38E+01
+	Y-88	898.04		93.70	3.09E-02	4.11E-02	7.80E-02
		1836.06		99.20	-6.20E-03		4.11E-02
+	NB-94	702.63		100.00	1.64E-02	5.61E-02	5.61E-02
		871.10		100.00	-6.44E-02		5.98E-02
+	I-131	284.30		6.06	-1.67E-02	7.61E-02	9.36E-01
		364.48		81.20	1.47E-02		7.61E-02
		636.97		7.27	3.17E-01		1.01E+00
+	CS-134	604.70		97.60	-1.63E-03	7.59E-02	7.59E-02
		795.84		85.40	-4.01E-02		8.28E-02

Analysis Report for L1-010-107-FJGS-015-SB

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65		85.12	6.90E-02	8.65E-02	8.65E-02
+	CE-144	80.12		1.36	2.48E+00	3.75E-01	4.91E+00
		133.51		11.09	3.80E-01		3.75E-01
+	EU-152	121.78		28.40	-1.99E-02	1.43E-01	1.43E-01
		344.28		26.60	-2.09E-01		1.90E-01
		1408.00		20.74	1.36E-01		2.67E-01
+	EU-154	123.07		40.40	-2.45E-02	1.00E-01	1.00E-01
		723.30		19.70	2.55E-02		3.36E-01
		1274.51		35.50	-2.04E-01		2.32E-01
+	EU-155	86.54		32.80	-1.47E-01	1.70E-01	1.70E-01
		105.31		21.80	1.34E-02		2.04E-01
+	BI-214	609.31	*	46.30	8.64E-02	1.28E-01	1.28E-01
		1120.29		15.10	1.52E-01		5.86E-01
		1238.11		5.94	5.42E-01		1.69E+00
		1377.67		4.11	8.10E-01		1.71E+00
		1407.98		2.48	1.13E+00		2.23E+00
		1509.19		2.19	7.43E-01		2.75E+00
		1764.49		15.80	3.88E-01		4.69E-01
+	PB-214	77.11		10.70	3.19E-01	1.57E-01	6.62E-01
		295.21		19.20	1.99E-01		2.65E-01
		351.92		37.20	2.49E-01		1.57E-01
+	PA-228	89.95		22.00	1.68E+00	1.33E+00	2.27E+00
		93.35		35.00	5.13E-01		1.33E+00
		105.00		16.30	-8.96E-01		2.51E+00
		129.22		2.97	1.60E-01		1.27E+01
		338.32		5.30	-9.42E-01		8.58E+00
		463.00		13.80	1.93E+00		3.20E+00
		911.23		16.70	2.09E+00		4.51E+00
+	AM-241	59.54		36.30	1.57E-01	3.03E-01	3.03E-01
+	CM-243	103.76		23.00	-1.24E-02	1.93E-01	1.93E-01
		228.18		10.60	-1.08E-01		3.96E-01
		277.60		14.00	2.09E-01		3.39E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FJGS-016-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FJGS-016-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.011E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/9/2019 2:00:00PM
Acquisition Started	: 8/12/2019 1:55:46PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.8 seconds
Dead Time	: 0.32 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7232

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 2:25:56PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FJGS-016-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	185.73	364 -	379	371.95	6.87E+01	28.66	4.71E+02	1.76
F	2	238.52	471 -	485	477.51	2.09E+02	35.99	3.23E+02	1.93
F	3	295.28	585 -	595	591.00	5.60E+01	20.81	1.55E+02	1.42
F	4	338.18	669 -	683	676.79	3.60E+01	17.57	1.95E+02	1.18
F	5	351.81	697 -	708	704.06	1.14E+02	25.41	1.23E+02	1.63
F	6	583.08	1161 -	1173	1166.50	5.96E+01	18.48	6.13E+01	1.80
F	7	609.06	1213 -	1225	1218.45	9.27E+01	21.79	6.46E+01	1.83
F	8	661.48	1316 -	1328	1323.28	9.36E+01	21.44	4.89E+01	1.83
F	9	910.85	1815 -	1827	1821.94	3.54E+01	15.40	4.90E+01	2.01
F	10	1460.45	2913 -	2929	2921.01	2.57E+02	32.75	2.04E+01	2.69

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/12/2019 2:25:56PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	185.73	6.87E+01	28.66			6.87E+01	2.87E+01
F	2	238.52	2.09E+02	35.99			2.09E+02	3.60E+01
F	3	295.28	5.60E+01	20.81			5.60E+01	2.08E+01
F	4	338.18	3.60E+01	17.57			3.60E+01	1.76E+01
F	5	351.81	1.14E+02	25.41	4.18E+01	1.86E+01	7.19E+01	3.15E+01
F	6	583.08	5.96E+01	18.48			5.96E+01	1.85E+01
F	7	609.06	9.27E+01	21.79	2.06E+01	1.21E+01	7.21E+01	2.49E+01
F	8	661.48	9.36E+01	21.44	3.31E+01	1.27E+01	6.06E+01	2.49E+01
F	9	910.85	3.54E+01	15.40			3.54E+01	1.54E+01
F	10	1460.45	2.57E+02	32.75	2.82E+01	8.57E+00	2.29E+02	3.38E+01

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

Analysis Report for L1-010-107-FJGS-016-SS

L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	7.10E+00	1.12E+00
CS-137	0.99	661.65	*	85.12	1.17E-01	4.84E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	3.08E-01	5.53E-02
BI-214	0.34	609.31	*	46.30	2.37E-01	8.29E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	2.29E-01	8.57E-02
		351.92	*	37.20	1.77E-01	7.81E-02
RA-226	0.96	186.21	*	3.28	1.15E+00	4.86E-01

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.985	7.10E+00	1.12E+00	

Analysis Report for L1-010-107-FJGS-016-SS

L1-010-107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
CS-137	0.995	1.17E-01	4.84E-02	
PB-212	0.559	3.08E-01	5.53E-02	
BI-214	0.344	2.37E-01	8.29E-02	
PB-214	0.720	2.01E-01	5.77E-02	
RA-226	0.963	1.15E+00	4.86E-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 L1-010-107-FJGS-016-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 2:25:56PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	4	338.18	2.00185E-02	24.38	Tol.	AC-228 PA-228
F	6	583.08	3.31153E-02	15.50		
F	9	910.85	1.96469E-02	21.78	Tol.	AC-228 PA-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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	7.10E+00	9.86E-01	9.86E-01
+	AR-41	1293.64		99.16	-3.21E+10	8.37E+10	8.37E+10
+	CO-60	1173.22		100.00	3.12E-03	9.03E-02	1.19E-01
		1332.49		100.00	-4.35E-03		9.03E-02
+	KR-85	513.99		0.43	2.47E+01	1.83E+01	1.83E+01
+	Y-88	898.04		93.70	2.15E-02	7.48E-02	8.90E-02
		1836.06		99.20	2.02E-02		7.48E-02
+	NB-94	702.63		100.00	-2.46E-02	7.07E-02	7.07E-02
		871.10		100.00	2.54E-03		7.42E-02
+	I-131	284.30		6.06	6.67E-01	8.96E-02	1.20E+00
		364.48		81.20	-6.81E-02		8.96E-02

Analysis Report for L1-010-107-FJGS-016-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	636.97		7.27	-2.84E-01	8.96E-02	1.29E+00
+	CS-134	604.70		97.60	-3.25E-02	9.55E-02	9.55E-02
		795.84		85.40	6.93E-02		1.02E-01
+	CS-137	661.65	*	85.12	1.17E-01	7.96E-02	7.96E-02
+	CE-144	80.12		1.36	3.85E+00	4.79E-01	6.45E+00
		133.51		11.09	1.45E-01		4.79E-01
+	EU-152	121.78		28.40	-9.96E-02	1.83E-01	1.83E-01
		344.28		26.60	2.07E-02		2.37E-01
		1408.00		20.74	-1.90E-01		3.80E-01
+	EU-154	123.07		40.40	-4.01E-02	1.29E-01	1.29E-01
		723.30		19.70	4.15E-01		4.41E-01
		1274.51		35.50	-1.33E-01		2.88E-01
+	EU-155	86.54		32.80	-7.81E-02	2.23E-01	2.23E-01
		105.31		21.80	-9.39E-02		2.58E-01
+	BI-214	609.31	*	46.30	2.37E-01	1.40E-01	1.40E-01
		1120.29		15.10	2.86E-02		7.59E-01
		1238.11		5.94	-2.95E-01		1.93E+00
		1377.67		4.11	6.17E-01		2.29E+00
		1407.98		2.48	-1.59E+00		3.18E+00
		1509.19		2.19	1.76E+00		3.32E+00
		1764.49		15.80	2.55E-01		6.50E-01
+	PB-214	77.11		10.70	5.89E-01	1.43E-01	8.67E-01
		295.21	*	19.20	2.29E-01		1.94E-01
		351.92	*	37.20	1.77E-01		1.43E-01
+	PA-228	89.95		22.00	4.10E+00	1.86E+00	3.19E+00
		93.35		35.00	9.91E-01		1.86E+00
		105.00		16.30	4.56E-02		3.38E+00
		129.22		2.97	7.28E+00		1.76E+01
		338.32		5.30	3.27E+00		1.14E+01
		463.00		13.80	-6.69E-01		4.64E+00
		911.23		16.70	2.85E+00		6.31E+00
+	AM-241	59.54		36.30	3.05E-01	3.94E-01	3.94E-01
+	CM-243	103.76		23.00	-4.72E-02	2.46E-01	2.46E-01
		228.18		10.60	1.06E-01		4.92E-01
		277.60		14.00	2.79E-03		4.17E-01

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

Analysis Report for L1-010-107-FJGS-016-SS

L1-010-107

Apex-Gamma

Analysis Report for L1-010-107-FJGS-017-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FJGS-017-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.216E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/9/2019 2:05:00PM
Acquisition Started	: 8/12/2019 2:40:44PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.7 seconds
Dead Time	: 0.32 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7233

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/12/2019 3:10:54PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FJGS-017-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	186.09	366 -	376	372.69	4.68E+01	25.39	2.91E+02	1.66
F	2	238.40	470 -	481	477.27	1.24E+02	31.03	3.57E+02	1.34
F	3	294.98	582 -	594	590.42	4.67E+01	19.74	1.37E+02	1.77
F	4	351.71	700 -	711	703.85	8.29E+01	22.91	1.40E+02	1.43
F	5	477.22	948 -	959	954.82	3.90E+01	15.77	7.80E+01	1.13
F	6	583.00	1161 -	1172	1166.33	3.61E+01	16.01	7.37E+01	1.65
F	7	609.25	1214 -	1225	1218.83	6.85E+01	19.83	6.69E+01	1.84
F	8	910.96	1816 -	1831	1822.16	5.36E+01	16.48	3.29E+01	2.21
F	9	969.11	1934 -	1943	1938.45	1.96E+01	11.11	3.19E+01	1.26
F	10	1460.60	2912 -	2930	2921.31	2.63E+02	32.97	1.87E+01	2.61

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/12/2019 3:10:54PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	186.09	4.68E+01	25.39			4.68E+01	2.54E+01
F	2	238.40	1.24E+02	31.03			1.24E+02	3.10E+01
F	3	294.98	4.67E+01	19.74			4.67E+01	1.97E+01
F	4	351.71	8.29E+01	22.91	4.18E+01	1.86E+01	4.11E+01	2.95E+01
F	5	477.22	3.90E+01	15.77			3.90E+01	1.58E+01
F	6	583.00	3.61E+01	16.01			3.61E+01	1.60E+01
F	7	609.25	6.85E+01	19.83	2.06E+01	1.21E+01	4.79E+01	2.32E+01
F	8	910.96	5.36E+01	16.48			5.36E+01	1.65E+01
F	9	969.11	1.96E+01	11.11			1.96E+01	1.11E+01
F	10	1460.60	2.63E+02	32.97	2.82E+01	8.57E+00	2.34E+02	3.41E+01

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

Analysis Report for L1-010-107-FJGS-017-SS

L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	7.08E+00	1.10E+00
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.78E-01	4.53E-02
BI-214	0.34	609.31	*	46.30	1.53E-01	7.46E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.71	77.11		10.70		
		295.21	*	19.20	1.85E-01	7.87E-02
		351.92	*	37.20	9.84E-02	7.08E-02
RA-226	0.99	186.21	*	3.28	7.65E-01	4.17E-01

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.996	7.08E+00	1.10E+00	
PB-212	0.554	1.78E-01	4.53E-02	

Analysis Report for L1-010-107-FJGS-017-SS

L1-010-107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BI-214	0.349	1.53E-01	7.46E-02	
PB-214	0.715	1.37E-01	5.27E-02	
RA-226	0.998	7.65E-01	4.17E-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 L1-010-107-FJGS-017-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/12/2019 3:10:54PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	5	477.22	2.16725E-02	20.21	Sum	
F	6	583.00	2.00523E-02	22.17		
F	8	910.96	2.97820E-02	15.37	Tol.	AC-228 PA-228
F	9	969.11	1.08723E-02	28.39	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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	7.08E+00	9.59E-01	9.59E-01
+	AR-41	1293.64		99.16	-1.18E+10	8.89E+10	8.89E+10
+	CO-60	1173.22		100.00	-1.14E-02	8.53E-02	1.07E-01
		1332.49		100.00	5.22E-03		8.53E-02
+	KR-85	513.99		0.43	1.59E+01	1.60E+01	1.60E+01
+	Y-88	898.04		93.70	6.76E-02	6.02E-02	9.46E-02
		1836.06		99.20	-5.41E-02		6.02E-02
+	NB-94	702.63		100.00	-3.14E-02	6.10E-02	6.10E-02
		871.10		100.00	-8.78E-02		6.86E-02
+	I-131	284.30		6.06	1.69E-01	9.56E-02	1.10E+00
		364.48		81.20	8.20E-02		9.56E-02

Analysis Report for L1-010-107-FJGS-017-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	636.97		7.27	-1.05E-01	9.56E-02	1.23E+00
+	CS-134	604.70		97.60	-6.02E-02	8.94E-02	8.94E-02
		795.84		85.40	1.06E-02		9.28E-02
+	CS-137	661.65		85.12	7.04E-02	1.03E-01	1.03E-01
+	CE-144	80.12		1.36	1.26E+00	4.39E-01	5.61E+00
		133.51		11.09	9.43E-02		4.39E-01
+	EU-152	121.78		28.40	-1.93E-01	1.68E-01	1.68E-01
		344.28		26.60	-2.37E-01		2.22E-01
		1408.00		20.74	8.49E-02		4.25E-01
+	EU-154	123.07		40.40	-8.68E-02	1.20E-01	1.20E-01
		723.30		19.70	5.54E-02		3.35E-01
		1274.51		35.50	7.02E-02		2.62E-01
+	EU-155	86.54		32.80	-5.08E-02	1.93E-01	1.93E-01
		105.31		21.80	-1.53E-01		2.36E-01
+	BI-214	609.31	*	46.30	1.53E-01	1.34E-01	1.34E-01
		1120.29		15.10	3.39E-01		7.15E-01
		1238.11		5.94	7.76E-01		2.03E+00
		1377.67		4.11	1.81E+00		2.22E+00
		1407.98		2.48	7.09E-01		3.55E+00
		1509.19		2.19	1.13E-01		2.74E+00
		1764.49		15.80	3.00E-01		5.86E-01
+	PB-214	77.11		10.70	5.40E-01	1.44E-01	7.66E-01
		295.21	*	19.20	1.85E-01		1.86E-01
		351.92	*	37.20	9.84E-02		1.44E-01
+	PA-228	89.95		22.00	7.49E-01	1.63E+00	2.74E+00
		93.35		35.00	2.62E-01		1.63E+00
		105.00		16.30	-4.97E-01		3.17E+00
		129.22		2.97	9.07E+00		1.64E+01
		338.32		5.30	7.09E-01		1.00E+01
		463.00		13.80	8.52E-01		4.36E+00
		911.23		16.70	8.63E+00		6.43E+00
+	AM-241	59.54		36.30	-3.16E-01	3.64E-01	3.64E-01
+	CM-243	103.76		23.00	3.56E-02	2.27E-01	2.27E-01
		228.18		10.60	1.54E-01		4.73E-01
		277.60		14.00	3.70E-02		3.79E-01

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

Analysis Report for L1-010-107-FJGS-017-SS

L1-010-107

Apex-Gamma

Analysis Report for L1-010-107-FQGS-009-SS

L1-010-107-FQGS-009-SS SOIL FSS UNIT 107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FQGS-009-SS
Sample Description	: L1-010-107-FQGS-009-SS SOIL FSS UNIT 107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.636E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 2:55:33PM
Acquisition Started	: 8/9/2019 3:17:55PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.4 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7220

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/9/2019 3:48:05PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FQGS-009-SS

L1-010-107-FQGS-009-SS SOIL FSS UNIT 107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	351.42	697 -	710	703.27	1.00E+02	24.49	1.06E+02	2.22
F	2	608.96	1213 -	1225	1218.25	7.15E+01	18.84	2.82E+01	2.44
F	3	1460.16	2913 -	2927	2920.43	1.30E+02	23.63	7.50E+00	2.90

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/9/2019 3:48:05PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	351.42	1.00E+02	24.49	4.18E+01	1.86E+01	5.83E+01	3.08E+01
F	2	608.96	7.15E+01	18.84	2.06E+01	1.21E+01	5.09E+01	2.24E+01
F	3	1460.16	1.30E+02	23.63	2.82E+01	8.57E+00	1.02E+02	2.51E+01

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\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Analysis Report for L1-010-107-FQGS-009-SS

L1-010-107-FQGS-009-SS SOIL FSS UNIT 107

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.94	1460.75	*	10.67	2.92E+00	7.35E-01
BI-214	0.34	609.31	*	46.30	1.53E-01	6.81E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.946	2.92E+00	7.35E-01	
BI-214	0.340	1.53E-01	6.81E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FQGS-009-SS

L1-010-107-FQGS-009-SS SOIL FSS UNIT 107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/9/2019 3:48:05PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	1	351.42	3.23831E-02	26.38	Tol.	PB-214

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	2.92E+00	7.88E-01	7.88E-01
+	AR-41	1293.64		99.16	-7.93E+02	8.61E+02	8.61E+02
+	CO-60	1173.22		100.00	-2.67E-02	6.90E-02	8.97E-02
		1332.49		100.00	8.12E-03		6.90E-02
+	KR-85	513.99		0.43	2.30E+01	1.52E+01	1.52E+01
+	Y-88	898.04		93.70	8.53E-03	6.23E-02	6.85E-02
		1836.06		99.20	-4.67E-03		6.23E-02
+	NB-94	702.63		100.00	-2.49E-02	5.45E-02	5.45E-02
		871.10		100.00	3.19E-02		6.42E-02
+	I-131	284.30		6.06	-6.29E-02	6.10E-02	8.13E-01
		364.48		81.20	-1.09E-03		6.10E-02
		636.97		7.27	2.52E-01		9.10E-01
+	CS-134	604.70		97.60	-7.62E-02	6.71E-02	7.69E-02
		795.84		85.40	-3.38E-02		6.71E-02
+	CS-137	661.65		85.12	5.41E-02	8.20E-02	8.20E-02
+	CE-144	80.12		1.36	-2.96E+00	3.85E-01	4.74E+00

Analysis Report for L1-010-107-FQGS-009-SS

L1-010-107-FQGS-009-SS SOIL FSS UNIT 107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CE-144	133.51		11.09	-5.60E-03	3.85E-01	3.85E-01
+	EU-152	121.78		28.40	-4.21E-02	1.47E-01	1.47E-01
		344.28		26.60	1.42E-02		2.04E-01
		1408.00		20.74	2.85E-01		3.35E-01
+	EU-154	123.07		40.40	-3.08E-02	1.04E-01	1.04E-01
		723.30		19.70	2.37E-01		3.14E-01
		1274.51		35.50	1.38E-01		2.25E-01
+	EU-155	86.54		32.80	-6.57E-02	1.70E-01	1.70E-01
		105.31		21.80	-1.04E-01		2.02E-01
+	BI-214	609.31	*	46.30	1.53E-01	1.04E-01	1.04E-01
		1120.29		15.10	3.19E-01		6.01E-01
		1238.11		5.94	6.61E-01		1.60E+00
		1377.67		4.11	1.00E+00		1.80E+00
		1407.98		2.48	2.38E+00		2.80E+00
		1509.19		2.19	-6.17E-01		2.27E+00
		1764.49		15.80	3.39E-01		4.68E-01
+	PB-214	77.11		10.70	4.44E-01	1.58E-01	6.60E-01
		295.21		19.20	1.83E-02		2.50E-01
		351.92		37.20	1.54E-01		1.58E-01
+	PA-228	89.95		22.00	6.16E-01	3.21E-01	5.49E-01
		93.35		35.00	-9.88E-02		3.21E-01
		105.00		16.30	6.76E-02		5.92E-01
		129.22		2.97	3.48E+00		3.18E+00
		338.32		5.30	3.15E-01		2.01E+00
		463.00		13.80	-9.48E-03		8.71E-01
		911.23		16.70	9.38E-02		8.88E-01
+	AM-241	59.54		36.30	-3.84E-01	3.06E-01	3.06E-01
+	CM-243	103.76		23.00	1.52E-01	1.99E-01	1.99E-01
		228.18		10.60	1.52E-01		4.21E-01
		277.60		14.00	-1.81E-01		3.31E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FQGS-014-SS
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FQGS-014-SS
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.037E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/12/2019 8:04:00AM
Acquisition Started	: 8/13/2019 7:35:32AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.6 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7241

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/13/2019 8:05:41AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FQGS-014-SS

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.65	470 -	481	477.78	7.42E+01	26.10	3.44E+02	1.19
F	2	294.86	586 -	595	590.17	3.14E+01	16.04	1.47E+02	0.85
F	3	351.58	699 -	710	703.60	8.21E+01	22.23	1.40E+02	1.28
F	4	582.55	1157 -	1173	1165.45	4.27E+01	17.49	7.65E+01	2.68
F	5	609.24	1214 -	1225	1218.82	6.67E+01	18.82	5.88E+01	1.52
F	6	1460.65	2914 -	2930	2921.40	2.78E+02	33.38	0.00E+00	2.78

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/13/2019 8:05:41AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.65	7.42E+01	26.10			7.42E+01	2.61E+01
F	2	294.86	3.14E+01	16.04			3.14E+01	1.60E+01
F	3	351.58	8.21E+01	22.23	4.18E+01	1.86E+01	4.03E+01	2.90E+01
F	4	582.55	4.27E+01	17.49			4.27E+01	1.75E+01
F	5	609.24	6.67E+01	18.82	2.06E+01	1.21E+01	4.62E+01	2.24E+01
F	6	1460.65	2.78E+02	33.38	2.82E+01	8.57E+00	2.50E+02	3.45E+01

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

Analysis Report for L1-010-107-FQGS-014-SS

L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.24E+00	7.80E-01
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	7.38E-02	2.62E-02
BI-214	0.34	609.31	*	46.30	1.02E-01	5.00E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.70	77.11		10.70		
		295.21	*	19.20	8.66E-02	4.44E-02
		351.92	*	37.20	6.71E-02	4.84E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.998	5.24E+00	7.80E-01	
PB-212	0.560	7.38E-02	2.62E-02	
BI-214	0.349	1.02E-01	5.00E-02	

Analysis Report for L1-010-107-FQGS-014-SS

L1-010-107

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.706	7.77E-02	3.27E-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 L1-010-107-FQGS-014-SS

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/13/2019 8:05:41AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	4	582.55	2.36954E-02	20.50		

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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.24E+00	5.28E-01	5.28E-01
+	AR-41	1293.64		99.16	3.59E+01	5.34E+02	5.34E+02
+	CO-60	1173.22		100.00	-4.51E-03	6.43E-02	7.51E-02
		1332.49		100.00	-4.14E-03		6.43E-02
+	KR-85	513.99		0.43	3.14E+00	1.18E+01	1.18E+01
+	Y-88	898.04		93.70	4.01E-02	4.13E-02	6.75E-02
		1836.06		99.20	-8.94E-03		4.13E-02
+	NB-94	702.63		100.00	-1.87E-02	4.36E-02	4.36E-02
		871.10		100.00	-2.01E-02		5.34E-02
+	I-131	284.30		6.06	-5.99E-01	4.75E-02	6.25E-01
		364.48		81.20	-3.55E-02		4.75E-02
		636.97		7.27	-9.51E-02		6.77E-01
+	CS-134	604.70		97.60	-2.60E-02	5.86E-02	5.99E-02
		795.84		85.40	4.70E-02		5.86E-02
+	CS-137	661.65		85.12	4.33E-02	6.01E-02	6.01E-02
+	CE-144	80.12		1.36	-2.77E+00	3.17E-01	3.90E+00
		133.51		11.09	8.26E-02		3.17E-01

Analysis Report for L1-010-107-FQGS-014-SS

L1-010-107

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	EU-152	121.78		28.40	-4.74E-02	1.22E-01	1.22E-01
		344.28		26.60	-3.90E-02		1.51E-01
		1408.00		20.74	-8.95E-02		2.29E-01
+	EU-154	123.07		40.40	-4.63E-03	8.63E-02	8.63E-02
		723.30		19.70	1.05E-01		2.63E-01
		1274.51		35.50	2.87E-03		1.87E-01
+	EU-155	86.54		32.80	1.10E-02	1.37E-01	1.37E-01
		105.31		21.80	-1.56E-01		1.66E-01
+	BI-214	609.31	*	46.30	1.02E-01	8.99E-02	8.99E-02
		1120.29		15.10	3.11E-01		4.46E-01
		1238.11		5.94	3.69E-01		1.22E+00
		1377.67		4.11	1.83E-01		1.35E+00
		1407.98		2.48	-7.48E-01		1.92E+00
		1509.19		2.19	1.58E+00		2.18E+00
		1764.49		15.80	2.46E-01		3.91E-01
+	PB-214	77.11		10.70	3.38E-01	1.01E-01	5.38E-01
		295.21	*	19.20	8.66E-02		1.25E-01
		351.92	*	37.20	6.71E-02		1.01E-01
+	PA-228	89.95		22.00	-3.01E-02	2.45E-01	4.14E-01
		93.35		35.00	-9.19E-02		2.45E-01
		105.00		16.30	-2.74E-01		4.76E-01
		129.22		2.97	1.09E+00		2.50E+00
		338.32		5.30	-1.79E-01		1.56E+00
		463.00		13.80	2.05E-01		5.91E-01
		911.23		16.70	4.98E-01		8.88E-01
+	AM-241	59.54		36.30	2.20E-01	2.53E-01	2.53E-01
+	CM-243	103.76		23.00	-8.56E-02	1.60E-01	1.60E-01
		228.18		10.60	-2.61E-01		3.14E-01
		277.60		14.00	2.66E-01		2.67E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-002-SS SPLIT
L1-010-107 SPLIT

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-002-SS SPLIT
Sample Description	: L1-010-107 SPLIT
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.463E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/9/2019 10:57:00AM
Acquisition Started	: 8/14/2019 3:09:53PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.5 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7273

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/14/2019 3:40:03PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-002-SS SPLIT

L1-010-107 SPLIT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.718	2.32E-01	5.29E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FSGS-002-SS SPLIT

L1-010-107 SPLIT

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/14/2019 3:40:03PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	4	582.71	1.91716E-02	22.22		
F	6	910.95	1.45436E-02	23.84	Tol.	AC-228 PA-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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	7.15E+00	7.35E-01	7.35E-01
+	@ AR-41	1293.64		99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22		100.00	7.52E-02	6.49E-02	9.48E-02
		1332.49		100.00	1.14E-02		6.49E-02
+	KR-85	513.99		0.43	7.29E+00	1.41E+01	1.41E+01
+	Y-88	898.04		93.70	2.81E-02	6.29E-02	8.29E-02
		1836.06		99.20	-4.41E-03		6.29E-02
+	NB-94	702.63		100.00	4.36E-02	5.90E-02	5.90E-02
		871.10		100.00	2.40E-02		6.60E-02
+	I-131	284.30		6.06	-9.60E-01	9.41E-02	1.20E+00
		364.48		81.20	4.54E-02		9.41E-02
		636.97		7.27	-8.61E-02		1.15E+00
+	CS-134	604.70		97.60	-2.89E-02	6.86E-02	8.57E-02
		795.84		85.40	-3.11E-02		6.86E-02

Analysis Report for L1-010-107-FSGS-002-SS SPLIT

L1-010-107 SPLIT

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65		85.12	6.53E-02	8.12E-02	8.12E-02
+	CE-144	80.12		1.36	1.96E+00	3.99E-01	5.00E+00
		133.51		11.09	1.03E-01		3.99E-01
+	EU-152	121.78		28.40	1.24E-03	1.50E-01	1.50E-01
		344.28		26.60	1.77E-02		1.93E-01
		1408.00		20.74	-3.21E-03		3.57E-01
+	EU-154	123.07		40.40	-6.78E-03	1.05E-01	1.05E-01
		723.30		19.70	-3.36E-02		3.20E-01
		1274.51		35.50	3.76E-02		2.21E-01
+	EU-155	86.54		32.80	-2.45E-02	1.69E-01	1.69E-01
		105.31		21.80	-6.80E-02		2.10E-01
+	BI-214	609.31	*	46.30	2.06E-01	1.25E-01	1.25E-01
		1120.29		15.10	5.56E-01		6.91E-01
		1238.11		5.94	1.29E+00		1.86E+00
		1377.67		4.11	-5.05E-01		1.65E+00
		1407.98		2.48	-2.68E-02		2.98E+00
		1509.19		2.19	8.33E-01		2.43E+00
		1764.49	*	15.80	3.39E-01		3.76E-01
+	PB-214	77.11		10.70	3.28E-01	1.22E-01	6.75E-01
		295.21	*	19.20	2.29E-01		1.64E-01
		351.92	*	37.20	2.33E-01		1.22E-01
+	PA-228	89.95		22.00	6.33E+00	7.12E+00	1.22E+01
		93.35		35.00	-2.07E+00		7.12E+00
		105.00		16.30	-3.74E+00		1.42E+01
		129.22		2.97	-1.27E+01		7.26E+01
		338.32		5.30	1.11E+01		4.45E+01
		463.00		13.80	1.61E+01		2.05E+01
		911.23		16.70	2.15E+01		2.64E+01
+	AM-241	59.54		36.30	-5.10E-02	3.11E-01	3.11E-01
+	CM-243	103.76		23.00	-1.70E-02	2.01E-01	2.01E-01
		228.18		10.60	-7.78E-02		3.92E-01
		277.60		14.00	-1.03E-01		3.37E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FSGS-009-SS SPLIT
L1-010-107 SPLIT

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FSGS-009-SS SPLIT
Sample Description	: L1-010-107 SPLIT
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.929E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/8/2019 2:45:00PM
Acquisition Started	: 8/14/2019 3:40:27PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.7 seconds
Dead Time	: 0.31 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7274

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/14/2019 4:10:37PM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FSGS-009-SS SPLIT

L1-010-107 SPLIT

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	77.20	148 -	158	154.95	4.75E+01	25.95	4.34E+02	1.16
F	2	295.13	585 -	596	590.71	5.94E+01	20.73	1.59E+02	1.33
F	3	351.77	696 -	710	703.97	1.10E+02	24.75	1.31E+02	1.67
F	4	609.30	1213 -	1225	1218.93	8.90E+01	20.90	4.25E+01	1.97
F	5	1460.48	2913 -	2929	2921.08	1.78E+02	27.17	1.29E+01	2.29

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/14/2019 4:10:37PM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	77.20	4.75E+01	25.95			4.75E+01	2.59E+01
F	2	295.13	5.94E+01	20.73			5.94E+01	2.07E+01
F	3	351.77	1.10E+02	24.75	4.18E+01	1.86E+01	6.82E+01	3.10E+01
F	4	609.30	8.90E+01	20.90	2.06E+01	1.21E+01	6.84E+01	2.42E+01
F	5	1460.48	1.78E+02	27.17	2.82E+01	8.57E+00	1.50E+02	2.85E+01

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\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Analysis Report for L1-010-107-FSGS-009-SS SPLIT

L1-010-107 SPLIT

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	3.66E+00	7.24E-01
BI-214	0.35	609.31	*	46.30	1.76E-01	6.31E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.99	77.11	*	10.70	2.45E-01	1.35E-01
		295.21	*	19.20	1.90E-01	6.71E-02
		351.92	*	37.20	1.32E-01	6.02E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.989	3.66E+00	7.24E-01	
BI-214	0.350	1.76E-01	6.31E-02	
PB-214	0.997	1.67E-01	4.25E-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 L1-010-107-FSGS-009-SS SPLIT
L1-010-107 SPLIT

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/14/2019 4:10:37PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

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

All peaks were identified.

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

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	3.66E+00	7.23E-01	7.23E-01
+	@ AR-41	1293.64		99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22		100.00	3.84E-02	6.37E-02	7.01E-02
		1332.49		100.00	-5.89E-03		6.37E-02
+	KR-85	513.99		0.43	1.12E+01	1.18E+01	1.18E+01
+	Y-88	898.04		93.70	-4.28E-02	5.55E-02	5.55E-02
		1836.06		99.20	-2.08E-02		5.99E-02
+	NB-94	702.63		100.00	8.75E-03	5.11E-02	5.11E-02
		871.10		100.00	3.53E-04		5.77E-02
+	I-131	284.30		6.06	-2.54E-01	8.34E-02	1.10E+00
		364.48		81.20	2.02E-02		8.34E-02
		636.97		7.27	4.78E-02		1.12E+00
+	CS-134	604.70		97.60	-1.13E-02	6.02E-02	7.01E-02
		795.84		85.40	-3.09E-02		6.02E-02
+	CS-137	661.65		85.12	1.47E-02	5.82E-02	5.82E-02
+	CE-144	80.12		1.36	-2.17E+00	3.32E-01	4.38E+00
		133.51		11.09	-6.79E-02		3.32E-01
+	EU-152	121.78		28.40	8.02E-02	1.34E-01	1.34E-01

Analysis Report for L1-010-107-FSGS-009-SS SPLIT

L1-010-107 SPLIT

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	EU-152	344.28		26.60	5.84E-02	1.34E-01	1.67E-01
		1408.00		20.74	1.78E-01		3.38E-01
+	EU-154	123.07		40.40	8.58E-03	9.30E-02	9.30E-02
		723.30		19.70	1.56E-01		2.64E-01
		1274.51		35.50	-3.43E-02		1.67E-01
+	EU-155	86.54		32.80	-9.87E-03	1.53E-01	1.53E-01
		105.31		21.80	6.97E-02		1.88E-01
+	BI-214	609.31	*	46.30	1.76E-01	9.74E-02	9.74E-02
		1120.29		15.10	2.44E-01		5.05E-01
		1238.11		5.94	7.79E-01		1.45E+00
		1377.67		4.11	-2.73E-01		1.39E+00
		1407.98		2.48	1.49E+00		2.82E+00
		1509.19		2.19	-4.56E-01		2.30E+00
		1764.49		15.80	2.51E-01		3.76E-01
+	PB-214	77.11	*	10.70	2.45E-01	1.19E-01	4.00E-01
		295.21	*	19.20	1.90E-01		1.57E-01
		351.92	*	37.20	1.32E-01		1.19E-01
+	PA-228	89.95		22.00	1.27E+01	1.22E+01	2.11E+01
		93.35		35.00	-6.00E+00		1.22E+01
		105.00		16.30	-1.07E-01		2.42E+01
		129.22		2.97	-3.56E+01		1.18E+02
		338.32		5.30	4.17E+01		7.73E+01
		463.00		13.80	1.81E+01		3.40E+01
		911.23		16.70	1.62E+01		3.87E+01
+	AM-241	59.54		36.30	-4.30E-02	2.78E-01	2.78E-01
+	CM-243	103.76		23.00	7.94E-02	1.80E-01	1.80E-01
		228.18		10.60	-1.20E-01		3.54E-01
		277.60		14.00	-1.32E-01		2.90E-01

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

Apex-Gamma

Analysis Report for L1-010-107-FJGS-016-SB
L1-010-107

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-010-107-FJGS-016-SB
Sample Description	: L1-010-107
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.337E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 8/13/2019 2:35:00PM
Acquisition Started	: 8/15/2019 7:22:21AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 1800.0 seconds
Real Time	: 1805.4 seconds
Dead Time	: 0.30 %
Peak Locate Threshold	: 3.00
Peak Locate Range (in channels)	: 100 - 4096
Peak Area Range (in channels)	: 100 - 4096
Identification Energy Tolerance	: 1.000 keV
Energy Calibration Used Done On	: 7/8/2014
Efficiency Calibration Used Done On	: 7/8/2014
Efficiency Calibration Description	:
Sample Number	: 7276

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 8/15/2019 7:52:31AM

Peak Analysis From Channel	: 100
Peak Analysis To Channel	: 4096

Analysis Report for L1-010-107-FJGS-016-SB

L1-010-107

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.45	473 -	481	477.38	8.89E+01	28.57	2.54E+02	1.45
F	2	338.99	675 -	683	678.42	2.23E+01	14.82	9.52E+01	1.10
F	3	351.84	697 -	709	704.11	8.48E+01	21.61	9.76E+01	1.56
F	4	582.82	1161 -	1172	1165.99	4.34E+01	16.46	5.58E+01	1.84
F	5	910.72	1817 -	1828	1821.67	3.30E+01	12.74	2.23E+01	1.46
F	6	1460.37	2912 -	2928	2920.86	2.06E+02	29.32	1.29E+01	2.39

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 8/15/2019 7:52:31AM

Env. Background File : C:\Canberra\Apex\Root\Dairyland_NPP\Data\0000001364.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	238.45	8.89E+01	28.57			8.89E+01	2.86E+01
F	2	338.99	2.23E+01	14.82			2.23E+01	1.48E+01
F	3	351.84	8.48E+01	21.61	4.18E+01	1.86E+01	4.30E+01	2.85E+01
F	4	582.82	4.34E+01	16.46			4.34E+01	1.65E+01
F	5	910.72	3.30E+01	12.74			3.30E+01	1.27E+01
F	6	1460.37	2.06E+02	29.32	2.82E+01	8.57E+00	1.78E+02	3.05E+01

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

Analysis Report for L1-010-107-FJGS-016-SB

L1-010-107

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Dairyland_NPP\Library\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.75	*	10.67	4.65E+00	8.39E-01
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.10E-01	3.58E-02

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.977	4.65E+00	8.39E-01	
PB-212	0.557	1.10E-01	3.58E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-010-107-FJGS-016-SB

L1-010-107

UNIDENTIFIED PEAKS

Peak Locate Performed on : 8/15/2019 7:52:31AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	2	338.99	1.23917E-02	33.22	Tol.	AC-228 PA-228
F	3	351.84	2.38892E-02	33.16	Tol.	PB-214
F	4	582.82	2.41057E-02	18.97		
F	5	910.72	1.83430E-02	19.30	Tol.	AC-228 PA-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\Dairyland_NPP\Library\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	4.65E+00	7.74E-01	7.74E-01
+	AR-41	1293.64		99.16	2.02E+05	4.70E+05	4.70E+05
+	CO-60	1173.22		100.00	4.28E-02	6.82E-02	8.59E-02
		1332.49		100.00	-2.48E-02		6.82E-02
+	KR-85	513.99		0.43	1.52E+01	1.33E+01	1.33E+01
+	Y-88	898.04		93.70	1.57E-02	4.51E-02	6.79E-02
		1836.06		99.20	-1.81E-02		4.51E-02
+	NB-94	702.63		100.00	5.06E-03	6.19E-02	6.19E-02
		871.10		100.00	-4.21E-02		6.53E-02

Analysis Report for L1-010-107-FJGS-016-SB

L1-010-107

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	I-131	284.30	6.06	1.61E-01	6.54E-02	8.65E-01
		364.48	81.20	2.61E-02		6.54E-02
		636.97	7.27	-2.21E-01		8.23E-01
+	CS-134	604.70	97.60	3.64E-02	6.71E-02	6.71E-02
		795.84	85.40	1.55E-03		7.24E-02
+	CS-137	661.65	85.12	2.11E-02	7.14E-02	7.14E-02
+	CE-144	80.12	1.36	-7.32E-01	3.79E-01	4.77E+00
		133.51	11.09	2.17E-01		3.79E-01
+	EU-152	121.78	28.40	-7.94E-02	1.40E-01	1.40E-01
		344.28	26.60	-3.18E-03		1.82E-01
		1408.00	20.74	8.13E-02		3.07E-01
+	EU-154	123.07	40.40	-2.28E-02	9.92E-02	9.92E-02
		723.30	19.70	4.56E-02		3.20E-01
		1274.51	35.50	-1.58E-01		2.25E-01
+	EU-155	86.54	32.80	-5.54E-02	1.66E-01	1.66E-01
		105.31	21.80	-1.09E-01		1.91E-01
+	BI-214	609.31	46.30	1.30E-01	1.47E-01	1.47E-01
		1120.29	15.10	1.16E-01		5.50E-01
		1238.11	5.94	3.82E-01		1.51E+00
		1377.67	4.11	-1.68E-01		1.73E+00
		1407.98	2.48	6.80E-01		2.56E+00
		1509.19	2.19	-6.15E-01		2.28E+00
		1764.49	15.80	2.69E-01		4.03E-01
+	PB-214	77.11	10.70	6.21E-01	1.47E-01	6.60E-01
		295.21	19.20	-4.62E-02		2.47E-01
		351.92	37.20	1.33E-01		1.47E-01
+	PA-228	89.95	22.00	4.30E-01	5.13E-01	8.64E-01
		93.35	35.00	-7.19E-02		5.13E-01
		105.00	16.30	-1.05E+00		9.26E-01
		129.22	2.97	3.82E+00		5.08E+00
		338.32	5.30	-4.02E-01		3.20E+00
		463.00	13.80	4.60E-01		1.25E+00
		911.23	16.70	9.16E-01		1.69E+00
+	AM-241	59.54	36.30	-1.46E-01	2.87E-01	2.87E-01
+	CM-243	103.76	23.00	-4.89E-02	1.85E-01	1.85E-01
		228.18	10.60	-5.53E-02		3.72E-01
		277.60	14.00	-2.78E-01		3.13E-01

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

Analysis Report for L1-010-107-FJGS-016-SB

L1-010-107

ATTACHMENT 8
GEL LABORATORIES ANALYTICAL REPORTS

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

October 15, 2019

Mr. Jason Q. Spaide
LaCrosseSolutions
S4601 State Hwy 35
Genoa, Wisconsin 54632

Re: LACBWR Site Restoration Project
Work Order: 490846

Dear Mr. Spaide:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 20, 2019. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4453.

Sincerely,

Edith M. Kent

Edith Kent
Project Manager

Purchase Order: 672583
Enclosures

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 − (843) 556−8171 − www.gel.com

Certificate of Analysis Report
for

ENRG070 LaCrosseSolutions, LLC (672583)

Client SDG: 490846 GEL Work Order: 490846

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a Tracer compound

** Analyte is a surrogate compound

U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Edith Kent.

Reviewed by Edith M. Kent

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-A24-SB	Project:	ENRG07001
Sample ID:	490846001	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	03-JUL-19 12:56		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0174	+/-0.0686	0.134	0.400	pCi/g			JXC9	10/07/19	1511	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-A25-SB	Project:	ENRG07001
Sample ID:	490846002	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	03-JUL-19 13:01		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0855	+/-0.0784	0.128	0.400	pCi/g			JXC9	10/07/19	1511	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-A12A-SB	Project:	ENRG07001
Sample ID:	490846003	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	12-JUL-19 13:02		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0271	+/-0.0476	0.104	0.400	pCi/g			JXC9	10/07/19	1511	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			84	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-107-FJGS-005-SS	Project:	ENRG07001
Sample ID:	490846004	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	08-AUG-19 15:29		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.033	+/-0.0803	0.145	0.400	pCi/g			JXC9	10/07/19	1511	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			70.7	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-107-FJGS-016-SS	Project:	ENRG07001
Sample ID:	490846005	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	09-AUG-19 14:00		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0505	+/-0.0835	0.167	0.400	pCi/g			JXC9	10/07/19	1511	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			81.8	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-101-FJGS-003-SS	Project:	ENRG07001
Sample ID:	490846006	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	08-AUG-19 14:21		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.00619	+/-0.0654	0.121	0.400	pCi/g			JXC9	10/08/19	0817	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			81.8	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-102-FJGS-010-SS	Project:	ENRG07001
Sample ID:	490846007	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	15-AUG-19 08:48		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0125	+/-0.0576	0.106	0.400	pCi/g			JXC9	10/08/19	1106	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			79.6	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-103-FJGS-008-SS	Project:	ENRG07001
Sample ID:	490846008	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	14-AUG-19 10:25		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0247	+/-0.0832	0.149	0.400	pCi/g			JXC9	10/07/19	1510	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			90.6	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-104-FJGS-006-SS	Project:	ENRG07001
Sample ID:	490846009	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	23-AUG-19 08:44		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0047	+/-0.0675	0.130	0.400	pCi/g			JXC9	10/07/19	1510	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			81.8	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-105-FJGS-008-SS	Project:	ENRG07001
Sample ID:	490846010	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	23-AUG-19 13:39		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0453	+/-0.0588	0.125	0.400	pCi/g			JXC9	10/08/19	0817	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			77.3	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-106-FJGS-004-SS	Project:	ENRG07001
Sample ID:	490846011	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	28-AUG-19 10:39		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.024	+/-0.0648	0.117	0.400	pCi/g			JXC9	10/07/19	1510	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			92.8	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-106-FJGS-017-SS	Project:	ENRG07001
Sample ID:	490846012	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	28-AUG-19 14:31		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.023	+/-0.0397	0.0872	0.400	pCi/g			JXC9	10/08/19	0817	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			84	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-106-FJGS-018-SS	Project:	ENRG07001
Sample ID:	490846013	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	28-AUG-19 14:51		
Receive Date:	20-SEP-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0371	+/-0.0984	0.174	0.400	pCi/g			JXC9	10/07/19	1510	1921875	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			86.2	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: October 15, 2019

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-CJGS-A01-SB
Sample ID: 490846014
Matrix: Soil
Collect Date: 27-JUN-19 10:51
Receive Date: 20-SEP-19
Collector: Client

Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	U	0.0233	+/-0.0336	0.0405	0.400	pCi/g			MXS2	10/14/19	0853	1919949	1
Americium-243	U	-0.0154	+/-0.0278	0.0708	0.400	pCi/g							
Curium-243/244	U	-0.00404	+/-0.0179	0.0466	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	U	-0.00044	+/-0.00286	0.0059	0.010	pCi/g			MXS2	10/13/19	1023	1919950	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	U	0.0035	+/-0.0399	0.0848	0.400	pCi/g			MXS2	10/14/19	0738	1919951	3
Plutonium-239/240	U	-0.00481	+/-0.0332	0.0808	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	U	3.99	+/-3.10	5.16	5.00	pCi/g			MXS2	10/14/19	2041	1919952	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	U	-0.464	+/-1.15	1.82	5.00	pCi/g			TXJ1	10/11/19	0816	1921366	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137		0.312	+/-0.0643	0.0341	1.00	pCi/g			MXR1	10/05/19	1250	1919313	6
Cobalt-60	U	0.00967	+/-0.0204	0.0438		pCi/g							
Europium-152	U	0.031	+/-0.0481	0.0992		pCi/g							
Europium-154	U	0.0292	+/-0.0612	0.129		pCi/g							
Europium-155	U	0.00749	+/-0.0528	0.102		pCi/g							
Niobium-94	U	0.00999	+/-0.0155	0.0334		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0873	+/-0.113	0.192	0.400	pCi/g			JXC9	10/07/19	1510	1921875	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	U	4.06	+/-4.58	7.69	10.0	pCi/g			EW3	10/04/19	0308	1921574	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	U	-2.58	+/-2.02	3.60	5.00	pCi/g			TXP3	10/09/19	1559	1921585	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	U	-0.45	+/-0.886	1.55	2.00	pCi/g			JJ3	10/06/19	0743	1921541	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	-1.7	+/-5.55	7.59	10.0	pCi/g			TXJ1	10/11/19	1543	1921313	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

Certificate of Analysis

Report Date: October 15, 2019

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-CJGS-A01-SB
Sample ID: 490846014
Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	U	1.70	+/-2.13	3.60	5.00	pCi/g			TXJ1	10/11/19	1554	1921355	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	RYH1	09/25/19	1209	1919153

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			71.8	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			84.8	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			97.2	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			55.2	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			55.2	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			108	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			86.2	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			104	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			64.4	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			81.5	(25%-125%)

Notes:

Certificate of Analysis

Report Date: October 15, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-CJGS-A01-SB	Project:	ENRG07001
Sample ID:	490846014	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

QC Summary

Report Date: October 15, 2019

LaCrosseSolutions
S4601 State Hwy 35
Genoa, Wisconsin

Contact: Mr. Jason Q. Spaide

Workorder: 490846

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Alpha Spec										
Batch 1919949										
QC1204388648 490846014 DUP										
Americium-241	U	0.0233	U	0.0153	pCi/g	N/A		N/A	MXS2	10/14/19 08:53
	Uncertainty	+/-0.0336		+/-0.0404						
Americium-243	U	-0.0154	U	-0.00504	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0278		+/-0.0171						
Curium-243/244	U	-0.00404	U	-0.0184	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0179		+/-0.0318						
QC1204388649 LCS										
Americium-241	1.92			1.77	pCi/g		92.4	(75%-125%)		10/14/19 08:53
	Uncertainty			+/-0.186						
Americium-243			U	-0.0226	pCi/g			(75%-125%)		
	Uncertainty			+/-0.0444						
Curium-243/244	2.26			1.89	pCi/g		83.8	(75%-125%)		
	Uncertainty			+/-0.191						
QC1204388647 MB										
Americium-241			U	-0.00254	pCi/g					10/14/19 08:53
	Uncertainty			+/-0.0237						
Americium-243			U	0.000499	pCi/g					
	Uncertainty			+/-0.0229						
Curium-243/244			U	-0.00426	pCi/g					
	Uncertainty			+/-0.0193						
Batch 1919950										
QC1204388651 490846014 DUP										
Neptunium-237	U	-0.00044	U	-0.00249	pCi/g	N/A		N/A	MXS2	10/13/19 10:23
	Uncertainty	+/-0.00286		+/-0.00293						
QC1204388652 LCS										
Neptunium-237	1.44			1.55	pCi/g		108	(75%-125%)		10/13/19 10:23
	Uncertainty			+/-0.056						
QC1204388650 MB										
Neptunium-237			U	-0.00178	pCi/g					10/13/19 10:23
	Uncertainty			+/-0.00276						

QC Summary

Workorder: **490846**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Alpha Spec										
Batch 1919951										
QC1204388654 490846014 DUP										
Plutonium-238	U	0.0035	U	0.0176	pCi/g	N/A		N/A	MXS2	10/14/19 07:38
	Uncertainty	+/-0.0399		+/-0.0379						
Plutonium-239/240	U	-0.00481	U	-0.0268	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0332		+/-0.0203						
QC1204388655 LCS										
Plutonium-238			U	0.00911	pCi/g					10/14/19 07:38
	Uncertainty			+/-0.0382						
Plutonium-239/240	1.96			1.86	pCi/g		95.3	(75%-125%)		
	Uncertainty			+/-0.244						
QC1204388653 MB										
Plutonium-238			U	-0.00287	pCi/g					10/14/19 07:38
	Uncertainty			+/-0.0268						
Plutonium-239/240			U	0.00918	pCi/g					
	Uncertainty			+/-0.0253						
Batch 1919952										
QC1204388657 490846014 DUP										
Plutonium-241	U	3.99	U	3.44	pCi/g	N/A		N/A	MXS2	10/15/19 02:00
	Uncertainty	+/-3.10		+/-2.41						
QC1204388658 LCS										
Plutonium-241	162			184	pCi/g		113	(75%-125%)		10/15/19 04:04
	Uncertainty			+/-4.54						
QC1204388656 MB										
Plutonium-241			U	1.84	pCi/g					10/14/19 22:45
	Uncertainty			+/-2.15						
Rad Gamma Spec										
Batch 1919313										
QC1204386990 490846014 DUP										
Cesium-137		0.312		0.350	pCi/g	11.5		(0%-20%)	MXR1	10/05/19 15:03
	Uncertainty	+/-0.0643		+/-0.0553						
Cobalt-60	U	0.00967	U	0.0062	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0204		+/-0.0199						
Europium-152	U	0.031	U	-0.00481	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0481		+/-0.0438						

QC Summary

Workorder: **490846**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1919313										
Europium-154	U	0.0292	U	0.00422	pCi/g	N/A		N/A	MXR1	10/05/19 15:03
	Uncertainty	+/-0.0612		+/-0.0613						
Europium-155	U	0.00749	U	-0.0257	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0528		+/-0.0382						
Niobium-94	U	0.00999	U	0.0181	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0155		+/-0.0137						
QC1204386991 LCS										
Americium-241	487			510	pCi/g		105	(75%-125%)		10/05/19 12:52
	Uncertainty			+/-5.36						
Cesium-137	167			164	pCi/g		98.3	(75%-125%)		
	Uncertainty			+/-3.96						
Cobalt-60	108			107	pCi/g		98.5	(75%-125%)		
	Uncertainty			+/-3.72						
Europium-152			U	-0.591	pCi/g					
	Uncertainty			+/-1.40						
Europium-154			U	-0.258	pCi/g					
	Uncertainty			+/-0.900						
Europium-155			U	0.655	pCi/g					
	Uncertainty			+/-1.02						
Niobium-94			U	0.231	pCi/g					
	Uncertainty			+/-0.450						
QC1204386989 MB										
Cesium-137			U	-0.00479	pCi/g					10/05/19 12:51
	Uncertainty			+/-0.0152						
Cobalt-60			U	-0.00517	pCi/g					
	Uncertainty			+/-0.0145						
Europium-152			U	-0.000709	pCi/g					
	Uncertainty			+/-0.0424						
Europium-154			U	-0.0286	pCi/g					
	Uncertainty			+/-0.038						
Europium-155			U	0.0641	pCi/g					
	Uncertainty			+/-0.0928						

QC Summary

Workorder: **490846**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1919313										
Niobium-94			U	0.00784	pCi/g				MXR1	10/05/19 12:51
	Uncertainty			+/-0.0142						
Batch 1921366										
QC1204391968 490846014 DUP										
Nickel-59	U	-0.464	U	-0.171	pCi/g	N/A		N/A	TXJ1	10/11/19 08:17
	Uncertainty	+/-1.15		+/-0.691						
QC1204391969 LCS										
Nickel-59	92.8			100	pCi/g		108	(75%-125%)		10/11/19 09:30
	Uncertainty			+/-6.10						
QC1204391967 MB										
Nickel-59			U	1.07	pCi/g					10/11/19 08:17
	Uncertainty			+/-1.85						
Rad Gas Flow										
Batch 1921875										
QC1204393106 490846005 DUP										
Strontium-90	U	-0.0505	U	0.0293	pCi/g	N/A		N/A	JXC9	10/07/19 15:10
	Uncertainty	+/-0.0835		+/-0.0985						
QC1204393107 LCS										
Strontium-90	5.36			5.83	pCi/g		109	(75%-125%)		10/07/19 15:10
	Uncertainty			+/-0.340						
QC1204393105 MB										
Strontium-90			U	0.015	pCi/g					10/07/19 15:10
	Uncertainty			+/-0.0671						
Rad Liquid Scintillation										
Batch 1921313										
QC1204391802 490846014 DUP										
Iron-55	U	-1.7	U	-0.904	pCi/g	N/A		N/A	TXJ1	10/11/19 18:19
	Uncertainty	+/-5.55		+/-5.29						
QC1204391803 LCS										
Iron-55	76.4			71.5	pCi/g		93.5	(75%-125%)		10/11/19 19:37
	Uncertainty			+/-5.37						
QC1204391801 MB										
Iron-55			U	1.03	pCi/g					10/11/19 17:01
	Uncertainty			+/-4.39						

QC Summary

Workorder: **490846**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Liquid Scintillation										
Batch 1921355										
QC1204391926 490846014 DUP										
Nickel-63	U	1.70	U	-0.61	pCi/g	N/A		N/A	TXJ1	10/11/19 16:28
	Uncertainty	+/-2.13		+/-2.12						
QC1204391927 LCS										
Nickel-63	96.5			101	pCi/g		104	(75%-125%)		10/11/19 16:44
	Uncertainty			+/-5.11						
QC1204391925 MB										
Nickel-63			U	-0.418	pCi/g					10/11/19 16:11
	Uncertainty			+/-2.23						
Batch 1921541										
QC1204392284 490846014 DUP										
Technetium-99	U	-0.45	U	-0.161	pCi/g	N/A		N/A	JJ3	10/06/19 08:48
	Uncertainty	+/-0.886		+/-0.901						
QC1204392285 LCS										
Technetium-99	41.1			36.7	pCi/g		89.3	(75%-125%)		10/06/19 09:20
	Uncertainty			+/-1.70						
QC1204392283 MB										
Technetium-99			U	-0.684	pCi/g					10/06/19 08:15
	Uncertainty			+/-0.898						
Batch 1921574										
QC1204392383 490846014 DUP										
Tritium	U	4.06	U	4.45	pCi/g	N/A		N/A	EW3	10/04/19 05:53
	Uncertainty	+/-4.58		+/-4.62						
QC1204392385 LCS										
Tritium	146			129	pCi/g		88.1	(75%-125%)		10/04/19 07:27
	Uncertainty			+/-8.79						
QC1204392382 MB										
Tritium			U	3.98	pCi/g					10/04/19 03:55
	Uncertainty			+/-4.49						
QC1204392384 490846014 MS										
Tritium	149 U	4.06		124	pCi/g		83.3	(75%-125%)		10/04/19 06:40
	Uncertainty	+/-4.58		+/-8.95						

QC Summary

Workorder: **490846**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Liquid Scintillation										
Batch 1921585										
QC1204392425 490846014 DUP										
Carbon-14	U	-2.58	U	-1.82	pCi/g	N/A		N/A	TXP3	10/09/19 17:34
	Uncertainty	+/-2.02		+/-2.01						
QC1204392427 LCS										
Carbon-14	142			133	pCi/g		93.5	(75%-125%)		10/09/19 19:10
	Uncertainty			+/-4.36						
QC1204392424 MB										
Carbon-14			U	0.0484	pCi/g					10/09/19 16:46
	Uncertainty			+/-2.08						
QC1204392426 490846014 MS										
Carbon-14	146 U	-2.58		132	pCi/g		90.2	(75%-125%)		10/09/19 18:23
	Uncertainty	+/-2.02		+/-4.40						

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded
- J See case narrative for an explanation
- J Value is estimated
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- M M if above MDC and less than LLD
- M REMP Result > MDC/CL and < RDL
- N/A RPD or %Recovery limits do not apply.
- N1 See case narrative
- ND Analyte concentration is not detected above the detection limit
- NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Q One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
- R Sample results are rejected
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification

QC Summary

Workorder: **490846**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Radiochemistry
Technical Case Narrative
LaCrosseSolutions, LLC
SDG #: 490846

Product: **Alphaspec Isotopic Am241 Am243, Cm243/244, Solid**
Analytical Method: DOE EML HASL-300, Am-05-RC Modified
Analytical Procedure: GL-RAD-A-011 REV# 27
Analytical Batch: 1919949

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204388647	Method Blank (MB)
1204388648	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204388649	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
The Cm-244 portion of sample 1204388647 (MB) was recounted due to results more negative than the three sigma TPU. The recount is reported.

Product: **Alphaspec Np, Solid**
Analytical Method: ASTM C 1475-00 Modified
Analytical Procedure: GL-RAD-A-032 REV# 22
Analytical Batch: 1919950

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204388650	Method Blank (MB)
1204388651	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204388652	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Alphaspec Pu238, 239/240, Solid**
Analytical Method: DOE EML HASL-300, Pu-11-RC Modified
Analytical Procedure: GL-RAD-A-011 REV# 27
Analytical Batch: 1919951

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204388653	Method Blank (MB)
1204388654	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204388655	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846001	L1-SUB-TDS-FJGS-A24-SB
490846002	L1-SUB-TDS-FJGS-A25-SB
490846003	L1-SUB-TDS-FJGS-A12A-SB
490846004	L1-010-107-FJGS-005-SS
490846005	L1-010-107-FJGS-016-SS
490846006	L1-010-101-FJGS-003-SS
490846007	L1-010-102-FJGS-010-SS
490846008	L1-010-103-FJGS-008-SS
490846009	L1-010-104-FJGS-006-SS
490846010	L1-010-105-FJGS-008-SS
490846011	L1-010-106-FJGS-004-SS
490846012	L1-010-106-FJGS-017-SS
490846013	L1-010-106-FJGS-018-SS
490846014	L1-SUB-TDS-CJGS-A01-SB

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155**
Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Analytical Procedure: GL-RAD-A-013 REV# 27
Analytical Batch: 1919313

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204386989	Method Blank (MB)
1204386990	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204386991	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Gamma Ni59, Solid**
Analytical Method: DOE RESL Ni-1
Analytical Procedure: GL-RAD-A-022 REV# 19
Analytical Batch: 1921366

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204391967	Method Blank (MB)
1204391968	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204391969	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **GFPC, Sr90, Solid**
Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified
Analytical Procedure: GL-RAD-A-004 REV# 21
Analytical Batch: 1921875

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846001	L1-SUB-TDS-FJGS-A24-SB
490846002	L1-SUB-TDS-FJGS-A25-SB
490846003	L1-SUB-TDS-FJGS-A12A-SB
490846004	L1-010-107-FJGS-005-SS
490846005	L1-010-107-FJGS-016-SS
490846006	L1-010-101-FJGS-003-SS
490846007	L1-010-102-FJGS-010-SS
490846008	L1-010-103-FJGS-008-SS
490846009	L1-010-104-FJGS-006-SS

490846010	L1-010-105-FJGS-008-SS
490846011	L1-010-106-FJGS-004-SS
490846012	L1-010-106-FJGS-017-SS
490846013	L1-010-106-FJGS-018-SS
490846014	L1-SUB-TDS-CJGS-A01-SB
1204393105	Method Blank (MB)
1204393106	490846005(L1-010-107-FJGS-016-SS) Sample Duplicate (DUP)
1204393107	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
Samples 490846006 (L1-010-101-FJGS-003-SS), 490846007 (L1-010-102-FJGS-010-SS), 490846010 (L1-010-105-FJGS-008-SS) and 490846012 (L1-010-106-FJGS-017-SS) were recounted due to results more negative than the three sigma TPU. The second counts are reported.

Product: **Liquid Scint Pu241, Solid**
Analytical Method: DOE EML HASL-300, Pu-11-RC Modified
Analytical Procedure: GL-RAD-A-035 REV# 21
Analytical Batch: 1919952

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204388656	Method Blank (MB)
1204388657	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204388658	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Liquid Scint Fe55, Solid**
Analytical Method: DOE RESL Fe-1, Modified
Analytical Procedure: GL-RAD-A-040 REV# 13
Analytical Batch: 1921313

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204391801	Method Blank (MB)
1204391802	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204391803	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
Samples were recounted due to high MDCs. The recounts are reported.

Product: **Liquid Scint Ni63, Solid**
Analytical Method: DOE RESL Ni-1, Modified
Analytical Procedure: GL-RAD-A-022 REV# 19
Analytical Batch: 1921355

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1919153

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204391925	Method Blank (MB)
1204391926	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204391927	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Liquid Scint Tc99, Solid**
Analytical Method: DOE EML HASL-300, Tc-02-RC Modified
Analytical Procedure: GL-RAD-A-059 REV# 5
Analytical Batch: 1921541

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204392283	Method Blank (MB)
1204392284	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204392285	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **LSC, Tritium Distillation, Solid**
Analytical Method: EPA 906.0 Modified
Analytical Procedure: GL-RAD-A-002 REV# 23
Analytical Batch: 1921574

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204392382	Method Blank (MB)
1204392383	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204392384	490846014(L1-SUB-TDS-CJGS-A01-SB) Matrix Spike (MS)
1204392385	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Liquid Scint C14, Solid**
Analytical Method: EPA EERF C-01 Modified
Analytical Procedure: GL-RAD-A-003 REV# 16
Analytical Batch: 1921585

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
490846014	L1-SUB-TDS-CJGS-A01-SB
1204392424	Method Blank (MB)
1204392425	490846014(L1-SUB-TDS-CJGS-A01-SB) Sample Duplicate (DUP)
1204392426	490846014(L1-SUB-TDS-CJGS-A01-SB) Matrix Spike (MS)
1204392427	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

490846

Page: 1 of 2
Project # LACBWR Site
GEL Quote #:
COC Number (1):
PO Number: 672583

GEL Laboratories LLC
gel.com
Chemistry | Radiochemistry | Radiobioassay | Specialty Analytics

Chain of Custody and Analytical Request

GEL Work Order Number: *GEL Project Manager:*

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: La Crosse Solutions Phone # 608-689-4259
Project/Site Name: LACBWR-Genoa WI Fax #
Address: 54601 State Road 35
Collected By: Kevin L Murray Send Results To:Scott Zoller sgzoller@energysolutions.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Radioactive (If yes, please supply isotopic info.)	(7) Known or possible Hazards	Total number of containers	Sr90										<-- Preservative Type (6)	Comments Note: extra sample is required for sample specific QC
L1-SUB-TDS-FJGS-A24-SB	07/03/19	12:56	N	N	SO	N	N	1	1											
L1-SUB-TDS-FJGS-A25-SB	07/03/19	13:01	N	N	SO	N	N	1	1											
L1-SUB-TDS-FJGS-A12A-SB	07/12/19	13:02	N	N	SO	N	N	1	1											
L1-010-107-FSGS-005-SS	08/08/19	15:29	N	N	SO	N	N	1	1											
L1-010-107-FJGS-016-SS	08/09/19	14:00	N	N	SO	N	N	1	1											
L1-010-101-FSGS-003-SS	08/08/19	14:21	N	N	SO	N	N	1	1											
L1-010-102-FSGS-010-SB	08/15/19	8:48	N	N	SO	N	N	1	1											
L1-010-103-FSGS-008-SS	08/14/19	10:25	N	N	SO	N	N	1	1											
L1-010-104-FSGS-006-SS	08/23/19	8:44	N	N	SO	N	N	1	1											
L1-010-105-FSGS-008-SS	08/23/19	13:39	N	N	SO	N	N	1	1											

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Kevin L Murray	9/18/19	0900	1	9/20/19	8:55
2			2		
3			3		

TAT Requested: Normal: _X_ Rush: ____ Specify: _____ (Subject to Surcharge)

Fax Results: [ ] Yes [X] No

Select Deliverable: [ ] C of A [ ] QC Summary [ ] level 1 [X] Level 2 [ ] Level 3 [ ] Level 4

Additional Remarks: **None**

For Lab Receiving Use Only: *Custody Seal Intact?* [ ] *Yes* [ ] *No* ***Cooler Temp:*** ____ °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: [ ] Eastern [ ] Pacific [X] Central [ ] Mountain [ ] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: N = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite

3.) Field Filtered: For liquid matrices, indicate with a - **Y** - for yes the sample was field filtered or - **N** - for sample was not field filtered.

4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, **ML**=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B, 6010B/7470A**) and number of containers provided for each (i.e. *8260B* - **3**, *6010B/7470A* - **1**).

6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) **KNOWN OR POSSIBLE HAZARDS**

RCRA Metals
As = Arsenic **Hg**= Mercury
Ba = Barium **Se**= Selenium
Cd = Cadmium **Ag**= Silver
Cr = Chromium **MR**= Misc. RCRA metals
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F,K,P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. *(i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)*

490846

Page: 2 of 2
Project # LACBWR Site
GEL Quote #:
COC Number (1):
PO Number: 672583

GEL Laboratories LLC
gel.com
Chemistry | Radiochemistry | Radiobioassay | Specialty Analytics

Chain of Custody and Analytical Request

GEL Work Order Number: *GEL Project Manager:*

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: La Crosse Solutions Phone # 608-689-4259
Project/Site Name: LACBWR-Genoa WI Fax #
Address: 54601 State Road 35
Collected By: Kevin L Murray Send Results To:Scott Zoller sgzoller@energysolutions.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Radioactive (If yes, please supply isotopic info.)	Should this sample be considered: (7) Known or possible Hazards	Total number of containers	Sr90	Ni59, Co60, Nb94	Cs137 ,Eu152, Eu154	Eu155, Pu241	H3, C14, Fe55	Ni63, Tc99	Np237, Pu238	Pu239, Pu240	Am241, Am243	Cm243, Cm244	<-- Preservative Type (6) Comments Note: extra sample is required for sample specific QC
L1-010-106-FSGS-004-SS	08/28/19	10:39	N	N	SO	N	N	1	1										
L1-010-106-FJGS-017-SS	08/28/19	14:31	N	N	SO	N	N	1	1										
L1-010-106-FJGS-018-SS	08/28/19	14:51	N	N	SO	N	N	1	1										
L1-SUB-TDS-CJGS-A01-SB	06/27/19	10:51	N	N	SO	N	N	1	1	1	1	1	1	1	1	1	1	1	MDC <0.01pCi Np-237
					A														
				N															

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Kevin L Murray	9/18/19	0900	1	9/20/19	855
2			2		
3			3		

TAT Requested: Normal: _X_ Rush: _____ Specify: _____ (Subject to Surcharge)

Fax Results: [ ] Yes [X] No

Select Deliverable: [ ] C of A [ ] QC Summary [ ] level 1 [X] Level 2 [ ] Level 3 [ ] Level 4

Additional Remarks: **None**

For Lab Receiving Use Only: *Custody Seal Intact?* [ ] *Yes* [ ] *No* ***Cooler Temp:*** _____ °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: [ ] Eastern [ ] Pacific [X] Central [ ] Mountain [ ] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: **N** = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite

3.) Field Filtered: For liquid matrices, indicate with a - **Y** - for yes the sample was field filtered or - **N** - for sample was not field filtered.

4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, **ML**=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B, 6010B/7470A**) and number of containers provided for each (i.e. *8260B* - **3**, *6010B/7470A* - **1**).

6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) **KNOWN OR POSSIBLE HAZARDS**

RCRA Metals
As = Arsenic **Hg**= Mercury
Ba = Barium **Se**= Selenium
Cd = Cadmium **Ag**= Silver
Cr = Chromium **MR**= Misc. RCRA metals
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F,K,P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. *(i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)*

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: ENRG	SDG/AR/COC/Work Order: 490846
Received By: STACY BOONE	Date Received: 20 - SEPT - 19
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 7762 7528 4418

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A)Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#: If UN2910, Is the Radioactive Shipment Survey Compliant? Yes___ No___
B) Did the client designate the samples are to be received as radioactive?		✓	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): Ø CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		✓	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		✓	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*			✓	Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: 21c
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR1-19 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	If Yes, are Encores or Soil Kits present for solids? Yes___ No___ NA___(If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes___ No___ NA___(If unknown, select No) Are liquid VOA vials free of headspace? Yes___ No___ NA___ Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?				Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials MB Date 9/23/19 Page 1 of 1

GL-CHL-SR-001 Rev 6

List of current GEL Certifications as of 15 October 2019

State	Certification
Alaska	17−018
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M−SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122020−1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	2019−165
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−19−15
Utah NELAP	SC000122019−28
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

November 14, 2019

Mr. Jason Q. Spaide
LaCrosseSolutions
S4601 State Hwy 35
Genoa, Wisconsin 54632

Re: LACBWR Site Restoration Project
Work Order: 493624

Dear Mr. Spaide:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 21, 2019. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4453.

Sincerely,

Edith M. Kent

Edith Kent
Project Manager

Purchase Order: 672583
Enclosures

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 − (843) 556−8171 − www.gel.com

Certificate of Analysis Report
for

ENRG070 LaCrosseSolutions, LLC (672583)

Client SDG: 493624 GEL Work Order: 493624

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a Tracer compound

** Analyte is a surrogate compound

H Analytical holding time was exceeded

U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

h Preparation or preservation holding time was exceeded

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Edith Kent.

Reviewed by Edith M. Kent

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 14, 2019

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L3-012-101-RAGS-002-SS
Sample ID: 493624001
Matrix: Soil
Collect Date: 08-SEP-16 11:05
Receive Date: 21-OCT-19
Collector: Client

Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	HUh	0.0084	+/-0.0467	0.0895	0.400	pCi/g			HAKB	11/06/19	0953	1929693	1
Americium-243	HUh	0.0346	+/-0.0974	0.104	0.400	pCi/g							
Curium-243/244	HUh	-0.00429	+/-0.037	0.0857	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	HUh	0.00125	+/-0.00299	0.00529	0.010	pCi/g			HAKB	11/11/19	1231	1929694	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	HUh	0.00487	+/-0.0271	0.0519	0.400	pCi/g			HAKB	11/06/19	0922	1929695	3
Plutonium-239/240	HUh	-0.00402	+/-0.0278	0.0676	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	HUh	-1.25	+/-2.38	4.12	5.00	pCi/g			HAKB	11/09/19	0252	1929696	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	HUh	-0.18	+/-1.68	3.01	5.00	pCi/g			TXJ1	10/30/19	0619	1931847	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137	Hh	0.113	+/-0.0594	0.0518	1.00	pCi/g			MXR1	10/30/19	0857	1929624	6
Cobalt-60	HUh	0.036	+/-0.0349	0.0881		pCi/g							
Europium-152	HUh	-0.00616	+/-0.0669	0.115		pCi/g							
Europium-154	HUh	-0.0128	+/-0.0717	0.149		pCi/g							
Europium-155	HUh	0.0587	+/-0.0622	0.134		pCi/g							
Niobium-94	HUh	0.0376	+/-0.0275	0.0407		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	HUh	0.0238	+/-0.0658	0.120	0.400	pCi/g			JXC9	11/06/19	1419	1933651	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	HU	1.65	+/-5.62	9.75	10.0	pCi/g			EW3	10/28/19	2327	1929721	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	HU	1.92	+/-1.76	2.94	5.00	pCi/g			TXP3	11/08/19	1739	1934551	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	HU	-0.00734	+/-0.483	0.861	2.00	pCi/g			JJ3	11/05/19	2229	1929739	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	HUh	-1.57	+/-12.1	18.7	10.0	pCi/g			RP1	11/01/19	0908	1931683	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RAGS-002-SS	Project:	ENRG07001
Sample ID:	493624001	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	HUh	-0.424	+/-1.17	2.08	5.00	pCi/g			RP1	10/30/19	1251	1931689	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			35	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			18.2	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			91.7	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			79.9	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			79.9	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			98.8	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			92.8	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			92.1	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			20.5	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			97.4	(25%-125%)

Notes:

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RAGS-002-SS	Project:	ENRG07001
Sample ID:	493624001	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RAGS-004-SS	Project:	ENRG07001
Sample ID:	493624002	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	13-SEP-16 11:00		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	HUh	-0.00947	+/-0.0286	0.0803	0.400	pCi/g			HAKB	11/06/19	0953	1929693	1
Americium-243	HUh	0.049	+/-0.0706	0.0851	0.400	pCi/g							
Curium-243/244	HUh	-0.0105	+/-0.0316	0.0888	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	HUh	0.00322	+/-0.00457	0.00708	0.010	pCi/g			HAKB	11/11/19	1407	1929694	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	HUh	0.0216	+/-0.043	0.0698	0.400	pCi/g			HAKB	11/06/19	0922	1929695	3
Plutonium-239/240	HUh	0.00537	+/-0.0299	0.0572	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	HUh	-0.71	+/-2.66	4.58	5.00	pCi/g			HAKB	11/09/19	0453	1929696	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	HUh	0.790	+/-1.61	1.85	5.00	pCi/g			TXJ1	10/30/19	0732	1931847	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137	HUh	-0.00991	+/-0.0244	0.0436	1.00	pCi/g			MXR1	10/30/19	2007	1929624	6
Cobalt-60	HUh	-0.0119	+/-0.0357	0.0682		pCi/g							
Europium-152	HUh	0.0185	+/-0.085	0.158		pCi/g							
Europium-154	HUh	-0.0397	+/-0.0855	0.151		pCi/g							
Europium-155	HUh	0.0322	+/-0.121	0.245		pCi/g							
Niobium-94	HUh	0.00172	+/-0.0225	0.0424		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	HUh	-0.0186	+/-0.0688	0.136	0.400	pCi/g			JXC9	11/07/19	0654	1933651	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	HU	6.63	+/-5.88	9.76	10.0	pCi/g			EW3	10/29/19	0019	1929721	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	HU	0.791	+/-1.54	2.62	5.00	pCi/g			TXP3	11/10/19	1745	1934551	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	HU	0.117	+/-0.461	0.809	2.00	pCi/g			JJ3	11/05/19	2312	1929739	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	HUh	-8.13	+/-10.8	16.8	10.0	pCi/g			RP1	11/01/19	1112	1931683	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RAGS-004-SS	Project:	ENRG07001
Sample ID:	493624002	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	HUh	-0.325	+/-1.16	2.04	5.00	pCi/g			RP1	10/30/19	1308	1931689	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			45.5	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			29.7	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			77.2	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			72.9	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			72.9	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			106	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			75.1	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			95.4	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			23.8	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			101	(25%-125%)

Notes:

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RAGS-004-SS	Project:	ENRG07001
Sample ID:	493624002	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L3-012-101-RBGS-004-SS
Sample ID: 493624003
Matrix: Soil
Collect Date: 14-OCT-16 09:02
Receive Date: 21-OCT-19
Collector: Client

Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	HUh	0.00515	+/-0.0286	0.0549	0.400	pCi/g			HAKB	11/11/19	2243	1929693	1
Americium-243	HUh	0.0273	+/-0.0467	0.0409	0.400	pCi/g							
Curium-243/244	HUh	0.0083	+/-0.0311	0.0524	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	HUh	0.00372	+/-0.00542	0.00881	0.010	pCi/g			HAKB	11/11/19	1407	1929694	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	HUh	0.00351	+/-0.0367	0.0765	0.400	pCi/g			HAKB	11/06/19	0922	1929695	3
Plutonium-239/240	HUh	0.0186	+/-0.0427	0.0677	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	HUh	-2.96	+/-3.25	5.69	5.00	pCi/g			HAKB	11/09/19	0654	1929696	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	HUh	-1.19	+/-1.81	3.10	5.00	pCi/g			TXJ1	10/30/19	0732	1931847	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137	Hh	0.165	+/-0.0676	0.0583	1.00	pCi/g			MXR1	10/30/19	2007	1929624	6
Cobalt-60	HUh	0.00774	+/-0.0495	0.104		pCi/g							
Europium-152	HUh	0.00852	+/-0.0674	0.143		pCi/g							
Europium-154	HUh	-0.0312	+/-0.128	0.242		pCi/g							
Europium-155	HUh	0.0809	+/-0.0975	0.216		pCi/g							
Niobium-94	HUh	0.0112	+/-0.0238	0.0472		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	HUh	-0.0302	+/-0.0603	0.125	0.400	pCi/g			JXC9	11/06/19	1419	1933651	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	HU	2.06	+/-5.54	9.58	10.0	pCi/g			EW3	10/29/19	0111	1929721	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	HU	1.88	+/-1.91	3.20	5.00	pCi/g			TXP3	11/08/19	1914	1934551	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	HU	0.210	+/-0.757	1.32	2.00	pCi/g			JJ3	11/05/19	2354	1929739	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	HUh	-3.06	+/-10.9	16.7	10.0	pCi/g			RP1	11/01/19	1316	1931683	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RBGS-004-SS	Project:	ENRG07001
Sample ID:	493624003	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	HUh	-0.265	+/-1.50	2.64	5.00	pCi/g			RP1	10/30/19	1324	1931689	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			63.2	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			38.5	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			67	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			58.2	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			58.2	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			84.1	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			90.6	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			83.5	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			24.3	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			77.5	(25%-125%)

Notes:

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RBGS-004-SS	Project:	ENRG07001
Sample ID:	493624003	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RBGS-007-SS	Project:	ENRG07001
Sample ID:	493624004	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	24-OCT-16 09:05		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	HUh	0.0113	+/-0.0385	0.0714	0.400	pCi/g			HAKB	11/06/19	0953	1929693	1
Americium-243	HUh	0.0127	+/-0.0397	0.0744	0.400	pCi/g							
Curium-243/244	HUh	-0.00764	+/-0.0449	0.107	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	HUh	0.00296	+/-0.00441	0.00677	0.010	pCi/g			HAKB	11/11/19	1407	1929694	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	HUh	0.0131	+/-0.0504	0.0977	0.400	pCi/g			HAKB	11/07/19	0836	1929695	3
Plutonium-239/240	HUh	-0.0113	+/-0.0263	0.0779	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	HUh	-3.33	+/-2.87	5.04	5.00	pCi/g			HAKB	11/09/19	0856	1929696	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	HUh	0.384	+/-1.43	2.69	5.00	pCi/g			TXJ1	10/30/19	0901	1931847	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137	Hh	0.174	+/-0.128	0.107	1.00	pCi/g			MXR1	10/30/19	2008	1929624	6
Cobalt-60	HUh	0.010	+/-0.0701	0.154		pCi/g							
Europium-152	HUh	-0.0434	+/-0.125	0.241		pCi/g							
Europium-154	HUh	0.0975	+/-0.198	0.446		pCi/g							
Europium-155	HUh	0.184	+/-0.157	0.316		pCi/g							
Niobium-94	HUh	-0.0248	+/-0.0531	0.0943		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	HUh	-0.0921	+/-0.0818	0.172	0.400	pCi/g			JXC9	11/06/19	1419	1933651	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	HU	-0.242	+/-5.47	9.57	10.0	pCi/g			EW3	10/30/19	0546	1929721	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	HU	1.60	+/-1.86	3.13	5.00	pCi/g			TXP3	11/08/19	2000	1934551	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	HU	0.0756	+/-0.755	1.33	2.00	pCi/g			JJ3	11/06/19	0037	1929739	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	HUh	-2.34	+/-9.51	14.1	10.0	pCi/g			RP1	11/01/19	1519	1931683	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RBGS-007-SS	Project:	ENRG07001
Sample ID:	493624004	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	HUh	-0.239	+/-1.48	2.61	5.00	pCi/g			RP1	10/30/19	1340	1931689	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			57.8	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			55.4	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			61.1	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			67.4	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			67.4	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			77.8	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			79.7	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			33.8	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			75.7	(25%-125%)

Notes:

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-RBGS-007-SS	Project:	ENRG07001
Sample ID:	493624004	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L4-OFF-SOL-IJGS-A01-SS NE	Project:	ENRG07001
Sample ID:	493624005	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	04-MAY-17 08:25		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	HUh	0.00418	+/-0.0437	0.0913	0.400	pCi/g			HAKB	11/06/19	0953	1929693	1
Americium-243	HUh	0.0805	+/-0.113	0.180	0.400	pCi/g							
Curium-243/244	HUh	0.0123	+/-0.046	0.0774	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	HUh	0.0027	+/-0.0048	0.00826	0.010	pCi/g			HAKB	11/11/19	1407	1929694	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	HUh	0.00535	+/-0.0297	0.057	0.400	pCi/g			HAKB	11/07/19	0919	1929695	3
Plutonium-239/240	HUh	0.00565	+/-0.0365	0.0746	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	HUh	-1.69	+/-2.64	4.58	5.00	pCi/g			HAKB	11/09/19	1057	1929696	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	HUh	-0.319	+/-1.80	3.04	5.00	pCi/g			TXJ1	10/30/19	0902	1931847	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137	HUh	-0.0202	+/-0.0335	0.062	1.00	pCi/g			MXR1	10/31/19	1914	1929624	6
Cobalt-60	HUh	-0.000764	+/-0.0486	0.105		pCi/g							
Europium-152	HUh	-0.0349	+/-0.0944	0.189		pCi/g							
Europium-154	HUh	0.0419	+/-0.107	0.261		pCi/g							
Europium-155	HUh	0.0633	+/-0.0849	0.189		pCi/g							
Niobium-94	HUh	-0.0074	+/-0.0313	0.0606		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	HUh	-0.0141	+/-0.058	0.117	0.400	pCi/g			JXC9	11/06/19	1419	1933651	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	HU	3.03	+/-5.68	9.73	10.0	pCi/g			EW3	10/29/19	0406	1929721	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	HU	2.67	+/-1.65	2.70	5.00	pCi/g			TXP3	11/08/19	2047	1934551	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	HU	0.468	+/-0.587	0.992	2.00	pCi/g			JJ3	11/06/19	0235	1929739	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	HUh	-2.65	+/-8.40	12.7	10.0	pCi/g			RP1	11/01/19	1723	1931683	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L4-OFF-SOL-IJGS-A01-SS NE	Project:	ENRG07001
Sample ID:	493624005	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	HUh	0.190	+/-1.16	2.01	5.00	pCi/g			RP1	10/30/19	1357	1931689	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			40	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			32.4	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			89.7	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			71.9	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			71.9	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			98	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			95.2	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			28.8	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			101	(25%-125%)

Notes:

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L4-OFF-SOL-IJGS-A01-SS NE	Project:	ENRG07001
Sample ID:	493624005	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L4-OFF-SOL-IJGS-A03-SS SW	Project:	ENRG07001
Sample ID:	493624006	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	04-MAY-17 09:30		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	HUh	-0.00883	+/-0.0399	0.101	0.400	pCi/g			HAKB	11/06/19	0953	1929693	1
Americium-243	HUh	0.00791	+/-0.0933	0.197	0.400	pCi/g							
Curium-243/244	HUh	-0.00337	+/-0.0291	0.0673	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	HUh	0.00226	+/-0.004	0.00662	0.010	pCi/g			HAKB	11/11/19	1407	1929694	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	HUh	-0.0135	+/-0.0384	0.0935	0.400	pCi/g			HAKB	11/06/19	0953	1929695	3
Plutonium-239/240	HUh	0.00711	+/-0.0355	0.071	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	HUh	-1.48	+/-2.38	4.14	5.00	pCi/g			HAKB	11/09/19	1258	1929696	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	HUh	0.850	+/-0.613	1.77	5.00	pCi/g			TXJ1	10/30/19	0902	1931847	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137	HUh	-0.0164	+/-0.0249	0.0423	1.00	pCi/g			MXR1	11/01/19	0622	1929624	6
Cobalt-60	HUh	0.00904	+/-0.0233	0.0583		pCi/g							
Europium-152	HUh	0.123	+/-0.0925	0.150		pCi/g							
Europium-154	HUh	-0.097	+/-0.081	0.110		pCi/g							
Europium-155	HUh	0.0555	+/-0.0883	0.181		pCi/g							
Niobium-94	HUh	0.0103	+/-0.0227	0.049		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	HUh	-0.0582	+/-0.055	0.122	0.400	pCi/g			JXC9	11/06/19	1419	1933651	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	HU	3.85	+/-5.29	8.96	10.0	pCi/g			EW3	10/29/19	0458	1929721	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	HU	1.65	+/-1.66	2.79	5.00	pCi/g			TXP3	11/10/19	1832	1934551	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	HU	-0.11	+/-1.09	1.95	2.00	pCi/g			JJ3	11/06/19	0317	1929739	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	HUh	-1.18	+/-6.18	8.97	10.0	pCi/g			RP1	11/01/19	1927	1931683	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L4-OFF-SOL-IJGS-A03-SS SW	Project:	ENRG07001
Sample ID:	493624006	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	HUh	-0.546	+/-1.17	2.08	5.00	pCi/g			RP1	10/30/19	1413	1931689	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			42.8	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			27.2	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			69.5	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			80	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			80	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			98.4	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			95	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			63.8	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			43.4	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			96.5	(25%-125%)

Notes:

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L4-OFF-SOL-IJGS-A03-SS SW	Project:	ENRG07001
Sample ID:	493624006	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	S3-012-109B-FJGS-062-SM	Project:	ENRG07001
Sample ID:	493624007	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	22-AUG-19 10:05		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0139	+/-0.0617	0.113	0.400	pCi/g			JXC9	11/06/19	1419	1933651	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			110	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	S3-012-109B-FJGS-063-SM	Project:	ENRG07001
Sample ID:	493624008	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	22-AUG-19 10:14		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.00923	+/-0.0636	0.121	0.400	pCi/g			JXC9	11/06/19	1419	1933651	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			104	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	S3-012-109B-FJGS-064-SM	Project:	ENRG07001
Sample ID:	493624009	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	22-AUG-19 13:12		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0355	+/-0.0445	0.0974	0.400	pCi/g			JXC9	11/06/19	1419	1933651	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			104	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L2-011-101-FSGS-013-SS	Project:	ENRG07001
Sample ID:	493624010	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	20-SEP-19 10:43		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0706	+/-0.085	0.144	0.400	pCi/g			JXC9	11/06/19	1419	1933651	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			97.2	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L2-011-104-FSGS-001-SS	Project:	ENRG07001
Sample ID:	493624011	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	09-SEP-19 14:08		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0354	+/-0.0446	0.096	0.400	pCi/g			JXC9	11/06/19	1419	1933651	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			113	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L2-011-104-FSGS-010-SS	Project:	ENRG07001
Sample ID:	493624012	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	09-SEP-19 14:46		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0194	+/-0.0367	0.0792	0.400	pCi/g			JXC9	11/07/19	0654	1933651	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			97.2	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-FSGS-004-SS	Project:	ENRG07001
Sample ID:	493624013	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	05-SEP-19 08:58		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.112	+/-0.084	0.133	0.400	pCi/g			JXC9	11/06/19	1419	1933651	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			92.8	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-109-FSGS-005-SS	Project:	ENRG07001
Sample ID:	493624014	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	24-SEP-19 08:05		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0801	+/-0.0672	0.107	0.400	pCi/g			JXC9	11/06/19	1419	1933651	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-109-FSGS-006-SS	Project:	ENRG07001
Sample ID:	493624015	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	24-SEP-19 10:36		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0454	+/-0.038	0.0913	0.400	pCi/g			JXC9	11/06/19	1419	1933651	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			104	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-109-FSGS-011-SS	Project:	ENRG07001
Sample ID:	493624016	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	23-SEP-19 14:09		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0482	+/-0.0493	0.111	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			92.8	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-107-FSGS-008-SS	Project:	ENRG07001
Sample ID:	493624017	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	08-AUG-19 15:00		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0295	+/-0.0766	0.151	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			84	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-101-FSGS-015-SS	Project:	ENRG07001
Sample ID:	493624018	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	08-AUG-19 15:12		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0436	+/-0.0544	0.118	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-102-FSGS-007-SS	Project:	ENRG07001
Sample ID:	493624019	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	14-AUG-19 15:18		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0969	+/-0.0724	0.155	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-103-FSGS-005-SS	Project:	ENRG07001
Sample ID:	493624020	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	14-AUG-19 10:13		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0229	+/-0.0522	0.109	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1024	1929602

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			90.6	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-104-FSGS-016-SS	Project:	ENRG07001
Sample ID:	493624021	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	23-AUG-19 09:57		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0967	+/-0.087	0.141	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1034	1929603

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			79.6	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-010-105-FSGS-007-SS	Project:	ENRG07001
Sample ID:	493624022	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	23-AUG-19 13:29		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0341	+/-0.0859	0.154	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1034	1929603

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			79.6	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L2-011-101-FSGS-005-SS	Project:	ENRG07001
Sample ID:	493624023	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	20-SEP-19 14:01		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0135	+/-0.0736	0.141	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1034	1929603

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L2-011-104-FSGS-011-SS	Project:	ENRG07001
Sample ID:	493624024	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	09-SEP-19 14:52		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.058	+/-0.0508	0.117	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1034	1929603

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-101-FSGS-005-SS	Project:	ENRG07001
Sample ID:	493624025	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	05-SEP-19 13:00		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0836	+/-0.0864	0.144	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1034	1929603

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			102	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-109-FSGS-014-SS	Project:	ENRG07001
Sample ID:	493624026	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	23-SEP-19 14:21		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0202	+/-0.0604	0.110	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1034	1929603

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			97.2	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L3-012-109-FSGS-017-SS	Project:	ENRG07001
Sample ID:	493624027	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	24-SEP-19 13:52		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0116	+/-0.0446	0.0829	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1034	1929603

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			115	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-PAD-GR5-AJGS-006-SS	Project:	ENRG07001
Sample ID:	493624028	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	12-JUL-19 12:22		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0456	+/-0.0691	0.119	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1034	1929603

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			104	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: November 14, 2019

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-PAD-GR10-AJGS-007-SS	Project:	ENRG07001
Sample ID:	493624029	Client ID:	ENRG070
Matrix:	Soil		
Collect Date:	13-JUL-19 13:48		
Receive Date:	21-OCT-19		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0349	+/-0.0546	0.0954	0.400	pCi/g			JXC9	11/06/19	1526	1933654	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	10/22/19	1034	1929603

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			97.2	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

QC Summary

Report Date: November 14, 2019

LaCrosseSolutions
S4601 State Hwy 35
Genoa, Wisconsin

Contact: Mr. Jason Q. Spaide

Workorder: 493624

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Alpha Spec										
Batch 1929693										
QC1204411092 493624001 DUP										
Americium-241	HUh	0.0084	HU	0.0166	pCi/g	N/A		N/A	HAKB	11/06/19 09:53
	Uncertainty	+/-0.0467		+/-0.0457						
Americium-243	HUh	0.0346	HU	-0.012	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0974		+/-0.0532						
Curium-243/244	HUh	-0.00429	HU	-0.0069	pCi/g	N/A		N/A		
	Uncertainty	+/-0.037		+/-0.0305						
QC1204411093 LCS										
Americium-241	1.92			1.99	pCi/g		104	(75%-125%)		11/07/19 09:18
	Uncertainty			+/-0.348						
Americium-243			U	0.00469	pCi/g			(75%-125%)		
	Uncertainty			+/-0.0491						
Curium-243/244	2.26			2.33	pCi/g		103	(75%-125%)		
	Uncertainty			+/-0.373						
QC1204411091 MB										
Americium-241			U	0.014	pCi/g					11/06/19 09:53
	Uncertainty			+/-0.0279						
Americium-243			U	0.0163	pCi/g					
	Uncertainty			+/-0.0371						
Curium-243/244			U	0.00352	pCi/g					
	Uncertainty			+/-0.0196						
Batch 1929694										
QC1204411095 493624003 DUP										
Neptunium-237	HUh	0.00372	HU	0.00341	pCi/g	N/A		N/A	HAKB	11/11/19 14:07
	Uncertainty	+/-0.00542		+/-0.00442						
QC1204411096 LCS										
Neptunium-237	0.869			1.01	pCi/g		116	(75%-125%)		11/11/19 14:07
	Uncertainty			+/-0.0485						
QC1204411094 MB										
Neptunium-237			U	-0.000288	pCi/g					11/11/19 14:07
	Uncertainty			+/-0.00229						

QC Summary

Workorder: **493624**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Alpha Spec										
Batch 1929695										
QC1204411098 493624001 DUP										
Plutonium-238	HUh	0.00487	HU	0.0052	pCi/g	N/A		N/A	HAKB	11/06/19 09:53
	Uncertainty	+/-0.0271		+/-0.0366						
Plutonium-239/240	HUh	-0.00402	HU	-0.00169	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0278		+/-0.0254						
QC1204411099 LCS										
Plutonium-238			U	-0.00294	pCi/g					11/06/19 09:53
	Uncertainty			+/-0.0203						
Plutonium-239/240	1.96			2.06	pCi/g		105	(75%-125%)		
	Uncertainty			+/-0.231						
QC1204411097 MB										
Plutonium-238			U	0.00862	pCi/g					11/06/19 09:53
	Uncertainty			+/-0.0295						
Plutonium-239/240			U	0.00663	pCi/g					
	Uncertainty			+/-0.0297						
Batch 1929696										
QC1204411101 493624001 DUP										
Plutonium-241	HUh	-1.25	HU	-2.36	pCi/g	N/A		N/A	HAKB	11/09/19 17:00
	Uncertainty	+/-2.38		+/-2.42						
QC1204411102 LCS										
Plutonium-241	162			155	pCi/g		95.5	(75%-125%)		11/09/19 19:02
	Uncertainty			+/-4.78						
QC1204411100 MB										
Plutonium-241			U	-0.546	pCi/g					11/09/19 14:59
	Uncertainty			+/-1.98						
Rad Gamma Spec										
Batch 1929624										
QC1204410975 493624001 DUP										
Cesium-137	Hh	0.113	H	0.0865	pCi/g	26.4		(0% - 100%)	MXR1	11/01/19 06:24
	Uncertainty	+/-0.0594		+/-0.0561						
Cobalt-60	HUh	0.036	HU	0.0428	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0349		+/-0.0446						
Europium-152	HUh	-0.00616	HU	0.070	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0669		+/-0.0644						

QC Summary

Workorder: **493624**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1929624										
Europium-154	HUh	-0.0128	HU	-0.0196	pCi/g	N/A		N/A	MXR1	11/01/19 06:24
	Uncertainty	+/-0.0717		+/-0.109						
Europium-155	HUh	0.0587	HU	0.0597	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0622		+/-0.088						
Niobium-94	HUh	0.0376	HU	-0.0216	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0275		+/-0.0246						
QC1204410976 LCS										
Americium-241	487			512	pCi/g		105	(75%-125%)		11/01/19 06:24
	Uncertainty			+/-6.27						
Cesium-137	167			166	pCi/g		99.4	(75%-125%)		
	Uncertainty			+/-3.92						
Cobalt-60	107			106	pCi/g		98.5	(75%-125%)		
	Uncertainty			+/-3.73						
Europium-152			U	-1.13	pCi/g					
	Uncertainty			+/-1.44						
Europium-154			U	-0.069	pCi/g					
	Uncertainty			+/-1.07						
Europium-155			U	-1.32	pCi/g					
	Uncertainty			+/-1.03						
Niobium-94			U	-0.276	pCi/g					
	Uncertainty			+/-0.508						
QC1204410974 MB										
Cesium-137			U	0.00323	pCi/g					11/01/19 06:23
	Uncertainty			+/-0.0103						
Cobalt-60			U	0.0164	pCi/g					
	Uncertainty			+/-0.0236						
Europium-152			U	0.0135	pCi/g					
	Uncertainty			+/-0.0399						
Europium-154			U	0.0106	pCi/g					
	Uncertainty			+/-0.0612						
Europium-155			U	-0.00293	pCi/g					
	Uncertainty			+/-0.0231						

QC Summary

Workorder: **493624**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1929624										
Niobium-94			U	0.00978	pCi/g				MXR1	11/01/19 06:23
	Uncertainty			+/-0.020						
Batch 1931847										
QC1204415727 493624001 DUP										
Nickel-59	HUh	-0.18	HU	-0.803	pCi/g	N/A		N/A	TXJ1	10/30/19 10:43
	Uncertainty	+/-1.68		+/-1.60						
QC1204415728 LCS										
Nickel-59	90.3			73.2	pCi/g		81.1	(75%-125%)		10/30/19 10:44
	Uncertainty			+/-6.52						
QC1204415726 MB										
Nickel-59			U	-0.45	pCi/g					10/30/19 10:43
	Uncertainty			+/-1.04						
Rad Gas Flow										
Batch 1933651										
QC1204420255 493624005 DUP										
Strontium-90	HUh	-0.0141	HU	-0.134	pCi/g	N/A		N/A	JXC9	11/06/19 14:18
	Uncertainty	+/-0.058		+/-0.105						
QC1204420256 LCS										
Strontium-90	5.40			4.94	pCi/g		91.4	(75%-125%)		11/06/19 14:20
	Uncertainty			+/-0.313						
QC1204420254 MB										
Strontium-90			U	-0.00246	pCi/g					11/06/19 14:18
	Uncertainty			+/-0.0478						
Batch 1933654										
QC1204420263 493624025 DUP										
Strontium-90	U	0.0836	U	0.0226	pCi/g	N/A		N/A	JXC9	11/06/19 15:26
	Uncertainty	+/-0.0864		+/-0.0608						
QC1204420264 LCS										
Strontium-90	5.51			6.75	pCi/g		122	(75%-125%)		11/07/19 06:45
	Uncertainty			+/-0.356						
QC1204420262 MB										
Strontium-90			U	-0.02	pCi/g					11/06/19 15:26
	Uncertainty			+/-0.0423						

QC Summary

Workorder: **493624**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Liquid Scintillation										
Batch 1929721										
QC1204411179 493624001 DUP										
Tritium	HU	1.65	HU	-3.61	pCi/g	N/A		N/A	EW3	10/30/19 06:58
	Uncertainty	+/-5.62		+/-5.09						
QC1204411181 LCS										
Tritium	142			152	pCi/g		107	(75%-125%)		10/29/19 07:49
	Uncertainty			+/-17.1						
QC1204411178 MB										
Tritium			U	0.00583	pCi/g					10/29/19 05:50
	Uncertainty			+/-4.35						
QC1204411180 493624001 MS										
Tritium	171 HU	1.65	H	138	pCi/g		80.3	(75%-125%)		10/29/19 07:33
	Uncertainty	+/-5.62		+/-17.9						
Batch 1929739										
QC1204411223 493624001 DUP										
Technetium-99	HU	-0.00734	HU	0.523	pCi/g	N/A		N/A	JJ3	11/06/19 04:42
	Uncertainty	+/-0.483		+/-0.575						
QC1204411224 LCS										
Technetium-99	38.8			37.5	pCi/g		96.7	(75%-125%)		11/06/19 05:25
	Uncertainty			+/-2.62						
QC1204411222 MB										
Technetium-99			U	0.488	pCi/g					11/06/19 04:00
	Uncertainty			+/-0.492						
Batch 1931683										
QC1204415380 493624001 DUP										
Iron-55	HUh	-1.57	HU	-9.54	pCi/g	N/A		N/A	RP1	11/01/19 21:31
	Uncertainty	+/-12.1		+/-8.16						
QC1204415381 LCS										
Iron-55	75.4			73.8	pCi/g		97.8	(75%-125%)		10/31/19 18:25
	Uncertainty			+/-4.98						
QC1204415379 MB										
Iron-55			U	2.24	pCi/g					10/31/19 16:19
	Uncertainty			+/-3.57						

QC Summary

Workorder: **493624**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Liquid Scintillation										
Batch 1931689										
QC1204415395 493624001 DUP										
Nickel-63	HUh	-0.424	HU	-0.114	pCi/g	N/A		N/A	RP1	10/30/19 14:46
	Uncertainty	+/-1.17		+/-1.26						
QC1204415396 LCS										
Nickel-63	70.5			60.2	pCi/g		85.4	(75%-125%)		10/30/19 15:03
	Uncertainty			+/-3.12						
QC1204415394 MB										
Nickel-63			U	-0.312	pCi/g					10/30/19 14:30
	Uncertainty			+/-1.36						
Batch 1934551										
QC1204422492 493624001 DUP										
Carbon-14	HU	1.92	HU	1.76	pCi/g	N/A		N/A	TXP3	11/08/19 22:21
	Uncertainty	+/-1.76		+/-1.72						
QC1204422494 LCS										
Carbon-14	128			125	pCi/g		97.6	(75%-125%)		11/08/19 23:55
	Uncertainty			+/-3.84						
QC1204422491 MB										
Carbon-14			U	1.00	pCi/g					11/09/19 12:08
	Uncertainty			+/-1.18						
QC1204422493 493624001 MS										
Carbon-14	150 HU	1.92	H	146	pCi/g		97.3	(75%-125%)		11/08/19 23:08
	Uncertainty	+/-1.76		+/-4.51						

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded
- J See case narrative for an explanation
- J Value is estimated
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.

QC Summary

Workorder: **493624**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

M	M if above MDC and less than LLD
M	REMP Result > MDC/CL and < RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Radiochemistry
Technical Case Narrative
LaCrosseSolutions, LLC
SDG #: 493624

Product: **Alphaspec Isotopic Am241 Am243, Cm243/244, Solid**
Analytical Method: DOE EML HASL-300, Am-05-RC Modified
Analytical Procedure: GL-RAD-A-011 REV# 27
Analytical Batch: 1929693

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204411091	Method Blank (MB)
1204411092	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204411093	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204411092 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Recounts
The Am-243 traced portion of sample 493624003 (L3-012-101-RBGS-004-SS) was recounted due to a suspected false positive. The recount is reported.

Product: **Alphaspec Np, Solid**
Analytical Method: ASTM C 1475-00 Modified
Analytical Procedure: GL-RAD-A-032 REV# 22
Analytical Batch: 1929694

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204411094	Method Blank (MB)
1204411095	493624003(L3-012-101-RBGS-004-SS) Sample Duplicate (DUP)
1204411096	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204411095 (L3-012-101-RBGS-004-SSDUP)	Received 21-OCT-19, out of holding 12-APR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17

493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Product: **Alphaspec Pu238, 239/240, Solid**
Analytical Method: DOE EML HASL-300, Pu-11-RC Modified
Analytical Procedure: GL-RAD-A-011 REV# 27
Analytical Batch: 1929695

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204411097	Method Blank (MB)
1204411098	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204411099	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204411098 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Recounts
Samples 493624004 (L3-012-101-RBGS-007-SS) and 493624005 (L4-OFF-SOL-IJGS-A01-SS NE) were recounted due to a peak shift. The recounts are reported.

Miscellaneous Information

Additional Comments
The tracer peak centroid for sample 493624005 (L4-OFF-SOL-IJGS-A01-SS NE) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
493624007	S3-012-109B-FJGS-062-SM
493624008	S3-012-109B-FJGS-063-SM
493624009	S3-012-109B-FJGS-064-SM
493624010	L2-011-101-FSGS-013-SS
493624011	L2-011-104-FSGS-001-SS
493624012	L2-011-104-FSGS-010-SS
493624013	L3-012-101-FSGS-004-SS
493624014	L3-012-109-FSGS-005-SS
493624015	L3-012-109-FSGS-006-SS
493624016	L3-012-109-FSGS-011-SS
493624017	L1-010-107-FSGS-008-SS
493624018	L1-010-101-FSGS-015-SS
493624019	L1-010-102-FSGS-007-SS
493624020	L1-010-103-FSGS-005-SS

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929603

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624021	L1-010-104-FSGS-016-SS
493624022	L1-010-105-FSGS-007-SS
493624023	L2-011-101-FSGS-005-SS
493624024	L2-011-104-FSGS-011-SS
493624025	L3-012-101-FSGS-005-SS
493624026	L3-012-109-FSGS-014-SS
493624027	L3-012-109-FSGS-017-SS
493624028	L1-PAD-GR5-AJGS-006-SS
493624029	L1-PAD-GR10-AJGS-007-SS

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155**
Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Analytical Procedure: GL-RAD-A-013 REV# 27
Analytical Batch: 1929624

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204410974	Method Blank (MB)
1204410975	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204410976	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204410975 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Product: **Gamma Ni59, Solid**
Analytical Method: DOE RESL Ni-1
Analytical Procedure: GL-RAD-A-022 REV# 19
Analytical Batch: 1931847

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204415726	Method Blank (MB)
1204415727	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204415728	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204415727 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Product: **GFPC, Sr90, Solid**
Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified
Analytical Procedure: GL-RAD-A-004 REV# 21
Analytical Batch: 1933651

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
493624007	S3-012-109B-FJGS-062-SM
493624008	S3-012-109B-FJGS-063-SM
493624009	S3-012-109B-FJGS-064-SM
493624010	L2-011-101-FSGS-013-SS
493624011	L2-011-104-FSGS-001-SS
493624012	L2-011-104-FSGS-010-SS
493624013	L3-012-101-FSGS-004-SS

493624014	L3-012-109-FSGS-005-SS
493624015	L3-012-109-FSGS-006-SS
1204420254	Method Blank (MB)
1204420255	493624005(L4-OFF-SOL-IJGS-A01-SS NE) Sample Duplicate (DUP)
1204420256	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204420255 (L4-OFF-SOL-IJGS-A01-SS NEDUP)	Received 21-OCT-19, out of holding 31-OCT-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Recounts
Samples 493624002 (L3-012-101-RAGS-004-SS) and 493624012 (L2-011-104-FSGS-010-SS) were recounted due to results more negative than the three sigma TPU. The second counts are reported.

Product: **GFPC, Sr90, Solid**
Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified
Analytical Procedure: GL-RAD-A-004 REV# 21
Analytical Batch: 1933654

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batches: 1929602 and 1929603

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624016	L3-012-109-FSGS-011-SS
493624017	L1-010-107-FSGS-008-SS

493624018	L1-010-101-FSGS-015-SS
493624019	L1-010-102-FSGS-007-SS
493624020	L1-010-103-FSGS-005-SS
493624021	L1-010-104-FSGS-016-SS
493624022	L1-010-105-FSGS-007-SS
493624023	L2-011-101-FSGS-005-SS
493624024	L2-011-104-FSGS-011-SS
493624025	L3-012-101-FSGS-005-SS
493624026	L3-012-109-FSGS-014-SS
493624027	L3-012-109-FSGS-017-SS
493624028	L1-PAD-GR5-AJGS-006-SS
493624029	L1-PAD-GR10-AJGS-007-SS
1204420262	Method Blank (MB)
1204420263	493624025(L3-012-101-FSGS-005-SS) Sample Duplicate (DUP)
1204420264	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
Sample 1204420264 (LCS) was recounted due to high recovery. The recount is reported.

Product: **Liquid Scint Pu241, Solid**
Analytical Method: DOE EML HASL-300, Pu-11-RC Modified
Analytical Procedure: GL-RAD-A-035 REV# 21
Analytical Batch: 1929696

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204411100	Method Blank (MB)
1204411101	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204411102	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met
Sample (see below) did not meet the detection limit due to a lower sample yield. The client yield requirement was met. The sample was counted the maximum count time in order to achieve the lowest possible MDAs.

Sample	Analyte	Value
493624003 (L3-012-101-RBGS-004-SS)	Plutonium-241	Result -2.96 < MDA 5.69 > RDL 5 pCi/g

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204411101 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Miscellaneous Information

Additional Comments
The tracer peak centroid for sample 493624005 (L4-OFF-SOL-IJGS-A01-SS NE) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Product: **LSC, Tritium Distillation, Solid**
Analytical Method: EPA 906.0 Modified
Analytical Procedure: GL-RAD-A-002 REV# 23
Analytical Batch: 1929721

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The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204411178	Method Blank (MB)
1204411179	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204411180	493624001(L3-012-101-RAGS-002-SS) Matrix Spike (MS)
1204411181	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204411179 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
1204411180 (L3-012-101-RAGS-002-SSMS)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Recounts
Samples 1204411179 (L3-012-101-RAGS-002-SSDUP) and 493624004 (L3-012-101-RBGS-007-SS) were recounted due to high MDCs. The recounts are reported.

Product: **Liquid Scint Tc99, Solid**
Analytical Method: DOE EML HASL-300, Tc-02-RC Modified
Analytical Procedure: GL-RAD-A-059 REV# 5
Analytical Batch: 1929739

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204411222	Method Blank (MB)
1204411223	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204411224	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204411223 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Product: **Liquid Scint Fe55, Solid**
Analytical Method: DOE RESL Fe-1, Modified
Analytical Procedure: GL-RAD-A-040 REV# 13
Analytical Batch: 1931683

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204415379	Method Blank (MB)
1204415380	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204415381	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met
Samples (see below) did not meet the detection limits. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
1204415380 (L3-012-101-RAGS-002-SSDUP)	Iron-55	Result -9.54 < MDA 12.4 > RDL 10 pCi/g
493624001 (L3-012-101-RAGS-002-SS)	Iron-55	Result -1.57 < MDA 18.7 > RDL 10 pCi/g
493624002 (L3-012-101-RAGS-004-SS)	Iron-55	Result -8.13 < MDA 16.8 > RDL 10 pCi/g
493624003 (L3-012-101-RBGS-004-SS)	Iron-55	Result -3.06 < MDA 16.7 > RDL 10 pCi/g
493624004 (L3-012-101-RBGS-007-SS)	Iron-55	Result -2.34 < MDA 14.1 > RDL 10 pCi/g
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Iron-55	Result -2.65 < MDA 12.7 > RDL 10 pCi/g

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204415380 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Recounts
Samples 1204415380 (L3-012-101-RAGS-002-SSDUP), 493624001 (L3-012-101-RAGS-002-SS), 493624002 (L3-012-101-RAGS-004-SS), 493624003 (L3-012-101-RBGS-004-SS), 493624004 (L3-012-101-RBGS-007-SS), 493624005 (L4-OFF-SOL-IJGS-A01-SS NE) and 493624006 (L4-OFF-SOL-IJGS-A03-SS SW) were recounted due to high MDCs. The recounts are reported.

Product: **Liquid Scint Ni63, Solid**
Analytical Method: DOE RESL Ni-1, Modified
Analytical Procedure: GL-RAD-A-022 REV# 19
Analytical Batch: 1931689

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1929602

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204415394	Method Blank (MB)
1204415395	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204415396	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204415395 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17

493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Product: **Liquid Scint C14, Solid**
Analytical Method: EPA EERF C-01 Modified
Analytical Procedure: GL-RAD-A-003 REV# 16
Analytical Batch: 1934551

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
493624001	L3-012-101-RAGS-002-SS
493624002	L3-012-101-RAGS-004-SS
493624003	L3-012-101-RBGS-004-SS
493624004	L3-012-101-RBGS-007-SS
493624005	L4-OFF-SOL-IJGS-A01-SS NE
493624006	L4-OFF-SOL-IJGS-A03-SS SW
1204422491	Method Blank (MB)
1204422492	493624001(L3-012-101-RAGS-002-SS) Sample Duplicate (DUP)
1204422493	493624001(L3-012-101-RAGS-002-SS) Matrix Spike (MS)
1204422494	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Holding Time
Samples (See Below) were received and analyzed outside the hold time.

Sample	Value
1204422492 (L3-012-101-RAGS-002-SSDUP)	Received 21-OCT-19, out of holding 07-MAR-17
1204422493 (L3-012-101-RAGS-002-SSMS)	Received 21-OCT-19, out of holding 07-MAR-17
493624001 (L3-012-101-RAGS-002-SS)	Received 21-OCT-19, out of holding 07-MAR-17
493624002 (L3-012-101-RAGS-004-SS)	Received 21-OCT-19, out of holding 12-MAR-17
493624003 (L3-012-101-RBGS-004-SS)	Received 21-OCT-19, out of holding 12-APR-17
493624004 (L3-012-101-RBGS-007-SS)	Received 21-OCT-19, out of holding 22-APR-17
493624005 (L4-OFF-SOL-IJGS-A01-SS NE)	Received 21-OCT-19, out of holding 31-OCT-17
493624006 (L4-OFF-SOL-IJGS-A03-SS SW)	Received 21-OCT-19, out of holding 31-OCT-17

Recounts
Samples 493624002 (L3-012-101-RAGS-004-SS) and 493624006 (L4-OFF-SOL-IJGS-A03-SS SW) were recounted to verify sample results. Recounts are reported.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

493624

Page: 1 of 4
Project # LACBWR Site
GEL Quote #:
COC Number (1):
PO Number: 672583

GEL Laboratories LLC
gel.com
Chemistry | Radiochemistry | Radiobioassay | Specialty Analytics

Chain of Custody and Analytical Request

GEL Work Order Number: *GEL Project Manager:*

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: La Crosse Solutions Phone # 608-689-4259
Project/Site Name: LACBWR-Genoa WI Fax #
Address: 54601 State Road 35
Collected By: Kevin L Murray Send Results To:Scott Zoller sgzoller@energysolutions.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive (If yes, please supply isotopic info.)	Should this sample be considered: (7) Known or possible Hazards	Total number of containers	Sr90	Ni59, Co60, Nb94	Cs137, Eu152, Eu154	Eu155, Pu241	H3, C14, Fe55	Ni63, Tc99	Np237, Pu238	Pu239, Pu240	Am241, Am243	Cm243, Cm244	<-- Preservative Type (6) Comments Note: extra sample is required for sample specific QC
L3-012-101-RAGS-002-SS	09/08/16	11:05	N	N	SO	N	N	1	1	1	1	1	1	1	1	1	1	1	MDC <0.01pCi Np-237
L3-012-101-RAGS-004-SS	09/13/16	11:00	N	N	SO	N	N	1	1	1	1	1	1	1	1	1	1	1	MDC <0.01pCi Np-237
L3-012-101-RBGS-004-SS	10/14/16	9:02	N	N	SO	N	N	1	1	1	1	1	1	1	1	1	1	1	MDC <0.01pCi Np-237
L3-012-101-RBGS-007-SS	10/24/16	9:05	N	N	SO	N	N	1	1	1	1	1	1	1	1	1	1	1	MDC <0.01pCi Np-237
L4-OFF-SOL-IJGS-A01-SS NE	05/04/17	8:25	N	N	SO	N	N	1	1	1	1	1	1	1	1	1	1	1	MDC <0.01pCi Np-237
L4-OFF-SOL-IJGS-A03-SS SW	05/04/17	9:30	N	N	SO	N	N	1	1	1	1	1	1	1	1	1	1	1	MDC <0.01pCi Np-237

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Kevin L Murray	10/16/2019	1315	1 A. Olmen	10/21/19	8:40
2			2		
3			3		

TAT Requested: Normal: _X_ Rush: _____ Specify: _____ (Subject to Surcharge)

Fax Results: [ ] Yes [X] No

Select Deliverable: [ ] C of A [ ] QC Summary [ ] level 1 [X] Level 2 [ ] Level 3 [ ] Level 4

Additional Remarks: **None**

For Lab Receiving Use Only: *Custody Seal Intact?* [ ] *Yes* [ ] *No* ***Cooler Temp:*** _____ *°C*

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: [ ] Eastern [ ] Pacific [X] Central [ ] Mountain [ ] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: **N** = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite

3.) Field Filtered: For liquid matrices, indicate with a - **Y** - for yes the sample was field filtered or - **N** - for sample was not field filtered.

4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, **ML**=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B**, **6010B/7470A**) and number of containers provided for each (*i.e. 8260B* - **3**, *6010B/7470A* - **1**).

6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) KNOWN OR POSSIBLE HAZARDS

RCRA Metals
As = Arsenic **Hg**= Mercury
Ba = Barium **Se**= Selenium
Cd = Cadmium **Ag**= Silver
Cr = Chromium **MR**= Misc. RCRA metals
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F,K,P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. *(i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)*

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Page: 2 of 4
Project # LACBWR Site
GEL Quote #:
COC Number (1):
PO Number: 672583

GEL Laboratories LLC
gel.com
Chemistry | Radiochemistry | Radiobioassay | Specialty Analytics

Chain of Custody and Analytical Request

GEL Work Order Number: *GEL Project Manager:*

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: La Crosse Solutions Phone # 608-689-4259
Project/Site Name: LACBWR-Genoa WI Fax #
Address: 54601 State Road 35
Collected By: Kevin L Murray Send Results To:Scott Zoller sgzoller@energysolutions.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Radioactive (If yes, please supply isotopic info.)	(7) Known or possible Hazards	Total number of containers	Sr90										<-- Preservative Type (6) Comments Note: extra sample is required for sample specific QC
S3-012-109B-FJGS-062-SM	08/22/19	10:05	N	N	SO	N	N	1	1										
S3-012-109B-FJGS-063-SM	08/22/19	10:14	N	N	SO	N	N	1	1										
S3-012-109B-FJGS-064-SM	08/22/19	13:12	N	N	SO	N	N	1	1										
L2-011-101-FSGS-013-SS	09/20/19	10:43	N	N	SO	N	N	1	1										
L2-011-104-FSGS-001-SS	09/09/19	14:08	N	N	SO	N	N	1	1										
L2-011-104-FSGS-010-SS	09/09/19	14:46	N	N	SO	N	N	1	1										
L3-012-101-FSGS-004-SS	09/05/19	8:58	N	N	SO	N	N	1	1										
L3-012-109-FSGS-005-SS	09/24/19	8:05	N	N	SO	N	N	1	1										
L3-012-109-FSGS-006-SS	09/24/19	10:36	N	N	SO	N	N	1	1										
L3-012-109-FSGS-011-SS	09/23/19	14:09	N	N	SO	N	N	1	1										

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Kevin L Murray	10/16/2019	1315	1 A. Almen	10/21/19	8:40
2			2		
3			3		

TAT Requested: Normal: _X__ Rush: _____ Specify: _____ (Subject to Surcharge)

Fax Results: [ ] Yes [X] No
Select Deliverable: [ ] C of A [ ] QC Summary [ ] level 1 [X] Level 2 [ ] Level 3 [ ] Level 4
Additional Remarks: **None**
For Lab Receiving Use Only: *Custody Seal Intact?* [ ] *Yes* [ ] *No* ***Cooler Temp:*** _____ °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: [ ] Eastern [ ] Pacific [X] Central [ ] Mountain [ ] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: **N** = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite

3.) Field Filtered: For liquid matrices, indicate with a - **Y** - for yes the sample was field filtered or - **N** - for sample was not field filtered.

4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, **ML**=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B, 6010B/7470A**) and number of containers provided for each (i.e. *8260B* - **3**, *6010B/7470A* - **1**).

6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) **KNOWN OR POSSIBLE HAZARDS**

RCRA Metals
As = Arsenic **Hg**= Mercury
Ba = Barium **Se**= Selenium
Cd = Cadmium **Ag**= Silver
Cr = Chromium **MR**= Misc. RCRA metals
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F,K,P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. *(i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)*

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Page: 3 of 4
Project # LACBWR Site
GEL Quote #:
COC Number (1):
PO Number: 672583

GEL Laboratories LLC
gel.com
Chemistry | Radiochemistry | Radiobioassay | Specialty Analytics

Chain of Custody and Analytical Request

GEL Work Order Number: *GEL Project Manager:*

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: La Crosse Solutions Phone # 608-689-4259
Project/Site Name: LACBWR-Genoa WI Fax #
Address: 54601 State Road 35
Collected By: Kevin L Murray Send Results To:Scott Zoller sgzoller@energysolutions.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Radioactive (If yes, please supply isotopic info.)	Should this sample be considered: (7) Known or possible Hazards	Total number of containers	Sr90										<-- Preservative Type (6)
L1-010-107-FSGS-008-SS	08/08/19	15:00	N	N	SO	N	N	1	1										
L1-010-101-FJGS-015-SS	08/08/19	15:12	N	N	SO	N	N	1	1										
L1-010-102-FSGS-007-SS	08/14/19	15:18	N	N	SO	N	N	1	1										
L1-010-103-FSGS-005-SS	08/14/19	10:13	N	N	SO	N	N	1	1										
L1-010-104-FJGS-016-SS	08/23/19	9:57	N	N	SO	N	N	1	1										
L1-010-105-FSGS-007-SS	08/23/19	13:29	N	N	SO	N	N	1	1										
L2-011-101-FSGS-005-SS	09/20/19	14:01	N	N	SO	N	N	1	1										
L2-011-104-FSGS-011-SS	09/09/19	14:52	N	N	SO	N	N	1	1										
L3-012-101-FSGS-005-SS	09/05/19	13:00	N	N	SO	N	N	1	1										
L3-012-109-FSGS-014-SS	09/23/19	14:21	N	N	SO	N	N	1	1										

Comments
Note: extra sample is required for sample specific QC

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Kevin L Murray	10/16/2019	1315	1 A. Allmen	10/21/19	8:40
2			2		
3			3		

TAT Requested: Normal: _X_ Rush: _____ Specify: _____ (Subject to Surcharge)

Fax Results: [ ] Yes [X] No

Select Deliverable: [ ] C of A [ ] QC Summary [ ] level 1 [X] Level 2 [ ] Level 3 [ ] Level 4

Additional Remarks: **None**

For Lab Receiving Use Only: *Custody Seal Intact?* [ ] *Yes* [ ] *No* ***Cooler Temp:*** _____ °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone : [ ] Eastern [ ] Pacific [X] Central [ ] Mountain [ ] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: **N** = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite

3.) Field Filtered: For liquid matrices, indicate with a **- Y -** for yes the sample was field filtered or **- N -** for sample was not field filtered.

4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, **ML**=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B, 6010B/7470A**) and number of containers provided for each (i.e. *8260B* **- 3**, *6010B/7470A* **- 1**).

6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) KNOWN OR POSSIBLE HAZARDS

RCRA Metals
As = Arsenic **Hg**= Mercury
Ba = Barium **Se**= Selenium
Cd = Cadmium **Ag**= Silver
Cr = Chromium **MR**= Misc. RCRA metals
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F,K,P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. *(i.e.: Origin of sample(s), type of site collected from, add matrices, etc.)*

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Page: 4 of 4
Project # LACBWR Site
GEL Quote #:
COC Number (1):
PO Number: 672583

GEL Laboratories LLC
gel.com
Chemistry | Radiochemistry | Radiobioassay | Specialty Analytics

Chain of Custody and Analytical Request

GEL Work Order Number: *GEL Project Manager:*

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: La Crosse Solutions Phone # 608-689-4259
Project/Site Name: LACBWR-Genoa WI Fax #
Address: 54601 State Road 35
Collected By: Kevin L Murray Send Results To:Scott Zoller sgzoller@energysolutions.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive (if yes, please supply isotopic info.)	Should this sample be considered: (7) Known or possible Hazards	Total number of containers	Sr-90	<-- Preservative Type (6)	Comments Note: extra sample is required for sample specific QC
L3-012-109-FJGS-017-SS	09/24/19	13:52	N	N	SO	N	N	1	1		
L1-PAD-GR5-AJGS-006-SS	07/12/19	12:22	N	N	SO	N	N	1	1		
L1-PAD-GR10-AJGS-007-SS	07/13/19	13:48	N	N	SO	N	N	1	1		

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Kevin L Murray	10/16/2019	1315	1 A. Almen	10/21/19	8:40
2			2		
3			3		

TAT Requested: Normal: _X_ Rush: _____ Specify: _____ (Subject to Surcharge)

Fax Results: [ ] Yes [X] No

Select Deliverable: [ ] C of A [ ] QC Summary [ ] level 1 [X] Level 2 [ ] Level 3 [ ] Level 4

Additional Remarks: **None**

For Lab Receiving Use Only: *Custody Seal Intact?* [ ] *Yes* [ ] *No* ***Cooler Temp:*** _____ °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: [ ] Eastern [ ] Pacific [X] Central [ ] Mountain [ ] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: **N** = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite

3.) Field Filtered: For liquid matrices, indicate with a **- Y -** for yes the sample was field filtered or **- N -** for sample was not field filtered.

4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, **ML**=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B, 6010B/7470A**) and number of containers provided for each (i.e. *8260B* **- 3**, *6010B/7470A* **- 1**).

6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) KNOWN OR POSSIBLE HAZARDS

RCRA Metals
As = Arsenic **Hg**= Mercury
Ba = Barium **Se**= Selenium
Cd = Cadmium **Ag**= Silver
Cr = Chromium **MR**= Misc. RCRA metals
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F,K,P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. *(i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)*

GEL Laboratories LLC

EK

SAMPLE RECEIPT & REVIEW FORM

Client: ENRG	SDG/AR/COC/Work Order: 493624
Received By: AJA	Date Received: 10/21/19
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 7767 3575 6970

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A)Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#: If UN2910, Is the Radioactive Shipment Survey Compliant? Yes___ No___
B) Did the client designate the samples are to be received as radioactive?		✓	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 0 CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		✓	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		✓	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice (None) Other: *all temperatures are recorded in Celsius TEMP: 23°
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR4-16 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?		✓		Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	If Yes, are Encores or Soil Kits present for solids? Yes___ No___ NA___(If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes___ No___ NA___(If unknown, select No) Are liquid VOA vials free of headspace? Yes___ No___ NA___ Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided?	✓			
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials MB Date 10/22/19 Page 1 of 1

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List of current GEL Certifications as of 14 November 2019

State	Certification
Alaska	17−018
Alaska Drinking Water	SC00012
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M−SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122020−1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	2019−165
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−19−15
Utah NELAP	SC000122019−29
Vermont	VT87156
Virginia NELAP	460202
Washington	C780